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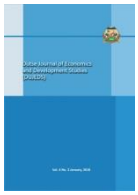

COMMERCIAL TRICYCLE: JOB CREATION AND INCOME GENERATION IN NASARAWA STATE - NIGERIA

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Abstract
The study examines the contribution of commercial tricycle; job creation and income generation in Nasarawa State, Nigeria. This study adopted a survey research technique. The data used in this study was gathered from primary sources, collected from cross-sectional surveys of commercial tricycle operators, officials of relevant trade unions, Nasarawa State license office (Central Motor Registry Unit), Nasarawa State Board of Internal Revenue and end users of their services using a comprehensive and structured questionnaire /interview method, as well as Focus Group Discussion (FGD). The study employed an optimized ouput -revenue framework, which is a technique of finding the best possible of output and price level to give the most possible revenue. It was discovered that over the years, accidents involving Commercial tricycle, resulting from reckless driving and refusal to comply with traffic rules have been on the increase in direct proportion to the number of commercial tricycles for commercial purposes. The study also discovered that commercial tricycle riders or operators are confronted with high cost of setting up the business. The findings revealed that about 171,000 persons were employed by the business in 2017, but commercial tricycle business has the potential to create 29,050,728 jobs to persons operating at full capacity. It also revealed that the business has the potential to contribute about N530million in taxes to the state coffers annually. The study recommends that there should be a purposeful regulation of the commercial tricycle business with the sole intention of widening the tax net to capture the activities of those currently edge to bridge the gap caused by the ban on motorcycle.

Keywords: Tricycle, Job Creation and Income Generation
JEL Classifications: L92, J62, E24

Introduction

The key element that connects the transport sector with the overall economy is mobility. Interestingly, mobility is one of the cardinal features of economic activity as it underlines the basic need of economic agents moving from one location to another - a need shared by critical factors in the production, consumption and distribution spheres of the economy. Generally, in modern economy, providing mobility is an industry that offers services to customers, employs people, pays wages and salaries, invests capital and generates income. At the macroeconomic level, transportation and its component element of mobility is connected to a level of output, employment and income within a national economy. At the microeconomic level, transportation is linked to producer, consumer and production costs (Umaru, 2013).

Tricycle remains to be a sound alternative for those who cannot access a more convenient ride to their destination. More so, it also provides additional income and employment for those who do not have a formal job. Tricycle transportation in Nigeria was introduced in some major cities in the country and had even became alternative mode of transportation in urban cities of the nation where other modes of transportation like cars are found inaccessible due to poor terrain or even a complete absence of motorable roads (Cervero, 2000).

Another benefit of the commercial tricycle business which was not appreciated by most people was the fact that since the riders followed people door to door, the simple exercise of walking from one's gate to the nearest bus stop was no longer undertaken and of course it was convenient (Cervero, 2000; Chepchieng et al, 2012). The type of motorized vehicle people acquire often comes down to household economics without much consideration given to social costs. In terms of affordability, in India, for example, the retail price of a two-wheeler ranges from $450 for an entry level moped or scooterette to $1,325 for a premium class motorcycle (Iyer & Badami, 2007).

In most cases the advantages of a tricycle include transport service, job creation, income generation and equity. It is a fast, safer and efficient mode of transportation. Transportation is the pivot of the socio-economic development of nations. It is equitable in a sense that it can provide access and cheap alternative mode of transportation for passengers. This mode of transportation in terms of security wise, safety and risky is assured. One of the important distinguishing features of this mode of transportation is the level of flexibility of its operation, such that it has the ability of maneuvering on stalled traffic as well as travel on unpaved/rough roads.

The flexible nature of operation offers wide range of opportunities; it is a source of additional income for government and private sectors workers who may take to it after closing from their official working hours as a driver or as an investment. Meanwhile, it is an important source of empowerment for the reserve army of unemployed youth on the streets and a cushion to reduce youth restiveness. One of the main objectives of developing public transport system is to improve the level of service in terms of comfort, safety, and frequency in service as well as providing a reasonable and affordable fare for the public.

As the Commercial tricycle business is, riders and operators are confronted with several challenges. Critics of the commercial tricycle business maintain that the expansion of the business has increased the number of road accidents in the country. This has led to the loss of lives and in many cases permanent disabilities to victims. Another challenge confronting the *Commercial tricycle* riders or operators is the high cost of setting up the business. A prospective businessman willing to go into Commercial motocycle/tricycle business would need between ₦600, 000 and ₦700, 000 to start the business (Garba, 2016). This includes the cost of purchasing a tricycle (depending on the brand), the cost of registering or licensing it and registration with the riders' or owners, association. Given the high cost of buying a tricycle, it is often difficult for new comers to raise sufficient fund to start commercial tricycle business.

