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Article 15

SOCIO-ECONOMIC CORRELATES AND PUBLIC TRANSPORT USE IN LAGOS METROPOLITAN AREA OF NIGERIA

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Abstract

The socio-economic characteristics are a very important factor of public transport use in the urban environment. The planning of public transport typologies need to consider the socio - characteristics of users. The urban trips have its components in the socio economic characteristics of the urban population whose understanding would help achieve efficient, effective and reliable urban public transport planning. It is in this light that this study examines the socio-economic characteristics and a public transport typology use in Lagos metropolitan area of Nigeria. The methodology used in this study is self completion survey method; data were collected on variables of socio-economic characteristics of urban trips maker, as well as, the trip patterns characteristics. The correlation, one sample t test were use for the hypothesis testing, univariate analysis of variance (ANOVA) for subjects interactions effects and stepwise multiple regression analysis were tested on the dependent and the independent variables datasets. The study revealed that socio-economic variables as income, educational background and household size among others influence more the use of BRT for public transport in Lagos metropolis.

Keywords: Mobility, Public Transport, Bus Rapid Transit, socio-economic, Accessibility, Access, Para Transit

Introduction

Public transport is invaluable to enhancing mobility and socio economic development in the cities across the world (Rodrigue et al, 2006; Adeniji, 2000; Oyesiku 2000). Without a doubt, no cities of the world would achieve socio economic development without a reliable, effective and efficient public transportation mode. It is important to note that cities economies typically have been buoyed as a result of uninterrupted movement of passengers, freight and services. The public transport constitute a lifeline to the cities developmental process, this is made possible via public transport modes, which may be formal or informal mode. Though, we have typologies of both formal and informal public transport use for mobility in cities, of these, however, a variant of public transport provision which combine the qualities of formal public transport technologies such as metro line, light rail and tram, is the bus rapid transit (BRT). It combines the carriage capabilities of the former at a less cost, have been tried to be effective in alleviating mobility problems in the major cities of the world and provide a cost effective option in public transport infrastructure finance, which is a necessity for cities socio economic growth and development. (Ogunkoya, 2008, ITDP, 2007; Hidalgo, 2004b; 2003a).

Moreover, public transport policy options should incorporate demands of socio-economic characteristics, which is a discrete choice forming a total aggregate of trips characteristics in public transport use. (Aworemi et al, 2008; Richardson et al; 1995). Virtually, all trips which constitute part of public transport trips have socio economic characteristics elements forming the whole public transport characteristics trips demands. In this light, understanding socio-economic characteristics of public transport users would help public transport planner to understand dynamics of public transport demands increase and formulate remedial policy to mitigate them, as well as effectively evolve a lasting policy options that will meet the soaring people's public transport needs.

In Nigeria, the public transport typology intervention of bus rapid transit (BRT) is new, and intended to remedy laxity in public transport provision by the city authorities and create an enabling public mobility to engender city economic development. Prior to the adoption of the bus rapid transit(BRT), the public transport fabrics in Lagos metropolitan is majorly characterized by the intermediate and the para-transit mode ,which are largely uncoordinated, unorganized, chaotic, unstructured, unregulated and ineffective to meet the increasing capacity demands on public transport supply and infrastructure provision (Adeniji; 2000). These sloppiness in public transport provision is belied in lack of understanding the relationships of socio-economic characteristics and urban public transport typologies.

In fact, the relationship of public transport use whether formal or informal form of transport as influenced by socio-economic characteristics in Ibadan and Kwara exist in

literature. These studies reveal that the choice of mode or demand for public transport is influenced by individual socio-economic characteristics as sex, education, age, car ownership, employment, income, type of work, cost of trips, and nature and characteristics of available mode (Aworemi, 2008; Fadare, 1998 and Hazayyin and el-Hawary, 1984). Similarly, the Japanese researcher studying the relationships between accessibility to an expressway and the socio-economic attributes of municipalities found that those municipalities with shorter access times have higher rates of population growth, produce higher value of manufactured goods and have larger numbers of workers employed in tertiary industries (Itoh, Nakagawa and Matsuoka, 2001).

However, in spite of studies on the relationship between socio-economic characteristics and some infrastructure and public transport provision, there is still a gap in literature on the socio-economic characteristics and access to a novel public transport typology of bus rapid transit (BRT) in Nigerian largest metropolitan area Lagos metropolis. In this light, this study tends to examine the socio-economic variables correlates and use of Bus Rapid Transit, a new form of public transport intervention in Lagos metropolis. This study would be a significant contribution to literature, more so, the shambolic nature of public transport provision in the study area until now and what may be the socio-economic relationships of the new variant of public transport in the area?

