

**DETERMINANTS OF EARNINGS AMONG COMMERCIAL TRICYCLE OPERATORS IN ILORIN METROPOLIS, NIGERIA****Funsho Idowu Obakemi\***

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**Abstract**

*In 1999, Nigerian government of Olusegun Obasanjo launched series of empowerment schemes to alleviate poverty. Among these is tricycle empowerment. Till date, tricycle is used for commercial transport in Nigeria. This study examines the determinants of earnings among commercial tricycle operators in Ilorin metropolis, Nigeria. 335 commercial tricycle operators were interviewed via structured questionnaire, using stratified-simple random sample method. 321 questionnaires were returned valid. The study covers 15 major tricycle parks in Ilorin metropolis. This study is rooted on Minority Group Theory and Human Capital Theory. It is analyzed using logistic binary logit and stepwise regression technique. The results show that ownership of tricycle, passengers-carried per day, and membership to tricycle union are core determinants of daily earnings. And that a unionist is better off than non-unionist. Operator who owns a tricycle is also better off than one who lives on a rented tricycle. The core challenges of operators are: high daily fee charges by union, high price of tricycle, seasonal demand for tricycle service in routes that link schools, and undignified approach of passengers. The study recommends that government should subsidize the cost of tricycle on monthly installments through registered tricycle unions, and that government should also regulate daily charges by unions.*

**Keywords:** Earnings, Tricycle operators, Minority group theory, Stepwise regression**JEL Classifications:** J24, 46; R41**Introduction**

Transportation is important to human beings. It is the initiator, catalyst, and facilitator of development; and hub on which revolves the economy of any nation. Transportation is also conveyance of both human and natural resources, as well as information and technology from source to destination (Akintayo, 2010). Therefore, development is practically impossible without transportation. Cervero (2000) opined that inadequate transport infrastructure accounts for low level of development in third-world countries.

The significance of transportation became obvious in Nigeria during the oil boom of 1970s and fall in oil earnings of early 1980s. Both periods witnessed rise and fall in transportation infrastructure respectively. The world recession of 1980s preceded by the crash in world oil price affected virtually all sectors of Nigerian economy. Cost of vehicles and other capital goods went up. Unemployment rate in Nigeria also increased. These led to emergence and general acceptance of informal transport system, especially motorcycle, to fill the gap created by cost of vehicles, deficient formal public transport system, and to generate earnings for Nigerians. It equally became a solace ground for Nigerians that lost their jobs to the Structural Adjustment Programme of 1986 (Arosanyin, Olowosulu & Oyeyemi, 2011). Thus, informal transport system became indispensable to Nigeria's transport sector.

Today, Nigeria's urban informal transport system includes unorganized bus transit system, taxis, motorcycles popularly called *okada*, and tricycle known as *Keke NAPEP*. Tricycles are motorized pedicabs. The common ones in Nigeria are 2-stroke and 4-stroke Bajaj and TVS, with carrying capacity of 350kg, equivalent to 7 bags of Nigerian cement (Obakemi, Nev & Inyang, 2017).

The emergence of tricycle as a means of commercial transportation in Nigeria is traceable to the government of Mohammed Marwa, a military administrator of Lagos State from 1996 to 1999. He first launched the use of tricycle as a means of commercial transportation and as palliative measure to transport problem and unemployment in Lagos State. This led to the coinage of the name *Keke-Marwa*. However, the popularity of *Keke* across Nigeria can be attributed to the National Poverty Eradication Programme (NAPEP), inaugurated under the administration of President Olusegun Obasanjo to alleviate poverty and provide economic empowerment to Nigerians (NAPEP, 2006). NAPEP was the central coordination point for all anti-poverty efforts across the nation, of which tricycle was one of four key agenda in alleviating poverty in Nigeria (NAPEP, 2006). And in 2001, the scheme launched and distributed two thousand units of green coloured tricycles, with the inscription *Keke NAPEP*, as a commercial means of transportation in the Federal Capital Territory -Abuja (Mukhtar, Waziri, Abdulsalam & Dankani, 2015).

NAPEP was to serve as a strategy to tackle poverty and convert Nigerian youths to productive work force. It was further expected that the spillover effect of the scheme nationwide, will provide affordable mass transit and mass gainful employment. It was also projected to create opportunity for growth of other ancillary services, such as vending, mobile food canteens, mobile grocery shops, post-delivery, among others. Nigerian government expected the programme to generate incentive for emergence of technical entrepreneurs and relative small businesses that will in turn facilitate transfer of technology, emergence of other subsidiary businesses, such as sale of tricycle spare parts and building of local contents, among others (NAPEP, 2006).