Commercial tricycle riders are also reported to constitute nuisance of the highways since many of the riders do not obey traffic rules. As the size and population of a city grow, the demand for passenger's transportation gets more complex and difficult to satisfy. People begin to spend unnecessarily longer time in their bid to catch a vehicle to their destinations. Businesses suffer, school children get to school late, workers get to work late, and so many activities are paralyzed. In the end, this affect the general economic condition of the people in Nasarawa state and the nation`s gross domestic product at large. It is against this background that both individuals and governments have made concerted effort to address the needs of commuters in our towns and cities. Nasarawa state government established mass transit outfits as a conscious effort to complement the service of the private transporters. Yet much is left to be desired in the provision of transport services. The situation came to a point that people started investing on private automobile as a way to seeking for a solution to the problem of transportation. To adequately put the tricycle business in its proper place in the economic history of Nigeria, it has become necessary to evaluate the contribution of *CTB* to the economy. It is on this ground that the Nasarawa State government in year 2011 introduced the KEKE TA'AL across the major towns and cities; such as Lafia, Keffi and Karu local government area of the State.

Literature Review

Tricycles are popular mode of public transportation among commuters due to their high accessibility, availability, affordability, and convenience. Being much less expensive in fares than other vehicles, they play an important role in Nigeria's overall transportation system. Tricycles are the most convenient means of transportation in rural areas especially from the central town to the villages in most African countries. Within big cities, they are usually located in smaller roads, lanes and alleys where other public transportations do not or cannot operate. Most tricycle brands in Nigeria are motorcycles with side cars, which have the legal capacity of five (5) passengers including the driver. Tricycle is an impressive job machine, creating more jobs than any other alternative mode of transportation (Oladipupo, 2008).

The tricycle or three-wheeler which assumes different names in most countries such as auto rickshaw, tuk-tuk, trishaw, auto rickshaw, autorick,

bajaj, rick, TVS King, tricycle, mototaxi, or baby taxi in popular parlance, is a motor vehicle which is used on the road as a mode of transport for both private and commercial purposes either for passengers or for deliveries. It is a motorized version of the traditional rickshaw or relotaxi, a small three wheeled cart operated by a single individual, and is a three-wheeled cabin cycle. Tricycles can be found in many developing countries and some developed countries (Yakubu, 2012). A tricycle is generally characterized by a sheet metal body or open frame resting on three wheels, a canvas roof with drop-down sides, a small cabin in the front of the vehicle for the driver, and seating space for up to three passengers in the rear. It is generally fitted with an air-cooled motorcycle engine, with handle-bar controls instead of steering wheel. Human – powered tricycles are usually powered by pedals, although some models have hand cranks (Dike, 2012).

The tricycles are vehicles with powerful diesel engines, and fuel tank capacity of 10.5 litres. They have passenger capacity of four people, and payload capacity of 320kg. Also, they have adequate room for passenger luggage and speed up to 80km per hour. The vehicles are suitable for intra-city commuting and commercial passenger carriage with low fuel consumption of 38km per litre. Distinct from the earlier diesel engine types, there are now petrol engine tricycles in operation. They are however, smaller in capacity than the diesel counterparts and appear to be favoured by both the operators and the passengers due mainly to the low noise and vibration which they generate. They also produce cleaner exhaust fumes than the diesel engine tricycles (Chepchieng etal, 2012).

In certain parts of Egypt such as Alexandria, auto rickshaws are used to access long streets where the use of taxi would be uneconomical, but not necessarily in poorer areas. They are also found on the streets of Banjul, the Gambia, but are not common as conventional four –wheel vehicles. They are in operation in several Kenyan towns, where they are considered much cheaper than the ordinary taxis, except that they cannot operate in the mountainous towns which are common in Kenya. Auto rickshaws or tricycles are common in Euthopia, Tanzania and Mozambique. Similarly, tricycles are one of the most popular modes of transport in Bangladash, Cambodia and the Gaza. They are present all over India where they provide cheap and efficient transportation. Other countries that use the tricycle in transportation are Indonesia, Pakistan, Philippines, Sri Lanka, Thailand, Vietnam, Italy, Netherlands, United Kingdom, El Salvador, Cuba, Guatemala and Peru (Chepchieng etal, 2012).

Job creation is the notion that jobs are created in response to some sort of event or situation. Conceptually, it's proactive opposite of unemployment. It's mostly a term used for political rhetoric. For example, a candidate might suggest a particular taxation or subsidy programme or regulatory framework, will create new jobs. Job creation would occur if the government grew and hire more people to operate it, or if the demand for goods and services rises substantially. For demand to rise, there would need to be a significant base of buyers for those goods and services. Job creation failed if the principal consumers refuse to buy goods and services because they have insufficient money and further, if the feel economic pressure, the borrow less (Steven & John,1992). Income generation is an intervention which imparts vocational skills or provides capital or commodities that enhance the capacity of individual or groups to generate income e.g micro credit, micro finance and micro vocational skills training Kennedy etal (2008). Income generation is an intervention programme attempt to address poverty, unemployment and lack of economic opportunities to increase participant ability to generate income and secure livelihoods (Hezron, 2016).

