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# The Effect of Car and Motorcycle Ownership on Traffic Flow in Tourism Area in Kuta Bali

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**Abstract** Transport is a fundamental sector of the tourism industry. Transport provides access to tourist attractions and is itself a tourism activity. Tourism plays a key role in stimulating economic growth and attracting more workers, thereby promoting the urbanization of the population. Due to rapid population growth and lack of adequate public transport, private vehicle (cars and motorcycles) ownership is on the rise. In developing countries, private vehicles severely impede urban transport systems. Low-income people are more likely to buy motorcycles, and high-income people are more likely to buy cars. Therefore, these two types of vehicles are usually considered substitutes for each other. The purpose of this study was to analyze people's perceptions of car ownership, motorcycle ownership, use of private vehicles, and traffic flow, and analyze the influence of perceptions of car and motorcycle ownership on perceptions of private vehicle use and perceptions of traffic flow. Perceptions of car and motorcycle ownership are used as exogenous variables. Perceptions of private vehicle use are used as intervening endogenous variables. Perception of traffic flow is used as the endogenous variable. Primary data collection was performed by distributing questionnaires to 200 respondents living in the tourist area of Kuta, Bali, a very popular tourist destination, especially for surfing fans. Respondents were asked about their perceptions, which were analyzed using structural equation models (SEM). Perceptions of car and motorcycle ownership have a significant effect on perceptions of private vehicle use. Perceptions of car ownership and the use of private vehicles have a significant effect on perceptions of traffic flow. Perceptions of private vehicle use can mediate the effect of perceptions of car ownership on perceptions of traffic flow. Perceptions of car ownership have been shown to have a greater impact on perceptions of private vehicle use than motorcycle ownership.

**Keywords** Perceptions, Car and Motorcycle Ownerships, Private Vehicle Use, Tourism, Traffic Flow

## 1. Introduction

An efficient, safe, integrated, and sustainable transport network is an essential prerequisite for the tourism sector. Visitors should be able to easily move around the country using a variety of modes of transportation [1]. Transport plays a double role in tourism, namely, providing access to or near tourist sites and tourism activities themselves [2]. Transport is a fundamental sector of the tourism industry. Without tourism, transport, and travel are independent, but without travel, tourism cannot develop [3]. Tourism is a form of international trade and the largest single economic sector in the world, growing the fastest [4]. Mass tourism is now global with tourists from developed countries visiting almost all parts of the world [5].

Indonesia receives visits from foreign tourists in

December 2022, which reached 895.12 thousand visits, an increase of 447.08 percent compared to conditions in December 2021. When compared to the previous month, the number of foreign tourist visits in December 2022 also increased, namely by 36.19 percent [6]. Meanwhile, foreign tourists who came directly to Bali Province in December 2022 recorded 377,276 visits, an increase of 31.27 percent compared to the previous month's period which recorded 287,398 visits. Cumulatively, during January-December 2022, Bali has received 2,155,747 visits by foreign tourists [7].

The tourism industry has made Badung the richest regency in Bali. Badung Regency has an area of 418.52 $km^2$ with a total population of 670,200 people and a population density of 1,601.4 people/ $km^2$. Some coastal areas in Badung Regency, such as beaches Kuta, Nusa Dua Beach, are coastal areas that are excellent for tourists for a vacation. Badung Regency has 299-star hotels (classified hotels) with 46,892 rooms, 458 simple hotels with 15.450 rooms, and 728 restaurants with 60,523 seats. The tourism sector contributes greatly to increasing the gross regional domestic product (GRDP) of Badung Regency constantly from Rp. 42,429.25 billion in 2015 to 62,794.58 in 2019 [8].

The population is growing rapidly as rapidly growing tourism absorbs more labor force and leads to the urbanization of the population. High levels of urbanization influence car purchasing decisions [9] and have a significant impact on car ownership [10]. Private vehicle ownership in Badung Regency reached 934,120 units, the largest after private vehicle ownership in Denpasar City which reached 1.470.570 units. Increased car ownership leads to increased car use [11]. Car ownership is one of the most important predictors of car use [12]. On the other hand, rapid urbanization is also affecting the use of motorcycles by the lower middle class [13]. Road users are more likely to choose motorcycles with lower purchasing power, mainly due to lower operating and acquisition costs [14].

Cars and motorcycles are private vehicles that dominate the traffic flow. In developing countries, private vehicles have a significant impact on urban transport systems [15]. Low-income people are more likely to buy motorcycles, and high-income people are more likely to buy cars. These two vehicle types are therefore usually considered alternatives to each other [16]. To achieve sustainable tourism, we need to reduce personal transport and expand sustainable transport modes such as walking, cycling, and public transport [17].

Therefore, if the city wants to remain tourist-oriented, it is very important to provide visitor-friendly and easy-to-travel transportation [1]. This survey was conducted in a tourist area of Kuta, a very famous tourist destination in Bali. Kuta is home to some of Indonesia's most famous overseas tourist attractions. Kuta Beach is especially famous for surfing fans. The area is also filled with various star hotels, restaurants, villas, and shopping malls. It has an area of 17.52 $km^2$, a population of 59,160, and a population density of 3,376.71 people/$km^2$. There are 412-starred and non-starred hotels in the Kuta area [8].

Tourism has an important contribution to driving Kuta's economic growth. As a major tourist destination, Kuta is susceptible to urbanization and residents are looking for jobs in the tourism sector. An improving economy, growing population, and lack of public transportation have led to an increase in private vehicle ownership, especially cars, and motorcycles. The increase in private vehicle ownership and use has not been accompanied by an increase in existing road capacity. As a result, traffic flow can clog roads and affect the quality of tourism transport services. The purpose of this study was to analyze people's perceptions of car ownership, motorcycle ownership, use of private vehicles, and traffic flow, and analyze the influence of perceptions of car and motorcycle ownership on perceptions of private vehicle use and perceptions of traffic flow. Perceptions of car ownership and perception of motorcycle ownership are used as exogenous variables. Perceptions of private vehicle use are used as intervening endogenous variables. The variable of perception of traffic flow is endogenous.