About two decades after the emergence of NAPEP, it is pertinent to investigate whether or not average earnings of commercial tricycle operators matches or exceeds that of their contemporary in other businesses in informal sector. Most of the reviewed studies give attention to the impact of para-transit on employment generation and poverty reduction (Arosanyin et al. 2011; Mustapha et al. 2017; Raji, 2012), and how it has eased commuting in urban area (Mukhtar et al, 2015). None of the reviewed studies provides evidence that new entrants in commercial tricycle business are guaranteed earnings above average. This is very imperative as Arosanyin et al. (2011) find evidences that informal workers switch into para-transit business. This study intends to fill this gap by estimating predicting earnings model for commercial tricycle operators.

This study is structured as follows: Section two presents empirical studies, third section presents materials and research methodology, and the fourth focuses on data and discussion of results. Section five is the conclusion.

## **Literature review**

### ***Theoretical issues***

Minority group theory and human capital theory provide the theoretical base for the study. Minority group theory, as propounded by Rowntree (1941) regards poverty as insufficient earnings of an individual household to maintain necessities. The theory sees poverty as synonymous to insufficient earnings of a household wage-earners. To Rowntree, some households remain poor because earnings of the chief wage-earners is low to sustain the family, and at times, the chief wage-earner dies or is out of work due to illness. The human capital theory (HCT) by Bercker (1963), on the other hand, opines that productivity is determined by the accumulated human capital in an individual. The worth of an individual comprises of the total stock of educational attainment, skills acquired, and state of health that are crucial to economic

activity. That is, higher level of skills attainment yields more human capital, and hence higher income or earnings, *ceteris paribus*.

### ***Empirical literature***

Few studies have looked into the economic importance of tricycle as a mode of transportation and source of income, and its challenges and role in the fight against poverty. Dike (2012) and Ismail, Adeniji and Paul (2018) examined tricycle as public transport in Owerri and Lokoja, Nigeria respectively. They found that tricycle significantly eased public transportation in the city. Ismail, Adeniji and Paul (2018) added that the preference for tricycle was attributed to its flexibility, affordability, and inter-street services. Dike (2012) lent credence to study on Davao, Philippine by Guillen and Ishida (2004), that tricycle has compliment supply of para-transit services.

There is also similarity between Nigeria and Ethiopia on challenges encountered by tricycle transport operators. Obioma, Nwaogbe, Ibe and Ukaegbu, (2012) in Nigeria and Chinniah and Kalimuthu (2014) in Ethiopia reported high level of road network deterioration, which often resulted to frequent breakdown of tricycles. Adetunji (2017) found daily extortion by tricycle unions and security agents as core challenges encountered by tricycle transport operators. Raji (2012); Mukhtar, Waziri, Abdulsalam and Dankani (2015); and Mustapha, Akande and Jimoh (2017) investigated tricycle as a scheme designed to tackle poverty in Nigerian State of Lagos, Maiduguri and Kwara respectively. The studies scored the scheme pass mark. It lent credence to Zira, Yau and Adamu (2017) whose findings showed that 85 percent of the studied tricycle operators earned above poverty line.

Also, studies by Chinniah and Kalimuthu (2014) in Ethiopia, and Ipingbemi and Adebayo (2016) and Adetunji (2017) in Nigeria, attested that tricycle transit has generated employment for informal sector workers. According to Adetunji (2017), some job seekers found solace in the commercial tricycle transport business. Oluwaseun (2019) showed that many switched from other informal sector businesses to tricycle transport business because it guarantees daily earnings. Jibrilla and Fashola (2017) agreed with Oluwaseun (2019) that tricycle transport service had generated more employment and earnings for youths. On account of road crashes, Jibrilla and Fashola (2017) showed that tricycle transport system has reduced road accident compared to motorcycle. But the findings of Omoke, Lasebikan, Onyemaechi and Ajali (2019) showed that it has contributed significantly to the rate of morbidity and mortality in Nigeria.

The above studies show the socio-economic importance of tricycle. But Arosanyin et al. (2011) and Oluwaseun (2019) showed that many operators of tricycle left informal sector businesses like trading, artisan, and farming for tricycle business to boost their streams of income. Thus, the need to investigate if new entrants are actually guaranteed above average daily earnings in the business. Is tricycle business generating substantial earnings for commercial tricycle operators? What are the factors influencing earnings of tricycle operators? And what are the challenges confronting commercial operators in Ilorin metropolis?