The ILO's Resolution concerning household income and expenditure statistics define income as follows: "Household income consist of all receipts weather monetary or in kind (goods and services) that are received by the household or individual members of the household at annual or more frequent intervals, but exclude windfall gains and other such in regular typically out time receipts. Household income receipts are available for current consumption and do not reduce the net worth of the household through a reduction of its cash, the disposal of its other financial or non- financial assets or an increase in liabilities (ILO, 2003). Income generating activities are those activities which can be undertaken by organizations so as to raise revenue to enhance the project or school finances. The main types of income generating activities include school buses, farms, hire of class rooms or halls by churches and other social activities like ceremonies or wedding receptions.

A study by Fasakin (2002) conducted on commercial motorcycle business in Akure-Nigeria examines factors that explain the costs of daily operations and the willingness of citizens to pay for the commercial motorcycle services and shows that factors that significantly explain costs of daily operations of *Achaba* business include: various levies imposed by union officials (garaging costs); districts of operation; ownership of business; ability of operators to repair or maintain their vehicles and the total number of hours spent in operations each day. It also shows that the incident

of armed robbery by operators and the education of citizens are also significant factors affecting citizen's willingness to pay. Other important factors include the method of determination of trip fares, variations in weather conditions and stability of trip fares. Perhaps more important a factor responsible for the continuous prominence of commercial motorcycles in Nigeria presently is the relentless drive by operators to make good profits every day (Fasakin, 2002).

A study was conducted by Onifade, Aduradola & Amao (2012) on the effect of socio-economic survival of Commercial motorcycle/tricycle riders in Abeokuta and Odeda Local Government Areas of Ogun state, Nigeria on African cultural values. The study was carried out using the questionnaire method to elicit vital information from one hundred respondents who are randomly- selected from ten Commercial motorcycle/tricycle parks within Abeokuta metropolis and Odeda township respectively. Simple percentage and t-test statistical tools were used to analysed the data. The findings showed that Commercial motorcycle/tricycle riding, though a lucrative enterprise has its direct and indirect bearing on the cultural values of the society. The recklessness that is associated with the business tends to erode certain cultural and moral values including respect for other road users, respect for authority and elders within immediate environment. Majority of the riders engaged in the business because of the pressing need to survive and sustain their families.

Yunusa, Lawal, Idris and Garba (2014) on their study occupational health hazards among motorcyclists using ABU, Zaria as a case study. A cross sectional survey design was used for the study. Questionnaires were administered to 216 respondents, majority of who were in the age group of 30-34 years with mean age of 31.7 years. It shows that 83.4% had formal education ranging from primary to tertiary education and 74.5% of the respondents are of Hausa/Fulani extraction, 55.6% have been involved in an occupational hazard out of which 86.7% had road traffic accidents. Major outcome of accidents include bruises, lacerations and fractures. It is therefore concluded that accidental injury is a major form of occupational health hazard associated with commercial motorcyclists.

Abdussalam and Wahab (2014) conducted a research on the impact of "Commercial motorcycle/tricycle" in reducing poverty among the riders/operators in Ilorin West Local Government Area, Kwara State, Nigeria. Sample size of hundred and twenty (120) respondents was chosen using multistage sampling techniques among the rider populace. However, questionnaires were employed as a major instrument of data collection and supplemented with personal interview with the respondents. The analysis was done through descriptive and inferential statistics inform of percentages and table frequencies as well as Spearman Rank Correlation (rho), using the software Statistical packages for Social Science (SPSS 20.0). The findings reveal negative but not significant impact of the "Commercial motorcycle/tricycle" motorcycle riding on poverty reduction as well as living standard of the respondents. The results show strong and negative correlation between the variables, $r = -0.9$, $n = 120$, $p (.325) > .0005$, with high amount of money makes per day associated with lower standard of living. Finally, the paper draws conclusion and gives meaningful suggestion towards the standardization and enhancement of the "Commercial motorcycle/tricycle" motorcycle riding in Ilorin West Local Government Area in particular and Kwara State, Nigeria in general.

Yakubu *et al* (2012) conducted a research on the core determinants of earning among commercial motorcyclist across the rural-urban divide in Kwara State, Nigeria. Apart from the specific objective, other issues examined include background of the respondents; economic and operational characteristics of the commercial motorcycle/tricycle operators. A total of 80 Questionnaire were distributed to commercial motorcycle/tricycle operators in both rural and urban areas. Out of this 77 were returned valid. The paper used a modified Mincerian equation as tool for data analysis. Results from the study show that, the significant variables like age of commercial motorcycle/tricycle riders; location; and license holding positively determine earnings while variable such as age; and average fare charged per trip; negatively determine earnings. The findings further indicate that commercial motorcycle/tricycle riders earn a minimum of N 500 and maximum of N 2,800 per day. Urban commercial motorcycle/tricycle operators earn N 591.97 operators higher than the rural operators; licensed operators also earn N 512.37 higher than non-licensed operators daily. In this connection, education does not in any way determine earnings of commercial motorcyclists.

