Effect of Car-Ownership and Income on Work and Non-Work Trip of Low-Income Households

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Abstract
This research assessed the influence of car ownership on both work trips and non-work trips in a semi urban industrial settlement, Ota, Ogun State. This was achieved with the distribution of One thousand five hundred (1500) question forms for nine months in the study area. Information on the socio-economic parameters, car ownership, modal split and volume of trips of respondents were analyzed to develop a multiple regression model for the analysis. This was done for for all trip types (both work and non-work trip). The data was analyzed using SPSS version 23 software. The linear regression model explains 70.2% of the variance of the data. The positive value of the model coefficient showed that the higher the income and car ownership, then the higher the volume of trip. This analysis was done on the aggregate level (work and non-work trip). However, the trip is expected to go up by 8.4 unit when car ownership goes up by 1 unit. The coefficient revealed that car ownership had a higher effect on trip than income. The outcome of the research will help policy makers and transportation planners in order to understand the travel behaviour of the study area and similar cities in the world for sustainable transportation and effective transportation planning now and in the foreseeable future.

Key words: Travel behavior, trip pattern, car ownership, sustainable transportation, low-income household.

Motivation
The Nigerian National Housing Policy described the low-income group as comprising all staff and self-employed individuals whose annual salary is below N100, 000 (equal to Level 1 step 06 in the civil service).

Surprisingly, N44, 000 per annum is the domestic minimum wage. About 57 percent of Nigeria's population falls below the point of poverty, which is on average US$ 1 a day. In fact, the majority of staff whose job is outside the government or private sector, as well as many self-employed people.

In fact, Nigerians receive well below the minimum domestic salary. Consequently, this implies that about 70% of Nigerians fall into this category, which also serves as the heart of the economy of the nation.

Lowincome earners include wage earners such as factory workers, semiskilled and unqualified building employees and other junior or intermediate employees found in numerous state and private institutions. The majority of these employees generally do not have their employers' accommodation. They live far from their locations of job and the transportation allowance they receive is hardly enough to pay for traveling to and from job. People with low incomes also consist of self-
employed individuals such as smallscale traders, masons, drivers, workers, carpenters, fitters and others likewise involved in small-scale companies, farmers, fishermen, motorcyclists, etc. Other features of lowincome individuals include low academic skills, predominance of squatter and slum settlement regions of very elevated density. Such environments are generally of very low quality and, to a large extent, without fundamental services.

1. Introduction

Nigeria’s transport infrastructure is in a depressing state and is short of the nations it wants to be compared with [1]. Much has to be achieved in the transport infrastructure as this was the overlooked element of the transport scheme. The state of transport system is expected to be efficient, affordable, adequate, safe, well integrated and environmentally sound [1] especially for the low income earners. The employment status of people and their features of spending within a free market economy must be taken into account. Low-income earners can be split into two classifications, namely low-income earners who do not have a gainful job and lowincome employees. In this regard, the lowincome earner is viewed as a low income individual who is unable to satisfy most of his fundamental requirements. Also, low income earners are junior civil service workers, traders and artisans. In this regard, the low-income earner is viewed as a low-income individual who is unable to satisfy most of his fundamental requirements. Low-income earners are also junior civil servants, traders and craftsmen. There are different factors that affect the mode choice of individuals viz: characteristics of trip (availability of personal vehicle and also possession of driver’s license), characteristic of transport facilities (cost and waiting time) and characteristic of journey (types of trips made and time of day) as avowed [2], and [3].

In latest times, vehicles are omnipresent; as a consequence, they are often used to evaluate a nation's degree of economic growth. Cars account for a significant share of petroleum production at international level, as well as 7% of worldwide greenhouse gas emissions [4]. Accurate estimates of future vehicle ownership trends are therefore a main input in forecasting global energy and commodity prices, particularly oil prices, as well as climate conditions.

The proof provided in support of car ownership strategies comprises of empirical research showing that people who own vehicles are more probable to be employed and earn more than people without vehicles, subject to being employed. [5], [6]. Car ownership is an significant determinant of household travel behavior and is essentially inter connected with housing place and motor travel decision-making[7-8]. High levels of car ownership are connected with urban sprawl, increased levels of car transport, the resulting air quality and health issues [9]. Families have different reasons for owning personal car. This reflect also in their trip pattern [10]. Environmental factors also play a key role in the travel behavior of individuals [11], [12]. Within IUMs, model car ownership plays a vital role in determining a household's amount of motorized journeys. In such models, however, the role of car ownership is often ignored and exogenously determined [13]. Several work have been done by [14-21] the research assessed the effect of income and car ownership on both work and non-work trip pattern of a semi urban industrial settlement. The outcome of the research will aid transport planners and transport policy makers for the provision of sustainable transportation for this unique set of people.
2. Methodology
The study adopts the field survey method of research design [22], [23] (Busari et al., 2013, Busari et al., 2015) for studying travel behaviour [24-26] trip pattern of low income household. The data and information for the study was collected through household questionnaire surveys. This is done so as to be able to extract information that will help evaluate the influence of car ownership on both work and non-work trips. The data was analyzed and regression model developed using SPSS version 23.

2.1 Data Collection
The information on trip and travel pattern and travel demand of the respondents have been acquired from the questionnaires administered with 867% return rate (Table 1). The questionnaire was split into two parts viz:
   i. Section A includes respondents' sociodemographic information
   ii. Section B includes respondents' daily travel patterns.

Table 3.1: Rate of response

| Questionnaire       | Respondents | Percentage |
|---------------------|-------------|------------|
| Returned            | 1300        | 86.7%      |
| Not Returned        | 200         | 13.3%      |
| Total Distributed   | 1500        | 100%       |

Source: Field Survey, 2015.