Conceptual Theoretical Framework

Concepts of public transport demands

The concepts of public transport demands as enunciated in the study by (Aworemi et al, 2008) revealed that, the demand for public transport is dependent on two major factors:

- i) The desire to make a particular trip at all and the drive to do so by public transport and
- ii) The characteristics and nature of public transport modes that are available (Thomson, 1969 cited in Aworemi et al, 2008). It was revealed in the aforementioned study that the identified factors of public transport demand may be influenced by individual socio-economic characteristics. However, the choice of mode or the demand for public transport is influenced by sex, education, age, car-ownership, employment, income, type of work, cost of trips, and the nature and characteristics of available modes (Fadare, 1988; Hazayyin, and El-Hawary, 1984, Aworemi et al, 2008).

Concept of Formal and Informal Public Transport

Formal public transport system is a standardized public transport technology options

available for the movement of passenger in many cities of the world. The prevalent features of formal public transport are more passenger carriage capacity, high technology, standard route schedule, exclusive right-of-way, comfortable and cost effective operational structure (Ogunkoya, 2008). Unlike the para-transit or intermediate mode that is seen as flexible and improvised mode, is adduced to dearth in provision of the conventional public transport mode (Orsk, 1975; Adeniji, 1987; Nutley, 1988; Aworemi et-al 2008). The precedents literature sees the provision of informal public transport, as corollary effects of the insufficient or no provision of formal public transport typologies in most urban cities, who cannot meet the demands of urban populace for formal public transport system. In Nigeria, the Lagos metropolis in particular, the informal public transport system is characterized by unregulated regimes and entry, un-standardized and most times rickety vehicle in supply (Adeniji, 1987). Though, the varieties of informal public transport mode in use for operation in major cities of the world are extant in literature (Adeniyi 1987; Aworemi et al 2008). It includes among others, jitney, duto, danfos, Molue and many variants of intermediate public transport intervention bearing local nomenclature of host urban centres in use. Similarly, motorized and non motorized public transport characteristic are inclusive of informal public transport in use in most urban centre. It include the rickshaw (manual and auto), motorcycle, bicycle and walking among others.

According to (WBCSD, 2004), the characteristics of public characteristics of the informal and formal in major cities of developing countries are as follow: Belo Horizonte, 89%(1995), Chennai, 47%, Dakar, 45%, Kuala Lumpur, 20% (of motorized), Mexico city, 70% (of motorized), Numbai, 88% (of motorized), Shanghai, 17% (1995), and Wuhan, 61%.whilst, it was envisaged the increasing level of mobility needs of these developing cities, however, the economic status of these countries would hindered the deployment of higher carrying capacity public transport technologies within the reach of these countries (wbcSD, 2004).

Concept of Public Transport Accessibility

The concept of "accessibility" connotes different applicability; basically, it largely depends on the contextual importance of usage in providing access to a phenomenon. According to (WBCSD, 2004), universally, "accessibility" is defined as "access to means of personal mobility". And this "access" is measured in one of two mutually exclusive ways strictly in terms of motor vehicle ownership (that is, the share of the population owing or having easy access to personal motor vehicles such as cars and mope); or strictly in terms of the ease of reaching public transport systems that is, the distance that individuals must walk or bicycle to reach public transport.

Similarly, (Rodrigue et al, 2006) sees accessibility inform of transit stop to provide

accessibility to the transit system, such as stops along a bus route. Also he sees land use impact on accessibility as significant if provided with necessary facilities such as shelter to facilitate waiting prior to access.

However, the concept of public transport accessibility is defined as the ease of access to public transport modal types, such accessibility is a measure of degree of ease to access public transit modes, a reliable alternative to auto. It should be noted however, the distinction between public transport access and public transport accessibility. The public transport access within public transport system connotes universal access i.e no specific user can have a competitive advantage in a transit system over the others since access is the same for all users. For example public transport services by transport companies as LAGBUS and LAMATA can be accessed by anyone. Thus, access is uniform wherever one is located in regard to a public transport system as long as there is opportunity to go in or go out. On the other hand, public transport accessibility varies according to one's location within the public transit system. The relevance of this concept to the study area is that it helps put the concept of accessibility in context of socio-economic correlates of public transport users in Lagos metropolis as a determinant of accessibility levels of BRT-a typology of public transport modes.