Another study by Emmanuel (2013) on the factors affecting Commercial motorcycle/tricycle services, impact of *Commercial motorcycle/tricycle* services and constraints hindering *Commercial motorcycle/tricycle* services in Community development. A 5-point Likert-type scale containing pretested statements was used to measure the impacts, while constraints was measure by the use of A-3 point likert-type scale in three randomly chosen communities from 3 purposively selected Local Government Areas of

Ogbomoso Agricultural Zone in Oyo State. The study found that majority of the rural dwellers are strongly agreed and agreed on the economy impacts, cultural impacts, societal impacts, health impacts and environmental impacts derived from commercial motorcycle/tricycle services in rural community development. The study also revealed that rural dwellers' socio-economic characteristics (age, sex, marital status, household size) influenced their perception of impact of commercial motorcycle/tricycle services in rural community development while, age, number of years in school, marital status, length of residence and household size influenced their perception of constraints hindered commercial motorcycle/tricycle services in community development.

Umaru (2013) conducted research in the same area. The study used a combination of survey techniques to examine the implications of the activity of commercial cyclists, popularly known as 'Achaba' (Hausa: motorized rickshaw) in Nasarawa state for the local economy, community and environment. The findings of the study show that apart fromyt being a money spinner, this public transport mode has been making other modest contribution to the state's economy. The study also shows that this transport is a latent contributor to environmental degradation in the state for it might have degraded the environment in excess of $6.98 million between 2006 and 2008.

Richard (2014) conducted a study on public enlightenment programme among motorcycle riders on the use of crash helmet in Akure Metropolis of Ondo State, Nigeria. This study was concluded in May 2013 using a structured questionnaire and adopted a sample survey in 5 selected populous locations in Akure to select 140 motorcycle riders. It was found that the majority (80%) of the respondents have been enlightened before the study was conducted. Out of about forty-three percent of the enlightened respondents that had crash after the campaign, twenty-seven percent of them were helmeted. Though the coverage of the public enlightenment programme among motorcycle riders was impressive, the message content needs to be worked up as it did not translate to high level of compliance on crash helmet usage.

One of the main objectives of developing public transport system is to improve the level of service in terms of comfort, safety, and frequency in service as well as providing a reasonable and affordable fare for the public. It is on this ground that the Nasarawa State government in year 2011 introduced the KEKE TA'AL across the major towns and cities; such as Lafia, Keffi and Karu local government area of the State.

Methodology

Data and Sources

The data used in this study was gathered from primary sources, collected from cross-sectional surveys of commercial tricycle operators, officials of relevant trade unions, Nasarawa State license office (Central Motor Registry Unit), Nasarawa State Board of Internal Revenue and end users of their services. The data was generated using a comprehensive and structured questionnaire in order to get vital information on commercial tricycle business from the operators in Nasarawa State. This study adopted cluster sampling technique. This is a non-random sampling method which can be employed where non-sampling frame exists and often, for a population which is distributed over some geographical area. The technique involves one or more geographical areas and sampling all the members of the target population that can be identified. It is generally cheaper than other methods since little organization or structure is needed in the selection of subjects as well as a good alternative to multi-stage sampling where no sampling frame exists.

Population and Sample Size

Table 1: 2006 Census Population Distributions by LGA

LGA AREA	SENATORIAL DISTRICT	LAND SIZE KM^2	MALE	FEMALE	POP. SIZE	REGISTERED CTB OPERATORS	2016 POP. TOTAL*	SELECTED SAMPLE††
Nasarawa West								
Karu	B	2707,642	109515	106715	216230	1,053		160
Keffi	B	141514	47527	45023	92550	383		100
Kokona	B	1889,651	54379	54179	108558	56		
Nasarawa	B	5860,505	95105	92115	187220	415		
Toto	B	2963,84	59884	59167	119051	34		
Nasarawa North								
Akwanga	A	1021,546	56135	55767	111902	267		
Nasarawa Eggon	A	1237,42	74675	74302	148977	182		
Wamba	A	1185,453	36813	35874	72887	46		
Nasarawa South								
Obi	C	989,433	74675	74302	148977	38		
Lafia	C	282119	164[631	164291	329922	1, 461		140
Keana	C	1070,503	40873	40928	81801	41		
Awe	C	2611,464	57326	55757	113083	32		
Doma	C	2771,336	71395	67596	138991	108		
Total		**27,271,497**	**943,801**	**925,576**	**1869,377**	**4,116**	**12,550,598**	**400**

Sources: NPC (2006), NBS (2015) and Central Motor Registry Lafia, Nasarawa State (2017).

Note: B=Nasarawa West, A= Nasarawa North and C=Nasarawa South.
† National Bureau of Statistics (2015).
* Projection based on NBS (2017) population and at 3% annual growth rate.
†† The Yamane (1973) formula was used for the calculation: $\left[S = \frac{N}{3 + N(ME^2)} \right]$, where S = desired sample size; N = working population; ME = margin of error (set at 5 per cent).