This study will provide veritable metric for evaluation of NAPEP as an anti-poverty policy since 2003. It will equally reveal to government the true level of wellbeing of tricycle operators, as well inform the right choices of policy in future. It will also provide the mechanism through which government can improve the activities of the sector by tackling the challenges unveiled.

### **Methodology**

#### ***Model specification***

The study estimated two different models to examine the determinants of daily and hourly earnings of commercial tricycle operators. It uses a modified Mincerian earnings model (1974), and stepwise version of logistic regression. The earnings model is expressed as;

$$\text{Log}Y_{ED} = f(X_i, W_i, Z_i, u) \tag{1}$$

Where,  $\log Y_{ED}$  is the logarithm of gross daily earnings in Naira (₦). The use of gross instead of net earnings became inevitable due to *information hoarding syndrome (IHS)* that surrounds operating cost and income tax in the informal sector.

X, from the model, is a vector of operator’s characteristics. W is that of tricycle operational factors, Z is of safety features, and U is the error term. Vector X comprises of age (AG),  $AG^2$ , highest educational attainment (EDU), household size (HH), ownership type of tricycle (OT). Vector W consists of daily operation hours (DOH), passenger carried per day (PCD), mode of operation (MO), membership of union (MU), type of tricycle purchased (TT), and years of working experience (EX). Safety vector includes Awareness of Highway Code (HC) and license holding (LH).

Equation (1) is modified and expressed as;

$$\text{Log} Y_{ED} = f(\text{EDU, HH, DOH, MO, AG, } AG^2, \text{ LH, PCD, TT, HC, MU, OT, EX, } u) \tag{2}$$

The a priori expectations with respect to equation (2) are stated as follow:

$$f'_{EDU} > 0; f'_{HH} > 0; f'_{DOH} > 0; f'_{MO} > 0; f'_{AG} > 0; f'_{LH} > 0; f'_{PCD} > 0; f'_{TT} > 0; f'_{MU} > 0; f'_{OT} > 0; f'_{EX} > 0. f'_{AG^2} < 0$$

The essence of  $AG^2$  in the model is to enable the study to examine the long run relationship between age of tricycle operator and earnings--that is, whether the relationship is linear or non-linear. Following Modigliani’s Life-Cycle Income Hypothesis, beyond certain age, earning is expected to fall as tricycle operator increases in age.

The second earnings model is derived from the first, although with modification of the response variable. The response variable (earnings) is modified to reflect earnings per hour to address the fact that there are those who operate on part-time basis. Since the response variable is now earnings per hour ( $Y_{EH}$ ), the patronage index, which is proxy by passengers carried per day, therefore, becomes passenger carried per hour (PCH), as follows:

$$\text{Log} Y_{EH} = f(\text{EDU, HH, PCH, AG, LH, TT, HC, MU, OT, EX, } u) \tag{3}$$

All a priori expectations in the first model are retained. PCD is replaced with PCH, while DOH and MO are held constant, because earning is viewed from hourly basis.

The first set of models was modified to estimate the probability that a tricycle operator will earn above the average daily earning in Ilorin metropolis, estimated to be ₦3804.

Y, from equation 3, takes the value 1, if daily earnings is ₦3804 and above and 0 if otherwise. The reason for this estimation is that some operators swap from other para-transit modes or other businesses (informal sector) to tricycle operation, to take advantage of improved earnings. Therefore, the study transformed the response variables into categorical variables using binary responses. This necessitates the use of qualitative response models. The response is dichotomous, thus makes the use of probability models appropriate (see Green, 2002).

If  $\pi$ , in equation 6, is the probability that Y, the dependent variable assumes 1 ( $\pi = P(Y=1)$ ) then  $1 - \pi$  is the probability that Y assumes value zero. In the absence of other information, we would estimate  $\pi$  by the simple proportion of cases for which  $Y=1$ . However, in the regression context, it is assumed that there is a set of predictor variables --  $X_1, X_2, \dots, X_K$  -- that are related to Y and, therefore, provide additional information for predicting Y.