Hypothesis Testing

H0: The socio-economic characteristics do not influence use of urban public transport typology.

H1: The socio-economic characteristics do influence use of urban public transport typology.

Methodology

The Study Area

The study area for this study is the first delineated area or corridor in Lagos metropolis, in Lagos state, Nigeria, which first witnessed the operation of the bus transit (BRT) in Lagos metropolis. Lagos metropolitan area is located in south western part of Nigeria. It is the largest metropolitan area in Nigeria (Ayeni, 1979; Ogunkoya, 2008). Lagos metropolis lies generally on lowlands, with the density of 24,182/km² and urban population of 7,937,932 (Federal Government of Nigeria, 2006). A Lagos metropolitan area is made up of 16 LGAS which includes the Islands of the former municipality of Lagos and mainland suburbs. It is noteworthy to say the study only cover sample of the municipalities who carve up in the first phase of BRT realization in Lagos metropolis. The data were collected within the area that forms this area of research. The questionnaires were divided into two sections. The first section of the questionnaire

elicits data on the socio-economic characteristics of Lagos metropolis using BRT as a public transport typologies and the second section of the questionnaire elicits information on the access of BRT by passengers in the Lagos metropolis.

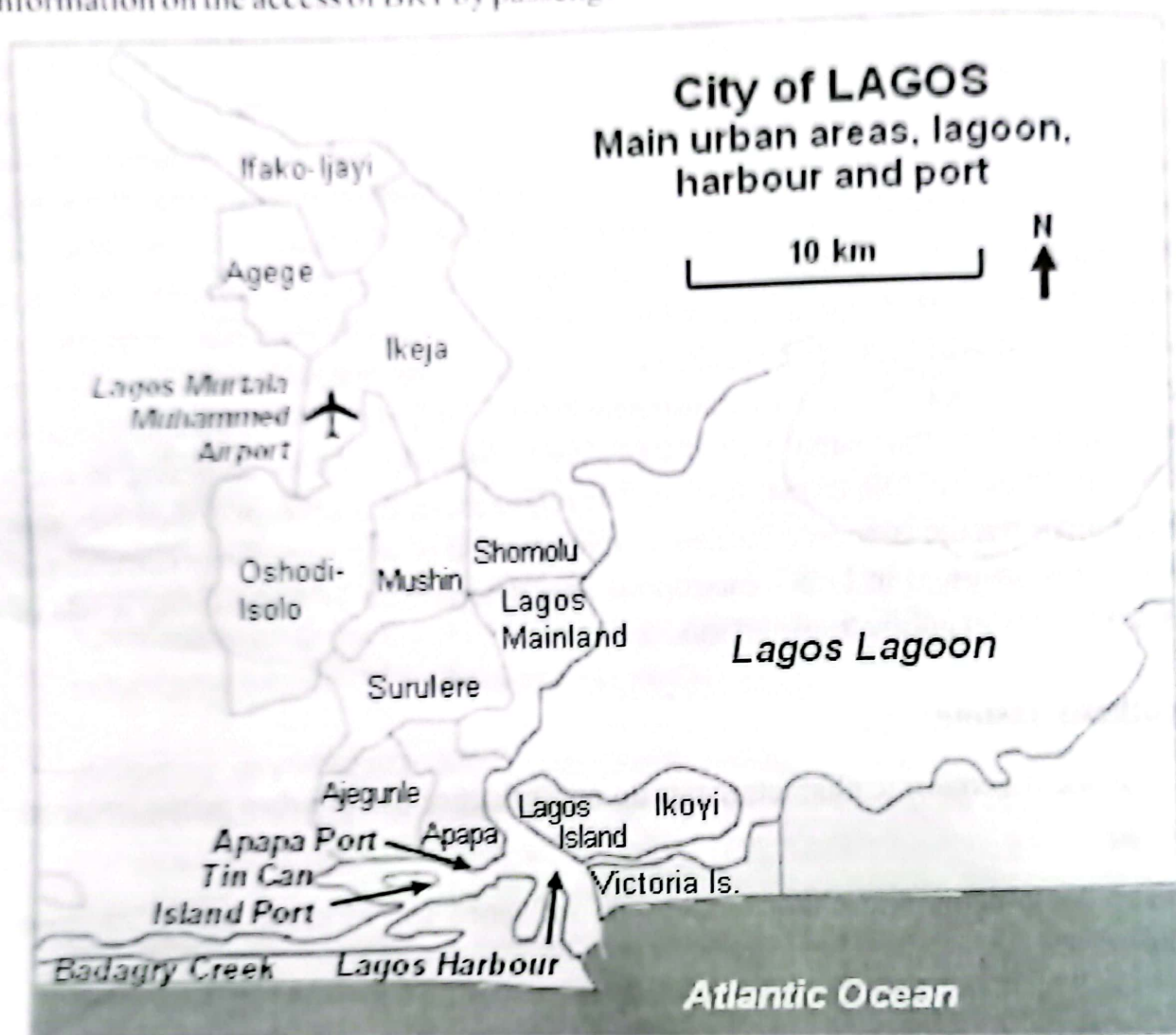


FIG 1 Map of Lagos Metropolis

Source: Wikipedia on Lagos metropolis

Data Source

The cross-sectional survey and self completion method were used for this study. It involves the collection of data at one point in time over a large number of identifiable groups in time over a large number of identifiable groups which constitute a fraction of the total population.

The questionnaire was divided into two sections. The first section elicits information on the socio-economic characteristics of BRT trip makers in Lagos metropolis. The socio-economic characteristics are an important factor of trips generator in urban area (Aworemi, 2008). The second section of the questionnaire elicits information on the trips characteristics of BRT passengers in Lagos metropolis.

The target population for this study, which is the complete group from which data was collected, was chosen from the regular trip makers and users of BRT as a form of public transport in the Lagos metropolis. The elements of this group include the various groups of the Lagos metropolis trip makers which make use of BRT buses for daily commute, which cut across different occupational strata. The sampling units include the urban workers, market women, university students, artisans, and etc making use of the BRT buses. The sampling frame includes all estimated 1 million residents that fall into above identified groups of daily commuters along the corridor serviced in the first phase of BRT implementation in Lagos metropolis.