The theoretical population of the study was the entire CTB operators in Nasarawa State which comprised of both registered and unregistered operators. However, the base for the determination of the sample size, the working population was the total number of officially registered CTB operator in the three (3) local government areas namely, Keffi (Nasarawa West), Lafia (Nasarawa South), and Karu (Nasarawa West). As at 2016, a number of 4,116 tricycle owners were reported by Nasarawa State Central Motor Registry to have officially registered as CTB operators in the state. Using Yamane (1973), a sample size of 400 was selected for the study. However, 349 responses were returned as valid questionnaires administered. Table 1 shows the population of the study area, how the sample size was determined based on the above information and the distribution of sample size among the various wards of the local governments selected. The Yamane (1973) formula was used for the calculation: $\left[S = \frac{N}{3 + N(ME^2)} \right]$

Where S = desired sample size; N = working population; ME = margin of error (set at 5 per cent).
4116/3+4116(0.0025) = 400.

This study is a survey research, an optimized output-revenue framework in the work of Garba (2016) and optimal control theory were adopted with a little modification in order to achieve the specific objectives of the study:

$$H = f(Q) - \lambda[M - M(Q, C(Q, K, Tax, ...) - F(K)] \quad (1)$$

Optimal control theory is an optimization framework that can handle any problem the calculus of variations was designed for. More importantly, optimal control theory is more powerful than the calculus of variations because it can manage some problems the calculus of variations cannot such as corner solutions, and other problems the calculus of variations cannot handle readily, such as constraints on derivatives of the functions being sought. The goal of optimal control theory is to select a stream of values overtime for control variable that will optimize a function subject to the constraints on the state variable.

Dynamic optimization of a function subject to a constraints on the state variable in optimal control involves a Hamiltonian function H similar to the Lagrangian function concave programming. The survey research design is a very valuable tool for assessing opinions and trends. Even on a small scale, such as local government or small businesses, judging opinion with carefully designed surveys can dramatically change strategies. The survey research design is often used because of the low cost and easily accessible information. Accurate research can generate vast amounts of revenue; bad or inaccurate research can cost millions, or even bring down governments.

Model Specification

Mathematically, the production function can be expressed as:

$$Q = f(L, OW, F, R, N) \tag{2}$$

Where:

Q = Transport demand

L = Number of persons driving the tricycle

OW = Type of ownership

F = Daily consumption of Fuel of the tricycle in liters

R = Number of routes plied by the tricycle

N =Number of operators within the cell of operation

The a priori expectations of the model are as follows:

$$\frac{\partial Q}{\partial L} > 0;\ \frac{\partial^2 Q}{\partial L^2} < 0;\ \frac{\partial Q}{\partial OW} > 0;\ \frac{\partial Q}{\partial F} > 0;\ \frac{\partial Q}{\partial R} > 0;\ \frac{\partial Q}{\partial N} > 0;\ \frac{\partial^2 Q}{\partial L^2} < 0$$

Mathematically, the model can be written as follows:

$$MSC(Q) = \partial TC(Q, K, Tax, ...) / \partial Q = \partial C(Q, K, Tax, ...) / \partial / Q \tag{3}$$

$$C(Q, K, Tax, ...) = \int_0^Q \mathrm{MSC}(q, K, \mathrm{Tax}, ...)\,dq. \tag{4}$$

$$Q = D(p) \tag{5}$$

Eq. (5) can alternatively be expressed as an inverse demand curve:

$$p = D^{'}(Q) \tag{6}$$

$$TR = pQ = p(D^{'}(Q)) \tag{7}$$

Technically, the problem can be expressed as:

$$Max \quad Q = f(L, OW, F, R, N) \tag{8}$$

Subject to:

$$M = M[(\omega, C(Q, K, Tax, ...) + F(K)] \tag{9}$$

Where:

M is the monetary value of capital base (assets and working capital) of *CTB*,

ω is the vector of factor inputs, (…) stands for other relevant variable such as R, P and N where P =price.

Forming the Hamiltonian yields:

$$H = f(Q) - \lambda[M - M(Q, C(Q, K, Tax,...) - F(K)] \quad (10)$$

Differentiating eq. (9) with respect to λ, L and Tax yield:

$$\frac{\partial H}{\partial \lambda} = \frac{M'_{\lambda} - M'_{\lambda}[(Q, C(Q, K, Tax,...)]}{\partial \lambda} \quad (11a)$$

$$\frac{\partial H}{\partial L} = \frac{f'_L(Q) - \lambda M'_L - M'_L[(Q, C(Q, K, Tax,...)]}{\partial L} \quad (11b)$$

$$\frac{\partial H}{\partial Tax} = \frac{f'_{TAX}(Q) - \lambda M'_{TAX} - M'_{TAX}[(Q, C(Q, K, Tax,...)]}{\partial Tax} \quad (11c)$$

Setting (10a), (10b) and (10c) to zero and solving simultaneously will produce the optimal values of labour and tax payments of the average firm.