The generic binary model is given as;

$$\text{Log}\left(\frac{\pi}{1-\pi}\right) = \alpha + \beta_1 X_1 + \beta_2 X_2 + \beta_3 X_3 + \dots + \beta_k X_k \tag{4}$$

Equation (4) could be written as follows:

$$\pi = \frac{e^{\alpha + \beta_1 X_1 + \beta_2 X_2 + \beta_3 X_3 + \dots + \beta_k X_k}}{1 + e^{\alpha + \beta_1 X_1 + \beta_2 X_2 + \beta_3 X_3 + \dots + \beta_k X_k}} \tag{5}$$

Equation (5) implies that:

$$P(Y=1/X_1, X_2, \dots, X_k) = \frac{e^{\alpha + \beta_1 X_1 + \beta_2 X_2 + \beta_3 X_3 + \dots + \beta_k X_k}}{1 + e^{\alpha + \beta_1 X_1 + \beta_2 X_2 + \beta_3 X_3 + \dots + \beta_k X_k}} \tag{6}$$

Two versions of Equation (6) are estimated, where Y takes the value 1, if daily earnings is ₦3804 and above and 0 if otherwise.  $X_{1-k}$  is a vector of regressors as used in Equations (4) and (5); e is the exponent.

The estimation of the two versions of equation (6) is based on the maximum likelihood technique. The logit binary method is used, and the variables are screened at 5 percent significance level.

**Sources of data and measurement**

There were 869 registered tricycles and 15 major tricycle parks in Ilorin metropolis. Each park has an average of 58 tricycles. The parks are University of Ilorin, Tipper-garage, post-office, offa-garage, Sango, Igaa-Akanbi, Geri Alimi, Okelele, Michael Immodu, Oja-oba, Gambari, Kwara Poly, Ogidi, Mandate, and Sobi. Data was sourced randomly, following Taro Yamane’s sample size formula, from 335 tricycle operators in the metropolis through well-structured questionnaire. To avoid sample bias, although variation in the size of the parks is insignificant, 23 operators from each of the 15 parks were selected randomly. Thus, lottery simple random sampling was used at each tricycle park.

The data were measured quantitatively and categorically. The categorical data are: ownership (owner-operator = 1, otherwise = 0), type of tricycle purchase (new = 1, otherwise = 0), mode of operation (full-time = 1, otherwise = 0), license holding( licensed=1, otherwise=0), highway code awareness (aware = 1, otherwise = 0), membership of union (member = 1, otherwise = 0), and educational attainment (No formal schooling = 0, Qu'ranic education = 1, Primary school = 2; junior secondary = 3, senior secondary = 4; post-secondary school = 5). The quantitative data are: daily and hourly earnings (₦), age (in completed year), household size, daily operation hours, experience (in months), passenger carried per hour, passengers carried per day, fare charge per trip, and operating cost per day.

**Results and discussion**

**Descriptive analysis**

Table 1 and 2 depict information on personal, tricycle and operational characteristics of the sampled operators. All operators were male of 28 years on average. The minimum and maximum age of operators were 21 and 53 years respectively (Table 1). This conforms to the National Road Traffic Regulation requirement, which stipulates that a commercial cyclist must at least be 18 years old (FRN, 2004:B199). About 76.1 percent and 23.9 percent were married and single respectively, with average household size of 3.

Table 1: Socioeconomic characteristics of commercial tricycle operators

Variables	Mean	Std. Dev.	Minimum	Maximum
Personal Characteristics:				
Age	27.7	7.37	21	53
Household size	3	1.58	1	8
Operational Characteristics:				
Years of experience (in month)	14.7	7.58	1	60

No. of passengers carried per day	89.9	21.3	45	135
No. of passengers carried per hour	9.6	1.8	5	15
Fare charged on passenger per trip (₦)	40	0.02	30	50
Earnings per day (₦)	3804	2.9	800	6300
Earnings per hour (₦)	390	0.3	150	760
Operating cost per day (₦)	912	0.16	495	1450
Daily operation hours (in hour)	7.1	1.7	2	10
Daily Rent on Tricycle (₦)	1500	1.4	1200	2000

Source: Computed from field survey by author

The study shows that 8.1 percent of the respondents had no formal education; 0.9 percent had Qur’anic education; 14.5 percent had completed basic school; 51.5 percent attended pre-high school; 23.3 percent attended high school; and 1.4 percent went to college. It shows that education seems not be an important input in para-transit transport business. Perhaps, it prompted the flexibility shift from other informal businesses to tricycle operating business. About 14 percent and 78.2 percent were previously into farming and informal sector respectively, while 7.8 percent were unemployed before taking tricycle business. About 84 percent and 15 percent of part-time operators engage in informal sector and organized-private sector respectively, while 1 percent engages in other occupations (See table 2).