Income has a positive impact on car and motorcycle ownership [18]. Larger households tend to own more cars. The number of adults in a household strongly influences car ownership [19]. Car travel facilitates the creation of new leisure activities and contributes to increased car ownership [20]. People tend to own motorcycles due to their low cost, availability and low maintenance costs [13]. On the other hand, income level and availability of public transport have a significant negative impact on motorcycle ownership [21]. Private vehicles are used not only for their instrumental function (freedom, convenience, comfort) but also for their symbolic function (social status) and emotional function (making driving enjoyable) preferred over transportation [22].

The car is an extreme symbol of modern society, embodying lifestyle, freedom, independence, power, speed, control, prestige, and consumption. Cars play a role not only in transportation but also in cultural and social life [23]. Increased car use is a result of car ownership and cannot be dampened by increased public transport [11]. Drivers who drive more often are more likely to get stuck in traffic and are therefore less satisfied with their journeys [24]. Meanwhile, the use of motorcycle has increased significantly around the world in recent decades [25]. In Asia, many countries have mixed traffic consisting of motorbikes and cars [26]. There are several reasons why people use motorcycle: (a) Motorcycles are faster and easier to maneuver; (b) A motorcycle is a door-to-door means of transportation; (c) Reduced operating costs; (d) High accessibility [27]; (e) Low fuel consumption; (f) Reduced maintenance costs [13]; (g) Small width and size, high power-to-weight ratio [28].

In addition, traffic problems are becoming more serious due to the rapid increase in the number of automobiles owned. Many cities have developed restrictive car policies to reduce traffic congestion by limiting car use and controlling growth in vehicle ownership [29]. High motorcycle usage dominates traffic flows in Asian countries. There is a large volume of motorcycle traffic, and it mixes with other traffic, complicating the characteristics of the traffic flow [21]. Motorcycles represent a significant portion of the traffic in many countries but are underestimated in traffic flow theory [30]. Motorcycles have been an important vehicle type for freight and passenger transport in several Asian countries for decades and already account for a significant proportion of road traffic in the region [31]. Many studies on private car ownership and its impact on traffic flow have been conducted by previous researchers. [32] states that there is insufficient road capacity to handle all the travel because congestion is common in densely populated areas with a high proportion of cars. [33] also found that economic growth, ownership and use of electric vehicles, electrification, and urbanization are putting significant pressure on transport networks.

# 2. Materials and Methods

### 2.1. Structural Equation Modeling (SEM)

The variables of car ownership, motorcycle ownership, use of private vehicles, traffic flow, and the indicator variables are observable variables, which can be quantified. But, in this study, we try to conceptualize all these variables through people's perceptions, those who experience, feel and pass in daily life on the roads in this tourist area. In this study, people's perceptions will be analyzed using the structural equation model (SEM) method.

This study was a cross-sectional survey using a questionnaire prepared for residents of Kuta, Badung-Bali. Those interviewed were civil servants, military/police, entrepreneurs, and private sector employees. Respondents are distributed in five districts Seminyak, Legian, Kuta, Tuban, and Kedonganan. 200 respondents were obtained from distributed questionnaires and evaluated as survey data. Community perceptions as primary data are analyzed with SEM AMOS. All respondents were asked to rate the questionnaire on a five-point Likert scale from 1 (strongly disagree) to 5 (strongly agree).

Structural equation modeling (SEM) is a modeling technique that can handle a large number of endogenous and exogenous variables, as well as latent (unobserved) variables specified as linear combinations of the observed variables. Regression, simultaneous equations (with and without error-term correlations), path analysis, variations of factor analysis, and canonical correlation analysis are all special cases of SEM. It is a confirmatory, rather than exploratory method. In SEM one can also separate errors in measurement from errors in equations, and one can correlate error terms within all types of errors. Estimation of SEM is performed using the covariance analysis method. Goodness-of-fit tests are used to determine if a model specified by the researcher is consistent with the pattern of variance-covariances in the data [34], explained that there are 7 (seven) steps in using the analytical method with SEM:

1. Theoretical Model Development

   Researchers through literature review to get justification for the theoretical model developed. SEM can only be used with a strong theoretical basis. Causal relationships are not produced by SEM but by theory and empirical experience.

2. Path Diagram Development

   The theoretical model that has been built in the first step will be described in a path diagram which will make it easier for researchers to see the causality relationships they want to test.

3. Convert Path Diagrams into Structural Equations and Measurement Models

   Researchers can start converting the model into a series of equations consisting of [35]:

   (i) structural equation

$$Y = \eta = \beta\,\eta + \Gamma.\xi + \zeta \qquad (1)$$

Where:
$\eta$ : (eta) endogenous latent variable
$\beta$ : (beta) path coefficient matrix for the relationship between endogenous latent variables
$\Gamma$ : (gamma) path coefficient matrix for the relationship between exogenous latent variables and endogenous latent variables
$\xi$ : (ksi) exogenous latent variable
$\zeta$ : (zeta) measurement error (error) in the structural equation

   (ii) measurement model

$$y = \lambda y\,\eta + \varepsilon \qquad (2)$$

$$x = \lambda x\,\xi + \delta \qquad (3)$$

Where:
yi : manifest variables for endogenous latent variables
xn : manifest variables for exogenous latent variables
$\lambda y$ : (lambda) loading factor endogenous indicators
$\lambda x$ : (lambda) loading factor between exogenous indicators
$\varepsilon$ : (epsilon) measurement error against y
$\delta$ : (delta) measurement error against x

4. Choose the Type of Input Matrix and Model Estimation

[36] found that the appropriate sample size is between 100 – 200 samples for the maximum likelihood estimation technique and suggests that the minimum sample size is 5 – 10 times the number of parameters estimated

5. Assessing Problem Identification

The problem of identification in principle is a problem regarding the inability of the developed model to produce good estimates. Identification problems can arise through the following symptoms: (i) The standard error for one or several coefficients is very large; (ii) The program is unable to produce the information matrix that should be presented; (iii) Strange numbers appear, such as a negative error variance; and (iv) The appearance of a very high correlation between the estimated coefficients obtained.