To calculate the total number of persons employed by *CTB* in Nasarawa metropolis, we transform equation (1) by making *L* the subject:

$$L = \frac{Q_i}{f'(1, OW, F, R, N)} \quad (1a)$$

and taking the expectation yields the potential number of persons employed by the sample operators in the business:

$$E(L_i)^S = E\left[\frac{Q_i}{f'(1, OW, F, R, N)}\right] = \int_{i=0}^{\hat{Q}} \left[\hat{\alpha} * \bar{L}\right] * f'(L)dL \quad (12)$$

To calculate the contribution of *CTB* operators in the sample area to government tax income, we substitute eq. (1) into eq. (8), and make *Tax* the subject to obtain, and taking its expectation to get:

$$Tax = \left[\frac{M}{M'[\omega, C([f(L, OW, K, R, N)], K,...)]} + \frac{F(K)}{M'[\omega, C([f(L, OW, K, R, N)], K,...)]}\right] \quad (13)$$

We differentiate eq. (13) with respect to output to get the first derivative of the tax function:

$$\frac{\partial Tax}{\partial Q} = \frac{\partial Tax}{\partial M} \cdot \frac{\partial M}{\partial Q} = f_{Tax.Q}$$

Taking the expectation of eq. (12) yields:

$$E(TAX_i)^S = E\left[f_{Tax.Q}\right] = \int_0^{\hat{Q}} \left[\left(\hat{\beta}_{Tax}.\bar{T}ax\right) f(T)dQ\right] \quad (14)$$

Where:

$f_{Tax.M} = f(T)dQ$ = first derivative of the tax function with respect to output

$\hat{Q}$ =optimal value of output

$\bar{T}ax$ =mean of tax

$\hat{\beta}_{Tax}$ = coefficient of tax

$$Max \quad \pi = \text{TR} - \text{TC} = p(D'(Q)) - [C(Q, UF, VRC, Tax) + F(K)] \quad (15)$$

$$\frac{\partial \pi}{\partial Q} = \frac{\partial (p(D'(Q))}{\partial Q} - \frac{\partial [C(Q, UF, VRC, Tax) + F(C)]}{\partial Q} \quad (16)$$

Or simply *MR* = *MC*.

Data Analysis and Results

Table 2: Descriptive Statistics

Statistic	Last union due payment	Amount paid to initial VIO registration	Annual renewal registration payment
Mean	1,300.7318	59,09.38	3,277.81
Median	50.00	5,000.00	2,500.00
Mode	50.00	.00	.00
Variance	27,450,919.73	26,293,197.68	19,550,546.69
Minimum	.00	.00	.00
Maximum	50,000.00	21,000.00	60,000.
Sum	392,821.00	1,784,634.00	989,897.00

Source: Computed from author's survey (2017)

The CTB is an all-comers' business characterized by a large number of operators and virtually no restrictions to entry and exit except the condition that the vehicle be registered with relevant authorities and an affiliate of the local commercial motorcycle's associations. In Karu local government alone, the survey shows there are no less than 1,053 registered operators as at 2017. The average total charges for union registration and others ranged between ₦10,500 and ₦8,200 annually see (Table 2).

Table 3: Descriptive Statistics - Types of ownership of commercial tricycle transport

Ownership	Frequency	Valid Percent	Cumulative Percent
Hire purchase	145	33.95	33.95
Owner-operator	142	33.25	67.21
Driver-operator	112	26.23	93.44
Not specified	28	6.56	100
TOTAL	427	100	

Source: Computed from author's survey (2017)

In terms of ownership, there are basically three ownership categories, namely, hire-purchase, owner-operator and driver-operator. While the second is the arrangement where the person driving the vehicle is the owner, the third is simply an arrangement with the driver being an employee of the owner of the vehicle. The first type is a special arrangement where the driver or 'would-be-owner' keeps the vehicle in custody until the total cost of the vehicle is fully paid the entity that footed the bill for its purchase plus a 'compensate'. The survey revealed that out of 349 valid responses received, 34 per cent and 33per cent claimed to belong to the second and third categories. Only 26 per cent of the respondents interviewed claimed to fall under the third category (Table 3).

Table 4: Estimated Regression Results - Output (*Q*)

	Linear			Log-linear			Generalized least squares		
Variable	*Unstand'd*	*Stand'd*	*Sig.*	*Unstand'd*	*Stand'd*	*Sig.*	*Unstand'd*	*Stand'd*	*Sig.*
Number of drivers (*L*)	-563.04	-0.243	0.809	-0.549	-0.024	0.110	-	-	
No. of vehicles (*T*)	912.77	3.376	0.001	0.136	0.023	0.210	-0.140	-0.022	0.049
No. of times of servicing (*S*)	888.24	0.658	0.511	0.323	0.045	0.012	0.393	0.038	0.038
No. of routes (*R*)	344.44	0.745	0.457	0.757	0.129	0.000	1.005	0.184	0.012
Quantity of fuel (*F*)	0.36	0.711	0.478	0.881	0.818	0.000	0.793	0.794	0.000
R^2	0.096			0.947			0.975		
D-W.	1.525			1.512			1.750		

Source: Computation from Author's survey (2017) using SPSS 17
Note: The variables in the *GLS* equation were weighted by *L*
Unstand'd - unstandardized coefficient
Stand'd - standardized coefficient

Table 5: Estimated regression results - Production constraint (*M*)