Commercial tricycle operation provides employment and earnings to tricycle dealers, mechanics, operators, and those who lease it out. This study focuses on the operators and those who lease out tricycles for a fee of ₦1200-₦2000 daily. The leased fee charged per tricycle is subject to the mechanical status of the tricycle, and the more tricycles leased, the more earnings that accrue to the owner. On average, an operator pays ₦1450 and ₦900 daily on rented tricycle and operating cost respectively. After deductions of the two costs from average daily earning (₦3804), an operator is left with ₦1454, while operators with maximum daily earnings are left with ₦2850.

From Table 1, the average years of experience on the job was computed at 14.7 months, with 1 and 60 months as the minimum and maximum years of experience respectively. The average passengers carried per day and earnings per day are estimated at 69 and ₦3804 respectively, while operators work on the average of 7 hours per day. The average fare charge per trip per person in Ilorin metropolis is estimated at ₦40, with minimum and maximum of ₦30 and ₦50 respectively.

From Table 1, minimum and maximum daily earnings are ₦800 and ₦6300, with daily operating cost of ₦1000 and ₦1450 respectively. This implies that, on average, a full-time operator with minimum of 25 working days earns ₦95000 monthly. This is equivalent to the basic salary of a level 9 Federal civil servant in Nigeria. The average passenger carried hourly and average earnings per hour are estimated at 9.6 and ₦390 respectively.

Table 2: Socioeconomic characteristics of commercial tricycle operators

Variables	Percentage (%)
<b>Personal Characteristics:</b>	
Marital Status	Single=23.9 Married=76.1
Educational Qualification	No formal education=8.14 Qu’ranic school=0.90 Basic School completed 14.5; Pre-high School completed= 51.6; High school completed= 23.3; Tertiary School=1.4
Previous Works	Unemployed= 7.8; Farming= 14; Informal sector= 78.2
Other Works	Informal sector= 84; Organized private sector= 15; Others=1
<b>Tricycle &amp; Operational Characteristics:</b>	
Membership of union	Member= 95.9 Non-member=4.1
Mode of Operation	Part-time 14.1; Full-time= 85.9

Ownership of Tricycle	Self = 19.4; Rented= 73.8; Hire purchase=6.8
Type of Tricycle Purchased	Fairly-used tricycle=13.4; New tricycle= 86.6
Highway Code Awareness	Not aware= 13.1; Aware=86.9
License Holding	Licensed= 64.3; No license=35.7
License Status	Valid license=87; Invalid=13
Number Plate	Yes=73; No=23
Challenges Encountered by Operators	Extortive daily charges by the union= 73.4; Frequent mechanical fault= 5.2; Undignified approach from passengers=9.6; Hike in the procurement cost of tricycle= 11.8

Source: Computed from field survey by author

Table 2 shows that 85.9 percent of respondents operated on full-time basis, while 14.1 percent on part-time basis. Since membership of union is a key pre-requisite for plying any of the routes in Ilorin metropolis, 95.9 percent were members of a union, while 4.1 percent were Non-members. However, there are cases where non-members still operate in the metropolis. Perhaps they take advantage of patronage during peak hours when demand exceeds supply. Due to the high cost of tricycle (₦750000) and poverty level, only 19.4 percent of operators owned a tricycle, 73.8 percent rent and 6.8 percent on hire purchase. The rent paid provides stream income to the owners, as remittances are done on daily or weekly basis, subject to the terms and conditions of agreement. For rented tricycles, an operator, after paying the rent, is responsible for fuelling. However, major repairs are borne by the owner and not the user.

From Table 2, in the case of owned tricycle operators, whatever is earned belongs to him, while hire purchase operators pay agreed monthly installment spread over an estimated period. He becomes the owner after the last installment has been paid. Intuitively, aside tricycle operators, tricycle business generates daily income to mechanics and spare part dealers, revenue to the government and stream of income to those who own and lease tricycles. Table 2 shows that 86.6 percent and 13.4 percent bought new and fairly used tricycles respectively. About 86.9 percent have the knowledge of Highway Code, while 13.1 percent were novice. A total of 35.7 percent were not licensed to operate on the road, while 64.3 percent were licensed; 87 percent of licensed operators were valid, while 13 percent were outdated. Physical inspection was carried out on licensed documents and number plate of tricycle, and 73 percent of the respondents had number plates, while 27 percent operate without number plate. This is an indication that road traffic agents need to be proactive and more efficient in road traffic responsibilities.

Challenges were reportedly encountered by the operators in the course of operating. About 73.4 percent complained of daily extortive charges by tricycle union. This conforms to the finding of Raji (2012). About 11.8 percent complained of the recent hike in procurement cost of tricycles and spare parts. The hike could be attributed to fall in the purchasing power parity of Naira at the world market. 9.6 percent of the operators also reported going through frequent undignified approach and assaults by passengers, while 5.2 percent complained of bad mechanical status of their tricycles.