6. Model Evaluation

Fit and Statistical Test: Likelihood ratio chi-square statistic ($\chi^2$), Root Mean Square Error Approximation (RMSEA), Goodness of Fit Index (GFI), Adjusted Goodness of Fit Index (AGFI), The Minimum Sample Discrepancy Function or Degree of Freedom (CMIN/DF), Tucker Lewis Index (TLI) and Comparative Fit Index (CFI)

7. Model Interpretation and Modification

If the estimation of the model is carried out and the results are still not good, the writer still gets it and makes modifications to the developed model if it turns out to be an incorrect estimate produced which has a large residue. The largest value modification index (MI) is chosen to be correlated/regressive, and this indication is estimated. In the process of this modification, there will be a significant reduction in the value of chi-square ($X^2$).

### 2.2. Research Variable

In this study, four latent variables and twenty-four indicator variables were involved. The explanation of this research variable is:

1. Perceptions of Car Ownership (X1)

Perceptions of car ownership is a variable that is conceptualized as an exogenous latent variable, which is constructed by five observed variables, namely: increase in tourist arrivals (X1.1); ease of purchase (X1.2); increase in household income (X1.3); increase in household members (X1.4); and increase in adults household members (X1.5).

2. Perceptions of motorcycle ownership (X2)

Perceptions of motorcycle ownership is a variable that is conceptualized as an exogenous latent variable, which is constructed by five observed variables, namely: increase in tourist arrivals (X2.1); ease of purchase (X2.2); cheap motorcycle prices (X2.3); and low maintenance costs (X2.4); Motorcycles require a small parking space (X2.5).

3. Perceptions of Private Vehicles Use (Y1)

Perceptions of private vehicle use is a variable that is conceptualized as an intermediary endogenous latent variable, which is constructed by seven observed variables, namely: poor quality of public transport services (Y1.1); cars provide freedom (Y1.2); cars provide flexibility (Y1.3); cars provide comfort (Y1.4); using a car is a lifestyle (Y1.5); the motorcycle is more practical for short distances (Y1.6); and motorcycles have high maneuverability (Y1.7).

4. Perceptions of Traffic Flows (Y2)

Perceptions of traffic flow variable (Y2) is a variable that is conceptualized as an endogenous latent variable, which is constructed by seven observed variables, namely: traffic flow density (Y2.1); congestion (Y2.2); domination of private vehicles (Y2.3); close to airport location (Y2.4); on-street parking (Y2.5); low speed (Y2.6); and longer travel time (X2.7).

### 2.3. Research Hypothesis

The hypotheses of this study are:

H1: The perceptions of car ownership (X1) have a significant effect on the perceptions of private vehicle use (Y1).

H2: The perceptions of car ownership (X1) have a significant effect on the perceptions of traffic flow (Y2).

H3: The perceptions of motorcycle ownership (X2) have a significant effect on private vehicle use perceptions (Y1).

H4: The perceptions of motorcycle ownership (X2) have a significant effect on the perceptions of traffic flow (Y2).

H5: The perceptions of private vehicle use (Y1) have a significant effect on the perceptions of traffic flow (Y2).

H6: The perceptions of private vehicle use (Y1) can mediate the effect of the perceptions of car (X1) and motorcycle ownership (X2) on the perceptions of traffic flow (Y2).

## 3. Results and Discussion

### 3.1. Preliminary Data Analysis

**Figure 1** shows the respondents' perceptions of car ownership (X1) in Kuta. The majority of respondents agreed that constructing this variable was: household income increased (X1.3) by 42%, household members increased (X1.4) by 41%, and adult household members increased (X1.5) by 41%.

**Figure 2** shows respondents' perceptions of motorcycle ownership (X2) in Kuta. The majority of respondents agreed that constructing this variable was: cheap motorcycle prices (X2.3) 41% and low maintenance costs (X2.4) 45%.

**Figure 3** shows respondents' perceptions of the Use of vehicle private (Y1) in Kuta. The majority of respondents agreed that constructing this variable was: poor quality of public transport service (Y1.1) by 53%, the car provides freedom (Y1.2) by 53%, the car provides flexibility (Y1.3) by 57%, the car provides comfort (Y1.4) by 56%, using a car is a lifestyle (Y1.5) by 57%, motorcycles are more practical for short distances (Y1.6) by 54%, and motorcycles have high maneuverability (Y1.7) by 61%.

**Figure 4** shows respondents' perceptions of the Traffic flows (Y2) in Kuta. The majority of respondents agreed that constructing this variable was: traffic flows density (Y2.1) by 51%, congestion (Y2.2) by 51%, dominant private vehicles (Y2.3) by 53%, close to the airport (Y2.4) by 59%, On-street parking (Y2.5) by 57%, low speed (Y2.6) by 54%, and long travel time (Y2.7) by 53%.