2.2 Description of the Study Area
Ogun State is located in southeastern Nigeria and was established in 1976 with an region of 16,980.55 km² (6,556.23 sq. mi) ranked 24th out of 36 states in Nigeria. It is named after the Ogun River running across Nigeria's northern portion to the southern portion. The 2006 domestic population census estimated the total population to be around 3,751,140, with 1,864,907 men and 1,886,233 females ranking 16th out of 36 countries in Nigeria. However, as in 2011, according to the National Population Census, the projected population is 4,397,604 consisting of 2,186,301 males and 2,211,303 females [27]. Ota which is a town in Ogun State (Figure 1), Nigeria has an estimated population number of 527,242 with 261,523 males and 265,719 females. Ota is the capital of Ado-odo/Ota local government area.
2.3 Strategy for Data Collection
The questionnaires were distributed evenly to adults (18 years and above) specifically to low income household who embark on independent trips virtually on daily basis either for work trip and non-work trip purposes.

2.4 Sampling Procedure/Land Use
The study area was stratified into three (3) homogeneous zones. These regions were selected to represent a specific sort of housing land use features. A total of 1,000,500 questionnaires (1,500) were administered to neighborhood participants in the administration of the questionnaire.
Systematic sampling method was performed on low-income earners only to guarantee an even distribution of the questionnaire. SPSS version 21 was used for the modelling of trip patterns of individuals (low income earners) in Ota, Ogun State.

3. Result and Discussion
Multiple regression analysis was used in showing the relationship between volume of trip, number of cars and income. The regression used is a first order multiple regression model (Power of the variable is 1). From the model, car ownership and income are the dependent variable while the volume of trip as the dependent variable. This was used to estimate the overall effect of income and car ownership on the total volume of trip. This is in a bid to predict the effect of this socio-economic parameters on trip.

The analysis of variance and the coefficients are in Table 1 and 2. The model summary is presented in Table 3 and the regression analysis (work trip) follows the trend shown in equation 1. The equation showing the relationship between income and car ownership on the volume of trips is shown in equation 2.

\[ Y = \beta_0 + \beta_1 X_1 + \beta_2 X_2 \ldots \ldots \beta_p X_p \]  

Equation 1
Car ownership = 13.257 + .522*X₁ + .848*X₂  
Y = Volume of trips  
X₁ = Average monthly income  
X₂ = Car Ownership  
The coefficient of each of the independent variables (income and car ownership) gives an idea of the value of the effect of the variable on the dependent variable. The positive value showed that the higher the income and car ownership, then the higher the volume of trip. This analysis was done on the aggregate level (work and non-work trip). The outcome of the research contradicted the outcome of the research of [25] which avowed that the higher the income, the lower the trip volume (non-work). This also contradicted the outcome of the research of [28] that car ownership had little effect on total number of journey. The coefficient of 13.257 represent the mean changes in the response variable for one unit of change. From the equation, the trip is predicted to increase by 0.52 units when income goes up by 1. The ANOVA table is as shown in Table 2. However, the trip is expected to go up by 8.4 unit when car ownership goes up by 1 unit. The coefficient revealed that car ownership had a higher effect on trip than income.

Table 2: ANOVA

| Model     | Sum of Squares | df  | Mean Square | F    | Sig.  |
|-----------|----------------|-----|-------------|------|-------|
| Regression| 1026.840       | 3   | 342.280     | 3.40 | .000b |
| Residual  | 431.841        | 495 | .872        |      |       |
| Total     | 1458.681       | 498 |             |      |       |

Table 3: Model coefficients

| Model | Unstandardized Coefficients | Standardized Coefficients | t  | Sig. |
|-------|-----------------------------|---------------------------|----|------|
|       | B | Std. Error | Beta |      |     |
| 1     | 13.257 | 1.479  | .919  | 8.962 | .000 |
|       | .848 | .058   | .919  | 14.600 | .000 |
|       | .000 | .052   | .000  | -.008 | .994 |
|       | .522 | .064   | .227  | 8.118 | .000 |

a. Dependent Variable: How many car do responder own?

From the model summary, it is estimated that, the F value showed the possibility of variance within the sample. The value of 3.4 showed the ratio of the variance of the two samples by examining the joint effect of all the variables (Table 3). The degree of freedom (DF) showed the number of observation that are free to vary with n-1 degree of freedom. The positive beta coefficient as shown in the Table 4 indicate that for every 1 unit increase in the predictor variable, the outcome variable will by the beta coefficient value. Additionally, the standardized value of the respondent income and car ownership on the volume of trip is as shown in Table 4. This is used to compare the relative importance of income and car ownership.
The linear regression model explains 70.2% of the variance of the data. The adjusted R square of 0.70 is a control for the overestimates of the population sample examined. The value of 74% R² (Table 5) of the model showed a good fitness of the model.

Table 3 shows the model summary of volume of trip as the dependent variable while average monthly income and number of cars are the independent variable.

3. Conclusion
This research assessed the effect of income and car ownership on the trip pattern of low income households in a semi-urban industrial settlement. The descriptive quantitative research was analyzed using a detailed question form. This was done in a bid to provide an efficient and effective transportation for the low income earners now and in the future. The outcome of the research revealed that:

i. Both income and car ownership affects the total volume of trip of the area.
ii. The positive value of the model equation showed that the higher the income and car ownership.
iii. However, the trip is expected to go up by 8.4 unit when car ownership goes up by 1 unit.
iv. The coefficient revealed that car ownership had a higher effect on trip than income.

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