***Regression on earnings models***

The study adopted stepwise estimation technique, because of the large number of explanatory variables analyzed at 5 percent significant level. Both hourly and daily earnings, as dependent variables, were log and regressed against the independent variables (see Table 3).

Table 3: Stepwise Regression Results on Earnings.

Earnings per day (Dependent variable)			Earnings per hour (Dependent variable)		
Explanatory Variables	Coefficient	P-value	Explanatory Variables	Coefficient	P-value
Passengers carried per day	0.0128	0.0026	Passengers carried per hour	0.1034	0.0062

Daily operation hour	0.033	0.0041	Membership of union	0.0681	0.0010
Mode of operation	0.154	0.0273	Age	0.0154	0.0830
Age	0.0069	0.0231	Age <sup>2</sup>	0.0072	0.1454
Age <sup>2</sup>	0.0350	0.0521	Ownership of tricycle	0.0213	0.0451
Ownership of tricycle	0.01625	0.0629	Type of tricycle owned	0.1543	0.0240
Membership of union	0.196	0.0032	License holding	0.0123	0.0580
Experience	0.0092	0.0021	Education	0.4211	0.0901
Education	0.0218	0.2153	C	3.7935	0.0000
C	5.234	0.0000			
R <sup>2</sup> Adjusted= 0.7675, F(9), Prob > F=0.00,			R <sup>2</sup> Adjusted= 0.7211, F(8.), Prob >F=0.000		
Root MSE= 0.08174			Root MSE= 0.02872		

Source: Stata Computation by author

The log earnings per day model shows that six variables are significant and conform to the aprior expectations. The variables are: passenger carried per day, daily operation hours, mode of operation, ownership type of tricycle, membership of union and experience. The adjusted R<sup>2</sup> of 0.7675 implies that about 77 percent of the variation in earnings is explained by the model. The F-statistic also shows the good fitness of the model. Log earnings per hour shows that four variables are significant and conform to the aprior expectations. They are: passenger carried per hour, ownership of tricycle, membership of union and type of tricycle purchased. The adjusted R<sup>2</sup> stood at 0.721, which implies that 72 percent of the variation in earning is explained by the model, while the F-statistic shows that the model is fit.

Results in Table 3 show that earnings are positively related to number of passengers carried. Fare charge per passenger for every trip is excluded from the model to avoid spurious regression result attributed to multicollinearity. This is due to the fact that hourly and daily earnings are product of fare charge and the total number of passengers carried. Also, operators with more years of experience seem to enjoy more patronage as they have built business relationship with passengers along the patronized routes. Membership of union is significant at both hourly and daily earning models since it is a fundamental pre-requisite for commercial tricycle to operate on any of the routes in Ilorin metropolis.

Mode of operation is significant in daily earning model as expected, because full time operators have more working hours. Age is significant at daily earnings model, but not significant at hourly earnings. Perhaps most passengers patronize aged operators than young ones because of safety. AG<sup>2</sup> contradicts the aprior expectation as suggested by Life-Cycle Income Hypothesis, as the findings show that earnings do not decline at old age. This is not a surprise as the maximum age of operators was 54.

Type-of-tricycle is significant at hourly earnings model, which implies that operator with new tricycle tends to earn more than those with old tricycles. Ownership of tricycle is significant at hourly earnings model. Operators that own tricycle earn more than those that live on rented tricycles. This could probably be attributed to the fact that operators could stay beyond the scheduled closing time applied to operators who live on rented tricycle. The above results further show that education is not really a factor in determining earnings in the informal sector, especially, among para-transit operators, when modeled along the traditional Mincerian equation. The study is in consonance with Arosanyin, et al. (2011), Yakubu (2012) and Obakemi, et al. (2017) that no serious education is required to operate in the informal transport sector.

***Logit model on predicting earnings***

The study shows that new entrants switched from other informal sector, either as part-time or full-time operators to take advantage of improved earnings. Therefore, response variables (earnings) was transformed from continuous to categorical form, which assumed binary form to determine

the probability that an operator or a new entrant will earn at least ₦3804 and ₦390 per day and per hour respectively.

$$P(Y=1/X_1, X_2, \dots, X_5) = \frac{e^{-6.90+0.496X_1+2.34X_2+1.053X_3+2.059X_4+0.137X_5}}{1+e^{-6.90+0.496X_1+2.34X_2+1.053X_3+2.059X_4+0.137X_5}}$$

$$P(Y=1/X_1, X_2, \dots, X_5) = 0.79 \text{ (79\%)}$$

$x_1$  = Mode of operation;  $x_2$  = Ownership of tricycle;  $x_3$  = Daily hour operation;  $x_4$  = Membership of union;  $x_5$  = Passenger carried per day.