	Linear			Log-linear			Generalized least squares		
Variable	*Unstand'd*	*Stand'd*	*Sig.*	*Unstand'd*	*Stand'd*	*Sig.*	*Unstand'd*	*Stand'd*	*Sig.*
Number of drivers (*L*)	-23,323.7	-0.007	0.853	-0.417	-0.011	0.257	-	-	-
No. of vehicles (*T*)	473,597.9	0.787	0.000	0.124	0.072	0.000	0795	0.076	0.000
No. of times of servicing (*S*)	143,513.7	0.072	0.049	0.153	0.017	0.157	-0.715	-0.036	0.028
No. of routes (*R*)	35,765.6	0.043	0.153	0.212	0.080	0.000	0.685	0.067	0.025
Quantity of fuel (*F*)	184.5	0.179	0.000	0.065	0.377	0.000	1.405	0.764	0.000
Annual Taxes (*Tax*)	0.522	0.006	0.779	0.046	0.492	0.000	0.206	0.146	0.023
R^2	0.878			0.983			0.997		
D-W.	1.802			1.815			1.351		

Source: Computation from Author's survey (2017) using SPSS 17
Note: The variables in the *GLS* equation were weighted by *L*
Unstand'd - unstandardized coefficient
Stand'd - standardized coefficient

Table 6: Estimated regression results - Total costs (*TC*)

	Linear			**Log-linear**			**Generalized least squares (GLS)**		
Variable	*Unstand'd*	*Stand'd*	*Sig.*	*Unstand'd*	*Stand'd*	*Sig.*	*Unstand'd*	*Stand'd*	*Sig.*
Constant	689,470.79	-	0.000	7.643	-	0.207	15.534	-	0.000
Passengers per km (*Q*)	25.16	1.029	0.053	2.759	3.146	0.203	-	-	-
Q^2	6.000	-5.431	0.060	-0.363	-7.008	0.151	-0.050	-1.020	0.019
Q^3	8.777E-10	4.583	0.058	0.015	3.991	0.106	0.004	1.127	0.010
R^2	0.032			0.024			0.031		
D-W.	1.760			1.580			1.612		

Source: Computation from Author's survey (2017) using SPSS 17
Note: The variables in the *GLS* equation were weighted by *Q*
Unstand'd - unstandardized coefficient
Stand'd - standardized coefficient

Table 7: Optimal values and profitability of commercial tricycle business in Nasarawa State

OPTIMIZED VALUES		**PROFITABILITY**	
Variable	*Values*	*Variable*	*Value (in Naira)*
Number of workers/employees ($\hat{L}$)	1.33362	Fixed costs (*TFC*)	7,887.894
No. of vehicles ($\hat{T}$)	8.89939	Average price (*p*)	179.27
No. of times of servicing ($\hat{S}$)	0.2434	Total revenue (*TR*)	1,414,074.59
No. of routes ($\hat{R}$)	1.456	Total costs (*TC*)	698,743.59
Quantity of fuel ($\hat{F}$)	-0.8684	Optimal profit ($\hat{\pi}$)	715,330.999
Annual taxes ($\hat{T}ax$)	6.49007		
Output ($\hat{Q}$)	10.843		

Source: Computation from Author's survey (2017) using SPSS 17

The R-squared statistic for the selected Output model indicates the overall fit was quite good. About 95 per cent of changes in output were explained by the observed changes in the explanatory variables. Equally observable is the evidence that there were just little traces of cross correlation considering the value of the Durbin-Watson statistic of 1.5 which was close to the expected standard value of no-correlation of 2.0. As for the signs, except for the variable representing labour (drivers or *L*) all the coefficients had the expected positive signs. All the coefficients in the output model were statistically significant at 5 per cent level except for variables representing drivers and vehicles. Judging by the relative size of the coefficient as indicated by the standardized column, fuel and routes seemed to influence output of the *CTB* in Nasarawa State more than any variable. The least influential appeared to be number of drivers (Table 4).

For the Production Constraint model, a similar pattern was observed. The value of the R-squared (0.983) indicated a good fit, while the value of the *D-W* statistic (1.815) indicated little traces of cross correlation. Like the output model, all the coefficients had the right signs (positive) except the variable proxying for labour. Equally all the coefficients were statistically significant at 5 per cent level, except those representing labour (drivers or *L*) and vehicle servicing (*S*). In terms of explanatory power, taxes and fuel appeared to have exerted more influence on the budget of the business than other variables. The variable representing labour (drivers or *L*) seemed to be the least influential (Table 5).

For the Total Costs function, the situation was somewhat different. The value of the R-squared statistic (0.032) indicated a poor fit. This would have been enough reason to reject this model but for the fact it was adjudged the 'best' of the three specifications suggested above and one that theory often recommends for analysis in empirical studies of this nature (Nicholson, 2002; Koutsoyiannis, 2003; Ahuja, 2015). The value of the D.-W statistic was indicative of little evidence of cross correlation. The coefficients turned out to be 'well-buehaved' in the sense that they were not only all positive signed but statistically significant at least at 5 per cent level (Table 6).

Table 7 shows the optimal values of the above variables and the outcome of the resultant computation of profit. It also shows that the total fixed cost for an operator was ₦7,887.894, while the optimal total revenue was about ₦1.4 billion per annum. Subtracting the annual total cost of ₦698, 743.59 from total revenue yielded an operating profit of ₦715,330.99. The fact that this value is significantly different from zero, the decision is to reject the null hypothesis that CTB is not commercial viable and conclude that other the contrary it is a highly profitable business venture.