A simple random sampling method technique was adopted for this study and a total of 100 questionnaires were administered to the respondents which represent 1% of the total sampling frame. This is tandem with (Bruton 1975, PP 53) who recommended a sample size of 10% for population of area under 50,000 and 1% for areas having 1,000,000 people and above. Similarly, (Richardson et al, 1995) asserts that it is the number of observations in the sample, rather than the sample size as a percentage of the population, which determines the precision of the parameter estimates. The observation in the sample was carefully taken to ensure validity of the research design and procedure. However, the cost of procuring survey material and skilled staff for the survey was also responsible for this choice. This in no way does affect the parameter estimate and the results of the research.

In the analysis which shall be discussed afterwards, the correlation, simple t test, ANOVA and stepwise regression analysis were employed on the dependent and the independent variables for the analysis of the socio-economic characteristics and public transport typology use in Lagos Metropolis.

Table 1: The correlation coefficient between the dependent and the independent variable

	PURINTRA	Educational background	Household size	Employment background	Income	Marital status	Age	Sex
PURINTRA								
Pearson Correlation	1.000	.229*	.170	.069	-.082	-.154	-.172	.092
Sig (2-tailed)		.022	.107	.504	.439	.125	.087	.364
N	1,000	100	91	97	92	100	100	100
Educational background								
Pearson Correlation	.229*	1.000	.071	.117	.112	-.061	-.160	-.003
Sig (2-tailed)	.022		.505	.253	.287	.546	.112	.974
N	100	100.000	91	97	92	100	100	100
Household size								
Pearson Correlation	.170	.071	1.000	-.142	.041	-.093	.017	.032
Sig (2-tailed)	.107	.505		.184	.707	.381	.873	.760
N	91	91	91.000	89	85	91	91	91
Employment background								
Pearson Correlation	.069	.117	-.142	1.000	-.068	.161	.124	-.016
Sig (2-tailed)	.504	.253	.184		.525	.115	.225	.880
N	97	97	89	97.000	90	97	97	97
Income								
Pearson Correlation	-.082	.112	.041	-.068	1.000	.198	.235*	.094
Sig (2-tailed)	.439	.287	.707	.525		.058	.024	.373
N	92	92	85	90	92.000	92	92	92
Marital Status								
Pearson Correlation	-.154	-.061	-.093	.161	.198	1.000	.509**	.223
Sig (2-tailed)	.125	.546	.381	.115	.058		.000	.026
N	100	100	91	97	92	100.000	100	100
Age								
Pearson Correlation	-.172	-.160	.017	.124	.235*	.509**	1.000	-.055
Sig (2-tailed)	.087	.112	.873	.225	.024	.000		.588
N	100	100	91	97	92	100	100.000	100
Sex								
Pearson Correlation	.092	-.003	.032	-.016	.094	-.223*	-.055	1.000
Sig (2-tailed)	.364	.974	.760	.880	.373	.026	.588	
N	100	100	91	97	92	100	100	100.000