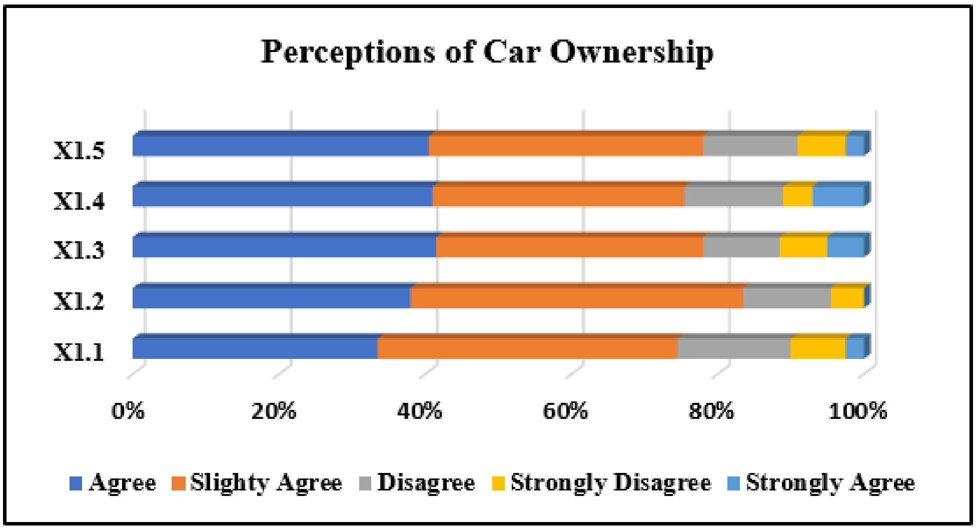


**Figure 1.** Respondent's perception of car ownership in Kuta

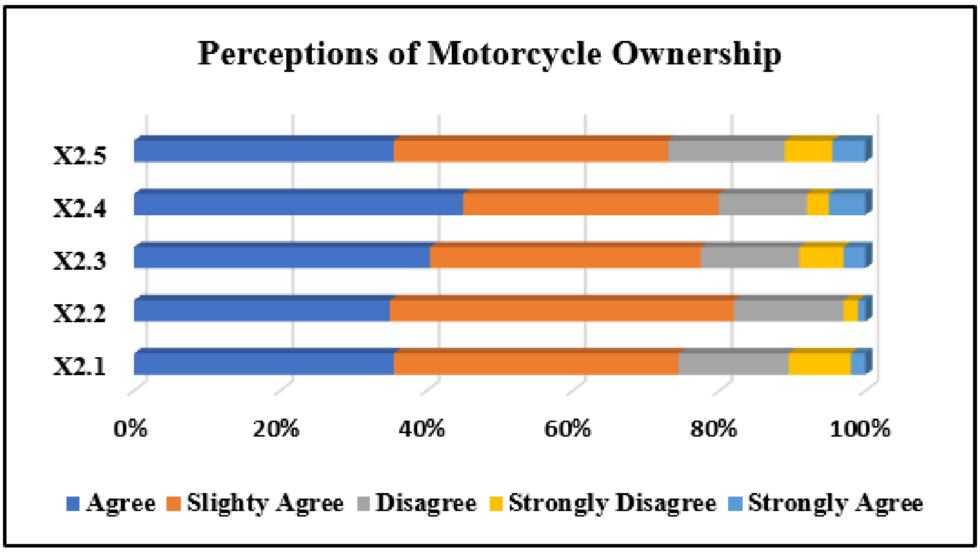


**Figure 2.** Respondent's perception of motorcycles ownership in Kuta

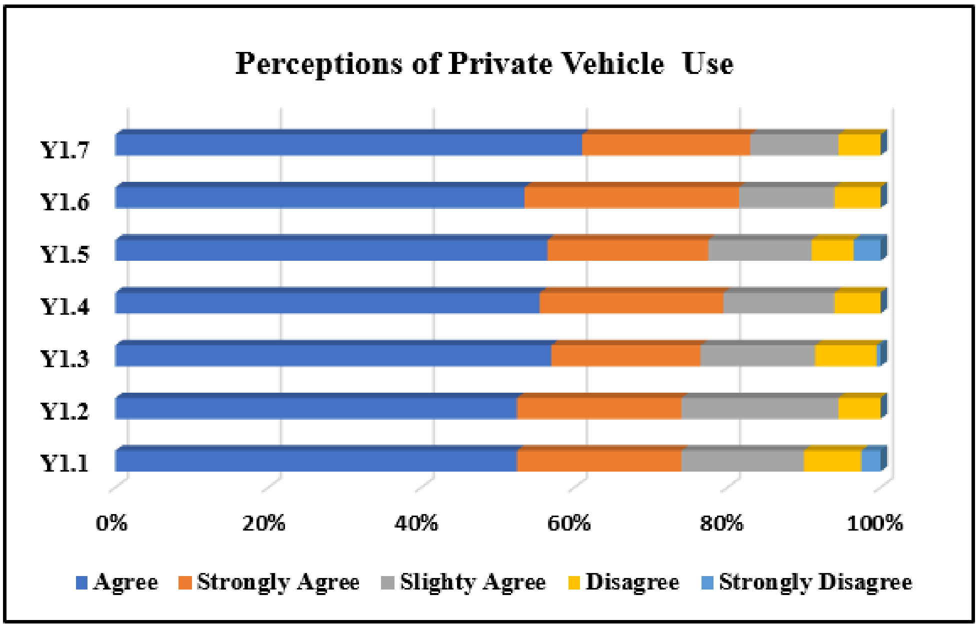


**Figure 3.** Respondent's perception of the use of vehicle private in Kuta

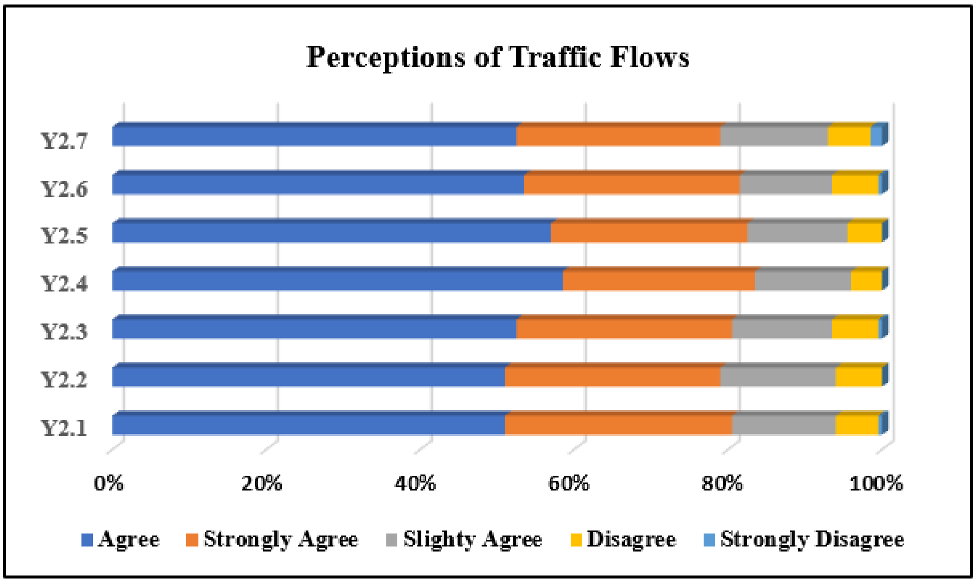


**Figure 4.** Respondent's perception of traffic flow in Kuta

### 3.2. The First SEM Diagram

**Figure 5** shows the initial SEM diagram. To find out whether the model made from observational data is following the theoretical model, it is necessary to refer to the model suitability index.