Equation (6) was estimated, where Y takes the value 1 if daily earnings is ₦3804 and above and 0 if otherwise.  $X_{1-5}$  is a vector of regressors, as in Equations (4) and (5). The estimation of probability of hourly and daily earnings from equation (6) is based on the maximum likelihood principle, using binary logit regression. The significant variables are mode of operation, ownership type, daily operation hour, membership of union and passengers carried per day.

Table 4: Logistic Regression Result for Predicting Daily Earnings

Earnings per day (Dependent variable)			Earnings per hour (Dependent variable)		
Explanatory Variables	Coefficient	P-value	Explanatory Variables	Coefficient	P-value
Passengers carried per day	0.137	0.002	Passengers carried per hour	0.835	0.047
Daily operation hour	1.053	0.031	Membership of union	1.30	0.032
Mode of operation	0.496	0.047	License holding	0.166	0.036
Age	0.021	0.079	Age	0.167	0.061
Ownership of tricycle	2.34	0.034	Ownership of tricycle	1.226	0.012
Education (years)	0.73	0.073	Education (years)	0.037	0.143
Experience (years)	1.02	0.092	Experience (years)	0.782	0.081
Membership of union	2.059	0.003	C	-1.923	0.032
C	-6.90	0.024			
Pseudo R <sup>2</sup> = 0.324, Wald Chi <sup>2</sup> (8) = 45.89			Pseudo R <sup>2</sup> = 0.349, Wald Chi <sup>2</sup> (7) = 61.45		
No of Obs. = 321, Prob. Chi <sup>2</sup> = 0.0000			No of Obs. = 321, Prob. Chi <sup>2</sup> = 0.0000		

Source: Stata Computation by author

In Table 4, the probability value of Wald Chi Squared for predicting both hourly and daily are significant at 1%, which implies that the models are fit. According to equation 6 the probability that an old or new entrant operator will earn at least ₦3804 per day is 0.79, provided that he owns a tricycle, operates on full-time and at minimum of 7 hours, carries an average of 89 passengers per day, and is a member of the tricycle union. Conversely, an operator who rents a tricycle, operates on part-time and works below the average hour, not a member of union, and carries below 89 passengers per day, has a probability of 0.21. The implication of the above worst and best scenarios is that even if an individual leaves an informal sector job or other para-transit service for the tricycle business to take advantage of earnings, the probability of earning equal or above daily average earnings will be low, except where an operator operates on best scenario.

The probability estimate for hourly earnings is computed using the equation below:

$$p(Y=1/X_1, X_2, \dots, X_4) = \frac{e^{-1.92+0.835X_1+1.30X_2+0.166X_3+1.226X_4}}{1+e^{-1.92+0.835X_1+1.30X_2+0.166X_3+1.226X_4}} \tag{7}$$

$$p(Y=1/X_1, X_2, \dots, X_4) = 0.68 \text{ (68\%)}$$

$x_1$  = Ownership of tricycle,  $x_2$  = Passengers carried per day,  $x_3$  = Membership of union,  $x_4$  = License holding

In Table 4, according to equation 6, the probability that an operator will earn at least ₦390 per hour is 0.68, provided that he owns a tricycle, has a valid license, carries an average of 10 passengers per hour, and is a member of tricycle union. On the contrary, an operator that rents a

tricycle, operates without a valid license, not a member of the union, and carries below 10 passengers hourly, has a probability of 0.32. The implication of the above worst and best scenarios is the same as that of the old or new entrant in daily earning model. And the binary response results in Table 4 prove further that education does not have significant effect on earnings in the informal transport sector.