- *. Correlation is significant at the 0.05 level (2-tailed).
 **. Correlation is significant at the 0.01 level (2-tailed).

ENOTATIONS AND MEANINGS OF VARIABLES

PURINTRA Purpose of intercity trips
 Educationalback-Educational Background
 Householdsize-Number of Household
 EmploymentBa-Emploiment Background
 Income-Income
 Maritalstat-Marital Status
 Age-Age of Respondent
 Sex-Sex of respondents

	Test Value = 50					
	t	df	Sig. (2-Tailed)	Mean difference	95% Confidence Interval of the Difference	
					Lower	Upper
TBRT30Days	-15.057	92	.000	-136.25805	-136.25805	-31.4755

T-TEST GROUPS=sex (1 0)

MISSING=ANALYSIS

VARIABLES=TBRT30Days

CRITERIA=CI (.9500).

Table 3: The test of between-subjects effects

Dependent Variable: PURINTRA

Source	Type III Sum of Squares	df	Mean Square	F	Sig.
Corrected Model	105.963 ^a	3	35.321	3.257	.026
Intercept	12.227	1	12.227	1.128	.291
Employment Ba	6.901	1	6.901	.636	.427
Household size	40.690	1	40.690	3.753	.056
Educational backg.	52.613	1	52.613	4.852	.030
Error	921.655	85	10.843		
Total	2066.000	89			
Corrected Total	1027.618	88			

a. R Squared = .103 (Adjusted R Squared = .071)

UNIANOVA PURINTRA WITH Employment Ba., Household size, Educational backg., Sex Age, Marital stat., Occupation Income
 /METHOD=SSTYPE(3)
 /INTERCEPT=INCLUDE
 /SAVE=PREDRESID
 /CRITERIA=ALPHA(0.05)
 /DESIGN=Employment Ba. Household size, Educational backg., Sex, Age Marital stat. Occupation Income.

Table 4: The model summary of stepwise regression table

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.271 ^a	.074	.061	24.45539
2	.360 ^b	.130	.106	23.85988

a. Predictors: (Constant), Income

b. Predictors: (Constant), Income, Householdsiz

Table 5: The analysis of variance of the stepwise regression analysis

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	3562.752	1	3562.752	5.957	.017 ^a
	Residual	44854.962	75	598.066		
	Total	48417.714	76			
2	Regression	6289.976	2	3144.988	5.524	.006 ^b
	Residual	42127.739	74	569.294		
	Total	48417.714	76			

a. Predictors: (Constant), Income

b. Predictors: (Constant), Income, Householdsiz

c. Dependent Variable: TBRT30Days

Table 6: The coefficient of the stepwise regression analysis

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	-2.396	7.544		-.318	.752
	Income	4.672	1.914	.271	2.441	.017
2	(Constant)	-15.780	9.569		-1.649	.103
	Income	4.475	1.870	.260	2.393	.019
	Householdsiz	5.485	2.506	.238	2.189	.032

a. Dependent Variable: TBRT30Days

Table 7: The excluded variables of the analysis of stepwise regression

Model		Beta In	t	Sig.	Partial Correlation	Collinearity Statistics Tolerance
1	sex	.099 ^a	.879	.382	.102	.978
	Age	.183 ^a	1.608	.112	.184	.930
	Maritalstat	.074 ^a	.648	.519	.075	.945
	Educationalbackg	.011 ^a	.098	.922	.011	.994
	Householdsize	.238 ^a	2.189	.032	.247	.998
	EmploymentBa	-.194 ^a	-1.768	.081	-.201	.995
	Occupation	.041 ^a	.367	.715	.043	.993
2	sex	.091 ^b	.824	.412	.096	.976
	Age	.181 ^b	1.630	.107	.187	.930
	Marital stat	.106 ^b	.940	.350	.109	.931
	Educational backg	.022 ^b	.200	.842	.023	.992
	EmploymentBa	-.161 ^b	-1.472	.145	-.170	.971
	Occupation	-.003 ^b	-.025	.980	-.003	.959

a. Predictors in the Model: (Constant), Income

b. Predictors in the Model: (Constant), Income, Household size

c. Dependent Variable: TBRT30Days

F-TEST

TESTVAL=50

MISSING=ANALYSIS

VARIABLES=TBRT30Days

CRITERIA=CI (.9500).