**Table 1** summarizes criteria from [36] to assess the goodness of fit overall structural equation models. In the first modeling, the results are shown in **Table 1**, all of which do not meet the specified criteria. The chi-square value obtained is 577.91 which is greater than the limit value of 283.59. The chi-square limit value is obtained from "=CHIINV(probability, deg_freedom)" = CHIINV(0 .05, 246) = 283.59, from the excel program.

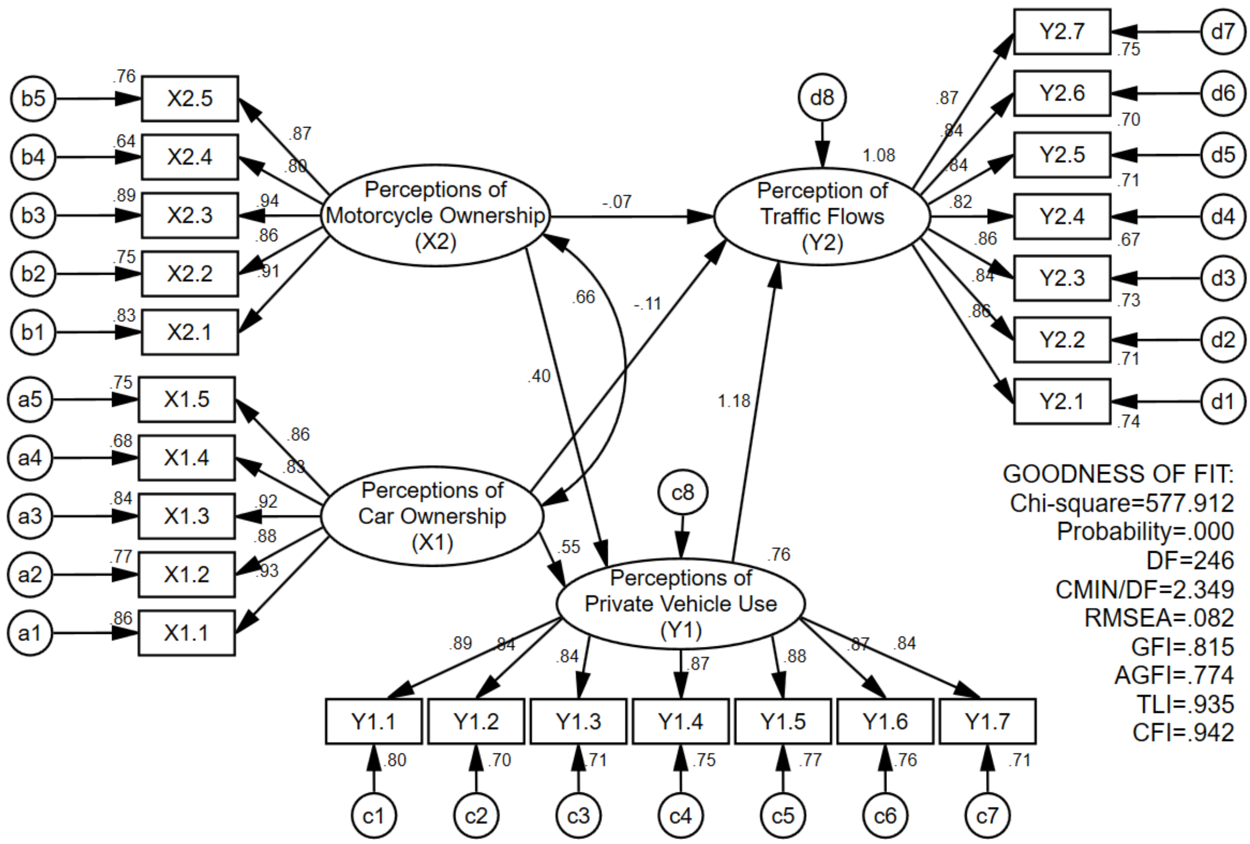


**Figure 5.** AMOS SEM Output diagram before modification indices

**Table 1.** Goodness fit test criteria

| No | Fit Measures | Cut off Value | Result | Good fit |
|---|---|---|---|---|
| 1 | Chi-square | ≤ 283.59 | 577.91 | Not Good |
| 2 | Significance of Probability | ≥ 0.05 | 0.000 | Not Good |
| 3 | CMIN/DF | ≤ 0.20 | 2.349 | Not Good |
| 4 | Root Mean Square Error of Approximation (RMSEA) | ≤ 0.08 | 0.082 | Not Good |
| 5 | The Goodness of Fit Index (GFI) | ≥ 0.90 | 0.815 | Not Good |
| 6 | Adjusted Goodness of Fit Index (AGFI) | ≥ 0.90 | 0.774 | Not Good |
| 7 | Tucker Lewis Index (TLI) | ≥ 0.95 | 0.935 | Not Good |
| 8 | Comparative Fit Index (CFI) | ≥ 0.95 | 0.942 | Not Good |

### 3.3. Validity and Reliability Test

Construct reliability is a measure of the internal consistency of the indicators of a formed variable that shows the degree of the formed variable. Variance extracted is a measure of how much total variance of the indicators extracted by the variables formed. 2 approaches can be taken to assess the reliability of the measurement model, namely the construct reliability test and variance extracted on each latent variable [37].