Table 5: Odd Ratio

Earnings per day (Dependent variable)			Earnings per hour (Dependent variable)		
Explanatory Variables	Odd Ratio	P-value	Explanatory Variables	Odd Ratio	P-value
Passengers carried per day	1.9468	0.002	Passengers carried per hour	1.8696	0.047
Daily operation hour	2.8662	0.031	Membership of union	1.6692	0.032
Mode of operation	1.6421	0.047	License holding	1.1806	0.036
Age (years)	1.0024	0.079	Age (years)	1.0072	0.091
Ownership of tricycle	1.381	0.034	Ownership of tricycle	1.0076	0.012
Education (years)	0.9562	0.073	Education (years)	0.6702	0.143
Experience (years)	1.0751	0.092	Experience (years)	0.9784	0.081
Membership of union	2.5381	0.003			
Pseudo R <sup>2</sup> = 0.324, Wald Chi <sup>2</sup> (8)= 45.89			Pseudo R <sup>2</sup> = 0.349, Wald Chi <sup>2</sup> (7)= 61.45		
No of Obs. =321, Prob. Chi <sup>2</sup> = 0.0000			No of Obs. =321, Prob. Chi <sup>2</sup> = 0.0000		

Source: Stata Computation by author

The coefficient in the logistic regression only provide information on the significance and signs of the explanatory variable, but do not account for impact of each independent variable. Odd ratio in Table 5 provides information on the impact of individual explanatory variable on dependent variable. From Table 5, as passengers carried per day and hour increase by one unit, the probability of earning ₦3804 and above increases by 94 percent and 86 percent respectively. This is in consonance with the simple demand theory; thus, as demand for transport services increases, operator earns more revenue. As operators extend operating hour by one, the probability of earning ₦3804 and above increases by 86 percent.

As for mode of operation (full-time was taken as reference category), full-time operators stand 1.64 times chance than part-time operators in earning ₦3804 and above. Also, members of a union stand a chance of 2.53 times than non-members in daily earning of ₦3804 and above. Meanwhile on hourly basis, members of union stand 1.67 times chances than non-members to earn ₦390 and above. Operator that owns a tricycle has 1.38 times chances than operator that rents a tricycle, to earn ₦3804 and above daily; and 1.0076 times chances to earn ₦390 on hourly basis.

**Conclusion and policy implications**

Many are of the view that the emergence of tricycle business has afforded many informal sector workers more income, and part-time earnings for the workforce in the formal sector. Therefore, it was imperative to ascertain those factors that determine earnings in the tricycle transportation business. And to attain this objective, the study used binary logit and step-wise regression to examine the determinants of earnings among commercial tricycle operators in Ilorin, Nigeria. Daily earning of average tricycle operator was estimated at ₦3804, with maximum earnings of ₦6300. Daily operation hour, ownership-type of tricycle, membership of union, mode of operation, experience and passengers carried per day are all significant determinants of daily earnings among operators.

Fare-charge per trip was excluded from the model because of the inclusion of number of passengers carried daily/hourly. This was to anticipate spurious regression that could likely emanate from multicollinearity. Stepwise regression and predicting models were estimated to attain the objectives of the study. Education was not significant in hourly and daily earnings model. Membership of union is key factor for any operator to ply any route in Ilorin metropolis.

The logit model shows that tricycle business in the informal transport sector, with less or no educational attainment, guarantees better earnings for full-time commercial tricycle operators than some civil servants. And that demand and supply of commercial tricycle service is characterized by identity of imperfect market, as new entrant is constrained by the activities of unionism. Also, the study shows that most new tricycle operators switched from other informal sectors to take advantage of improved earnings, either as part-time or full-time. Challenges encountered by operators were: daily extortive charges by union, high cost of tricycle and spare parts, and undignified approach from customers and the public.

The study points at three policy implications. First, many households depend on earnings from tricycle operation, as average earnings of operators sum up to ₦95100 monthly, equivalent to earnings of a level nine Federal civil servant in Nigeria. Second, membership of union, been a condition for any individual to operate in any of the routes in Ilorin metropolis, helps members to have more earnings than non-members--which means that a union member has 2.53 times chances to earn more than a non-member. Third, operators gave less heed to safety factors, therefore, Highway Code awareness and use of number identification plate were not significant in determining earnings. And only valid license holding was found significant in the predicting hourly earnings model. Lastly, education proved less important factor in earning model—as found by Arosanyin (2011) and Yakubu (2012).

The following recommendations are suggested: First, government should subsidize cost of tricycle on monthly installment via registered tricycle union -- because mechanical state of tricycle affect earnings. Second, government can monitor the activities of the union as to reduce the burden created by union's daily charges. Third, tricycle operators can also join thrift cooperative society that would afford them soft loan, for procurement of new tricycle.

And governments, via road traffic agencies, should put effective mechanism in place to enforce compliance with the use of valid license, adhere to Highway Code and number plate -- as these will go a long way to promote security, reduce road accident and loss of lives, and also salvage more revenue for government.

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