Findings and Discussions

Table 1 shows the correlation between the dependent variable and the independent variables used for the analysis. It depicts the strength of the relationships between two variables correlated together and was significant which explains the relationships between socio-economic variables and trip characteristics at both the 0.01 level (2-tailed), Puritra and educational background, significant at 0.05 level (2-tailed). The impulse of this results is that variables whose correlation were significant reveal the covariance was positive in the magnitude of dispersion. Implicit in this also is the fact that the trips makers using BRT among respondents have a relatively high degree of education. This group includes among others the primary and secondary school students,

university students, and the highly skilled private and public staff, which make use of BRT for their daily commute in Lagos metropolis.

Table 2 show the one sample t test of the TBRT30days variable is compared with the hypothesis that the mean is 50. The finding of significance indicates that the sample mean is significantly from the 50. The mean difference of -36.288806 means the sample mean was $50 + (-36.288806) = 13.711194$. That is, the sample mean of 13.711194 is found to be significantly different from the hypothesized mean of 50 being tested. The parameter estimate, TBRT30days, was tested against socio-economic grouping of the sex. As shown in table 2, the hypothesis testing revealed that there is a significant relationship between socio-economic variable and trip making using BRT.

Table 3 shows the between-Subject effect and univariate analyses of variance (ANOVA), for the dependent and independent variables. The overall effect of the model with the input of the criterion and the predictors, it shows the model is significant at 0.26. The independent variable educational background is significant at 0.30, which signifies the importance of socio-economic variable on BRT use for mobility within urban metropolis. Other variable use in the model which is relatively significant is the household size at 0.56 level of significance. The impulse of this is that the socioeconomic characteristics of educational background and household size contribute more than other variables to the trips making using BRT in Lagos metropolis.

Table 4 shows the summary of the stepwise regression, as well as the strength of the predictors that were included in the model. The adjusted R^2 in the first stage of the relationship between the variables included in the model is 0.61, which only accounted for the predictors : income and the model constant. The tandem variable included in the model include the model constant, income and the household size, which all accounted .106 to the overall model.

Table 5 shows the analysis of variance of the stepwise regression model, the overall model is significant at 0.17 and F value of 5.987. The sums of square of the model is 48417.714. However, the accounting variable in the model is the model constant and income as the criterion and the Trip30days as the dependent variable in the first stage of the model. In the second stage of the model, the overall model is significant at 0.06 and F value of 5.524. The sum of square of the second stage of the model is same with the first which further validate the veracity of the model significance. Notably, the model constant, income and the house size predict trips us of the BRT more in the socio-economic characteristics.

Table 6 shows the coefficient of the stepwise regression model with standardized or the

beta coefficient at .271 for income in the first stage of the model and significant at .017. In the second stage, the beta coefficients are .260 and .238 respectively, and significant at .019 and 0.32 for the independent variable of income and house hold size respectively. The foregoing reveals the successive importance of the socio economic importance of the income and house hold size as reliable predictors of trip making with the BRT in the Lagos urban metropolis.

Table 7 shows the stepwise regression model of the equation with the two stages of variable inclusion in the model. The partial correlation for the variables included in the model revealed that for the first stage only household size is significant and for the second stage of the model revealed educational background| is significant in the standardized form as well as the partial correlation.

Conclusion

In certainty, this study has been a remarkable contribution to literature as the socio-economic characteristics are indeed, a reliable generator of urban trips, involving use of BRT in Lagos Metropolis. It corroborated earlier studies in the Kwara and Ibadan metropolis that socio economic variables as income and cost of trips as most effective socio-economic determinant of demand for both formal and informal public transport mode in the study area (Aworemi, 2008; Fadare, 1998). In this study, the most effective socio-economic variable determinants of innovative public transport-BRT use for mobility within Lagos Metropolis are income, educational background and the household size. Invariably, this study emphasize the importance of socio-economic characteristics as a reliable factors in planning socio-economic view that in planning public transportation whether formal or informal.

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