**Table 2.** The value of the loading factor for each indicator

| Variable Latent and Indicator | Estimate (Loading factor) (λ) | Variable Latent and Indicator | Estimate (Loading factor) (λ) |
|---|---|---|---|
| X1.1 ← X1 | 0.929 | Y1.3 ← Y1 | 0.842 |
| X1.2 ← X1 | 0.880 | Y1.4 ← Y1 | 0.865 |
| X1.3 ← X1 | 0.919 | Y1.5 ← Y1 | 0.877 |
| X1.4 ← X1 | 0.827 | Y1.6 ← Y1 | 0.869 |
| X1.5 ← X1 | 0.864 | Y1.7 ← Y1 | 0.844 |
| X2.1 ← X2 | 0.910 | Y2.1 ← Y2 | 0.863 |
| X2.2 ← X2 | 0.865 | Y2.2 ← Y2 | 0.842 |
| X2.3 ← X2 | 0.943 | Y2.3 ← Y2 | 0.856 |
| X2.4 ← X2 | 0.797 | Y2.4 ← Y2 | 0.817 |
| X2.5 ← X2 | 0.873 | Y2.5 ← Y2 | 0.844 |
| Y1.1 ← Y1 | 0.894 | Y2.6 ← Y2 | 0.838 |
| Y1.2 ← Y1 | 0.839 | Y2.7 ← Y2 | 0.868 |

The CR and VE calculations are shown by Equations 4 and 5. The loading factor values are shown in **Table 2**, which were obtained from the first stage of modeling, namely from the standardized regression weight table.

$$CR = \frac{(\Sigma\lambda)^2}{(\Sigma\lambda)^2+\Sigma(1-\lambda^2)} \quad (4)$$

$$VE = \frac{\Sigma\lambda^2}{\Sigma\lambda^2+\Sigma(1-\lambda^2)} \quad (5)$$

Dimana:
CR: construct reliability
VE: variance extracted
λ: loading factor

**Table 3**, shows the reliability value which refers to the value of Cronbach's Alpha (CA), with the lowest value = 0.943 ≥ 0.7 [38], so that the instrument can be declared reliable. The probability value p = 0.000 ≤ 0.05 is significant. A Cronbach alpha value was obtained from the Statistical Package for the Social Sciences (SPSS) program. The probability value (p) is obtained from the regression weight table in the SEM program. Recommended variance extracted (VE) > 0.50. The Extracted Variance (VE) value > 0.50 indicates that the total variance of the indicators extracted by the latent construct is greater than the error variance. The limit value of construct reliability (CR) is 0.7. Item reliability or what we usually call indicator validity. Testing the reliability of the item (indicator validity) can be seen from the value of the loading factor (standardized loading). Standardized factor loadings (λ) should exceed 0.50 and ideally be above 0.70, with statistical significance, to demonstrate high convergence on a common point [39].

### 3.4. Modification Indices

Smaller chi-square values reflect that the estimated model is capable of adequately reproducing the observed sample statistics while larger values reflect that some aspects of the hypothesized model are inconsistent with the observed sample characteristics [40]. In the first modeling, the validity and reliability tests of the indicators have been fulfilled, as shown in **Table 3**. However, they have not fulfilled the goodness of fit criteria as shown in **Table 1.** To fulfill the goodness of fit criteria, index modifications have been made. Modification Indices reflect the increase in the model fit that will occur if the previous items were omitted and estimated independently [40] so that at least 3 items are retained for each construct [41].

**Table 3.** Latent and observed variables-reliability analysis

| Latent Variables | Observed Variables | Code | p | (λ) | CA | CR | VE |
|---|---|---|---|---|---|---|---|
| Perceptions of Car Ownership (X1) (Exogenous variable) | Increase in tourist arrivals Ease of purchase | X1.1 | 0.000 | 0.929 | 0.946 | 0.948 | 0.784 |
| | Increase in household income | X1.2 | 0.000 | 0.880 | | | |
| | Increase in household members | X1.3 | 0.000 | 0.919 | | | |
| | Increase in adult household members | X1.4 | 0.000 | 0.827 | | | |
| | | X1.5 | 0.000 | 0.864 | | | |
| Perceptions of Motorcycle Ownership (X2) (Exogenous variable) | Increase in tourist arrivals Ease of purchase | X2.1 | 0.000 | 0.910 | 0.943 | 0.944 | 0.772 |
| | Cheap motorcycle prices | X2.2 | 0.000 | 0.865 | | | |
| | Low maintenance costs | X2.3 | 0.000 | 0.943 | | | |
| | Motorcycles require a small parking space | X2.4 | 0.000 | 0.797 | | | |
| | | X2.5 | 0.000 | 0.873 | | | |
| Perceptions of Private Vehicle Use (Y1) (Intermediate endogenous variables) | Poor quality of public transport | Y1.1 | 0.000 | 0.894 | 0.952 | 0.953 | 0.742 |
| | Car provides freedom | Y1.2 | 0.000 | 0.839 | | | |
| | Car provides flexibility | Y1.3 | 0.000 | 0.842 | | | |
| | Car provides comfort | Y1.4 | 0.000 | 0.865 | | | |
| | Using a car is a lifestyle | Y1.5 | 0.000 | 0.877 | | | |
| | Motorcycles is more practical for short distances | Y1.6 | 0.000 | 0.869 | | | |
| | Motorcycles have high maneuverability | Y1.7 | 0.000 | 0.844 | | | |
| Perceptions of Traffic Flows (Y2) (Endogenous variable | Traffic flows density | Y2.1 | 0.000 | 0.863 | 0.946 | 0.947 | 0.717 |
| | Congestion | Y2.2 | 0.000 | 0.842 | | | |
| | Domination of private vehicles | Y2.3 | 0.000 | 0.856 | | | |
| | Near the airport | Y2.4 | 0.000 | 0.817 | | | |
| | On-street parking | Y2.5 | 0.000 | 0.844 | | | |
| | Low speed | Y2.6 | 0.000 | 0.838 | | | |
| | Long travel time | Y2.7 | 0.000 | 0.868 | | | |