Conclusion and Recommendations

The analysis of the survey data revealed three major findings. One, CTB is a highly lucrative venture. As a matter of fact, the study showed that total revenue of about ₦1.4 billion was reported for 2017. When ₦698, 743.5 was deducted from the total revenue an operating profit of ₦715, 330.99 reportedly generated, representing a more than 100 per cent return on investment and indicating that the business is indeed a lucrative one.

Two, the sample generating about 400 and the entire population of operators (4,116) to create 29050728 jobs in the city, all things being equal, the CTB has the potential to generate jobs significantly and reduce the level of unemployment in Nasarawa State and Nigeria as a whole.

Three, the individual CTB operator in Nasarawa State claimed to have paid on the average ₦22, 935.86 in 2017 alone and about ₦6,903,695.00 by the 349 operators in the same year. Further analysis however shows that an individual operator has the potential of pay ₦532, 964.51 taxes to authorities in the state, and the population of registered operators of 4,116 in Nasarawa State to pay about ₦219 million taxes to authorities.

High incidence of unemployment and dwindling state revenue are two of the macro-economic problems facing policy makers both at the federal and state levels of government in contemporary Nigeria. This explains why the policy focus of most state governments, Nasarawa State included has been to diversify state revenue (income generation) base and promote economic activities with the high potential to create jobs for the teeming unemployed youth. The findings of this study have demonstrated that commercial tricycle business (CTB) is one of such activities.

However, for the state government to take full advantage of its full potentials, the followings have to be considered:

i. The regulation of the trade to ensure that all operators conduct their activities under the ambit of officially recognized trade unions and captured by official statistics. A step in the right direction is give all tricycle unions official recognition and necessary empowerment;
ii. Widen the tax net to capture the activities of recalcitrant operators on moonlighting cruises; and
iii. The State Government should not find it difficult to replicate the Nasarawa State commercial tricycle business system in other urban and semi-urban centres of the state.
iv. As a result of some state government directives on placement of ban on the use of the motorcycle in the state capital, government should float or substitute it with tricycle in fulfillment of government pledge to bridge the gap caused by the ban on motorcycle.

References

Cevero. R. (2000). Informal Transport in Developing World. United Nations Centre for Human Settlements (habitat), Nairobi, Kenya.

Chepchieng etal (2012) Effects of Road Improvement on Safety: A Case Study of Narobi-Thika Superhigh. America Journal Civil Engineering.

Fasakin, J.O. (2002): Daily cost considerations in the operations of commercial motorcycles in Nigeria: a locational analysis for Akure township. *Transportation Research Part A: Policy and Practice* 36(3): 189-202.

Garba A. (2015) Commercial Tricycle and Employment Generation in Kaduna State, An Academic Thesis, Kasu

Hezron N.N .(2016) international journal of African and Asian studies, international peer reviewed journal, ISSN 20409-693.

kenedy C., Fonner V. O., Rally K, Sweat M. (2008) A system review of income generation interventions including micro credit and vocational skills training for HIV prevention,(2008) 12 (3) 396-403

Koutsoyiannis, A. (2003). *Modern microeconomics* 2nd ed. Hampshire, London: Macmillan Press.

National Bureau of Statistics (2015) A National Survey on Population in Nigeria.

National Population Commission (2006) A National Survey on Population in Nigeria.

Oladapo, O.O. (2012). The development and impact of motorcycles as means of commercial transportation in Nigeria. *Journal of Research on Humanities and Social Sciences* 2(6): 231-239.

Onifade, C.A., R.R. Aduradola and S.O. Amao (2012). The effect of socio-economic survival of commercial motorcycle/tricycle riders on African cultural values. *Global Journal of Human Social Science Arts & Humanities* 12(14): 45-52.

Richard W. (2014) Recent motorcycle accidents in Texas. https://www.weaverlawyers.com/blog2014/04/recent-motorcycle-accidents-in-texas.shtml. Assesed on 15/05/2016.

Umaru, I.G. (2003). A comparative approach to monetization of salaries and fringe benefits of public servants in Nigeria. *Jos Journal of Humanities* 1(3): 273-291.

Umaru, I.G. (2013). Commercial motorcycle activity, value creation and the environment in the developing world: The case of Nasarawa State, Nigeria. *International Journal of Social Science Research* 1(1): 122-139.

Yakubu, A. T. (2012). Determinants of earnings among commercial motorcycle operators in Kwara State, Nigeria. *International Journal of Economics and Management Sciences* 2(2): 11-17.

Yamane, T. (1973) Statistics: An Introductory Analysis. 3rd Edition, Harper and Row, New York.

Yunusa, U., U.B. Lawal, A. Idris and S.N. Garba (2014). Occupational health hazards among commercial motorcyclists in Ahmadu Bello University, Zaria. *IOSR Journal of Nursing and Health Science* 3(1): 46-52.