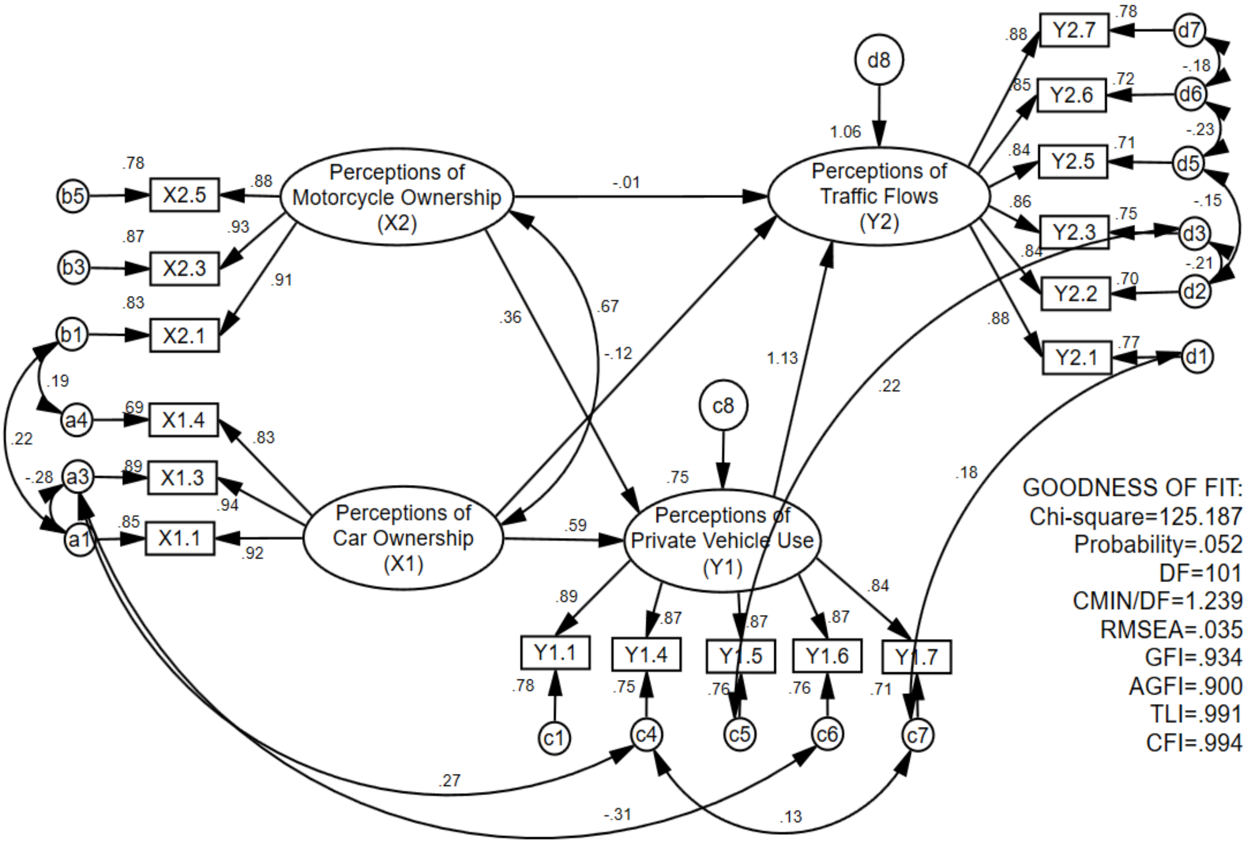


**Figure 6.** AMOS SEM Output diagram after modification indices

**Figure 6** shows the relationship between latent variables, latent variables, and their indicator variables after undergoing index modification steps until the goodness of fit requirements are met. Three observed variables Increase in tourist arrivals (X1.1), Increase in household income (X1.3), and Increase in household members (X1.4) were used to construct the variable perceptions of car ownership (X1). Three observed variables of the Increase in tourist arrivals (X2.1), cheap motorcycle prices (X2.3), and small parking lots (X2.5) were used to construct the variable perceptions of motorcycle ownership (X2). Five observed variables of the poor quality of public transport service (Y1.1), the car provides comfort (Y1.4), using a car is a lifestyle (Y1.5), motorcycles are practical for short distances (Y1.6), and motorcycles are high maneuverability (Y1.7) were used to construct the variable perceptions of private vehicle use (Y1). Six observed variables of traffic flows density (Y2.1), congestion (Y2.2), domination of private vehicles (Y2.3), on-street parking (Y2.5), low speed (Y2.6), and long travel time (Y2.7) were used to construct the variable perceptions of traffic flows (Y2).

### 3.5. Data Normality and Outlier Data

The normality of the data can be seen from the skewness and c.r values in the assessment of the normality table. The data is normal if the skewness values and values are in the range 1.96 ≤ c.r ≤ 1.96, at a significance of 0.05. In this study, a c.r value of 1,428 was obtained within this range, so the data can be stated as normal. The data also does not contain any outliers as evidenced by the value of p1 > 0.01 at the Mahalanobis distance.

### 3.6. The Goodness of Fit Models

To find out whether the model made from observational data is following the theoretical model, it is necessary to refer to the model suitability index. The following are the goodness of fit model parameters that are often used:

1. Chi-square (X2). To test whether the model fits the sample data. The smaller the Chi-square value, the better fit the model and sample data are [36]. In this study, the calculated Chi-square value was 125,187 ≤ 125,498 (table chi-square values).
2. The Chi-square value divided by the degree of freedom must be less than 2.00 [36]. In this study, the value was 1.239 ≤ 2.00, the model corresponds to the sample data.
3. Probability (p). The expected probability is not significant (probability value ≥ 005), the model is considered as a representation of the data or the hypothesis model has a good fit [36]. In this study, the value of p = 0.052 > 0.05 was obtained, thus the fit of the model was met.

4. Roots Mean Square Error of Approximation (RMSEA). RMSEA is a measure of the average difference per degree of freedom expected in a population. RMSEA value ≤ 0.08 is described as acceptable, while RMSEA value ≤ 0.05 is considered a good fit [36]. The RMSEA value in this study is 0.035, so the model is said to be a good fit.
5. The goodness of fit index (GFI). GFI to measure the relative amount of variance and covariance whose magnitude is 0-1. Values close to zero, the model has a low fit, values close to 1, the model has a good fit. Recommended GFI value ≥ 0.90 [36]. In this study, the GFI value was 0.934 > 0.90, thus the model has a good fit.
6. Adjusted Goodness of fit index (AGFI). AGFI size is a modification of GFI by accommodating a degree of freedom model with other models that are compared. AGFI ≥ 0.90 is a good fit [36]. AGFI value of 0.900 ≥ 0.90, so the model is a good fit.
7. Tucker-Lewis Index (TLI). TLI is a comparison between the tested model and the baseline model. TLI limit value ≥ 0.95 [36]. In this study, the TLI value was 0.991 > 0.95, so the model is a good fit.
8. Comparative Fit Index (CFI). CFI is a model feasibility test that is not sensitive to sample size and sample complexity. CFI limit value ≥ 0.95 [36]. In this study, the CFI value was 0.994 > 0.95, so the model is a good fit.

**Table 4** shows the goodness of fit parameter values, all of which meet the requirements.

Both exogenous variables, perceptions of car ownership (X1) and perceptions of motorcycles ownership (X2) significant effect on the intermediary endogenous variable's perceptions of private vehicle use (Y1), with a value p = 0.000 < 0.05, as shown in **Table 5**. Exogenous variable perceptions of car ownership (X1) have a significant effect on endogenous variables' perception of traffic flows (Y2) with value p = 0.005 < 0.05 and intermediary variable perceptions of private vehicle use (Y1) significant effect on endogenous variables' perceptions traffic flows (Y2) with value p = 0.000 < 0.05. Perceptions of motorcycle ownership (X2) have an insignificant on perceptions of traffic flows (Y2), with a value p = 0.821 > 0.05.

Based on the p-value in **Table 5.** and the estimated value in **Table 6**. the perceptions of private vehicle use (Y1) and perceptions of traffic flows (Y2) models can be made, as follows:

$$Y1 = 0.585X1 + 0.359X2$$

$$Y2 = -0,117X1 + 1.130Y1$$

Where:

X1: Perceptions of Car Ownership

X2: Perceptions of motorcycle ownership

Based on the estimated value in **Table 6**. Perceptions of car ownership (X1) have a greater effect than perceptions of motorcycle ownership (X2) on perceptions of private vehicle use (Y1), with the path coefficient value 0.585 > 0.359. Perceptions of car ownership (X1) have a direct significant effect on perceptions of traffic flow (Y2), with a path coefficient value of -0.117, which means the influence of perceptions of car ownership (X1) is mediated in part by perceptions of private vehicle use (Y1). Whereas, the influence of perceptions of motorcycles ownership is fully mediated by perceptions of private vehicle use (Y1).

**Table 4.** Model Validation

| Goodness of Fit | Chi-square ($X^2$) | Prob (p) | CMIN/DF $X^2$/DF | RMSEA | GFI | AGFI | TLI | CFI |
|---|---|---|---|---|---|---|---|---|
| Calculation | 125.187 | 0.052 | 1.239 | 0.035 | 0.934 | 0.900 | 0.991 | 0.994 |
| Cut off value | ≤ 125.458 | ≥ 0.050 | ≤ 2.000 | ≤ 0.080 | ≥ 0.90 | ≥ 0.90 | ≥ 0.95 | ≥ 0.95 |

**Table 5.** Regression weights of traffic flows model

| Latent Variables | | | p |
|---|---|---|---|
| Perceptions of private vehicle use (Y1) | ← | Perceptions of motorcycle ownership (X2) | *** |
| Perceptions of private vehicle use (Y1) | ← | Perceptions of car ownership (X1) | *** |
| Perceptions of traffic flows (Y2) | ← | Perceptions of motorcycle ownership (X2) | 0.821 |
| Perceptions of traffic flows (Y2) | ← | Perceptions of car ownership (X1) | 0.005 |
| Perceptions of traffic flows (Y2) | ← | Perceptions of private vehicle use (Y1) | *** |

**Table 6.** Standardized Regression Weights

| The relationship among variables | | | Estimate |
|---|---|---|---|
| Perceptions of private vehicle use (Y1) | ← | Perceptions of motorcycle ownership (X2) | 0.359 |
| Perceptions of private vehicle use (Y1) | ← | Perceptions of car ownership (X1) | 0.585 |
| Perceptions of traffic flows (Y2) | ← | Perceptions of motorcycle ownership (X2) | -0.117 |
| Perceptions of traffic flows (Y2) | ← | Perceptions of car ownership (X1) | 0.005 |
| Perceptions of traffic flows (Y2) | ← | Perceptions of private vehicle use (Y1) | 1.130 |

# 4. Conclusions

The purpose of this study was to analyze people's perceptions of car ownership, motorcycle ownership, use of private vehicles, and traffic flow, and analyze the influence of perceptions of car and motorcycle ownership on perceptions of private vehicle use and perceptions of traffic flow. A case study was conducted on the road network in the tourist area of Kuta, Badung, Bali. Perceptions of car ownership is constructed using observed such as an increase in tourist arrivals, an increase in household income, and an increase in adult household members. Perceptions of motorcycle ownership is constructed using observed variables such as an increase in tourist arrivals, cheap motorcycle prices, and motorcycles requiring a small parking space.

The study found that perceptions of car and motorcycle ownership are strong drivers of perceptions of private vehicle use. Perceptions of car ownership can have a significant impact on perception of traffic flow. Perceptions of motorcycle ownership also strongly encourage perceptions of private vehicles use. Perceptions of private vehicle use is influenced by perception of car and motorcycle ownership and observed factors such as poor public transport, car convenience, car-use lifestyle, and motorcycle practicality and maneuverability variable. Perceptions of traffic flows are heavily influenced by perceptions of private vehicle use and are structured by observed variables such as traffic density, congestion, private vehicle dominance, on-street parking, low speeds, and long travel times.

A joint strategy between tourism authorities and transport is therefore necessary to strengthen the role of transport in supporting tourism progress. The study proposes to limit the use of private vehicles, especially automobiles, in the Kuta area and provide a reliable alternative to public transport for using private vehicles. In addition, prosecutions of traffic offenses such as on-street parking, which may reduce on-street parking capacity, should also be enforced

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