Road Traffic Accident and Economic Growth:
"The Nigeria Experience"

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Abstract

Road traffic accidents are responsible for a fairly high proportion of deaths and injury resulting in the reduction of productive manpower. The study examined the effect of road traffic accidents on economic growth in Nigeria, where the ordinary least square method was used to analyse data for the period 1990-2013. The trend result showed a negative co-movement between road traffic accidents and the number of people who die from road traffic accidents in Nigeria. Further result revealed that road traffic accidents are responsible for the decline in economic growth in Nigeria. It was recommended that government should increase her budget allocation on transport infrastructure in Nigeria this will help to reduce road traffic accidents in Nigeria.

Keyword: road traffic accidents, economic growth, and Nigeria.

1. INTRODUCTION

Many researchers have come out with the causes, effects and recommendations to vehicular accidents, which include drunk driving, machine failure and over speeding just to mention a few. Yet every year there seems to be an un-ending situation with regard to road accidents in Nigeria (Adiele, 2011). Some important global facts pertaining to road traffic accidents are as follows: at least 1.3 million people are killed every year through road crashes; some 20-50 million suffer various forms of disability; 90% of these road casualties are in low and middle income countries; at current rates, Also, 1,800 lives are lost in these crash victims are pedestrians; 60% of all crash victims are people within the productive age group (FRSC, 2010). The above statistics are worrying and also implies the indirect destruction of the nation's human assets, as well as economic underdevelopment and retrogression rather than economic development and progression.

It is universally recognized that transportation is a crucial factor for sustained economic growth and modernization of a nation. Transport is the engine of growth and development in any economy. Thus, people of various distinctions and categories; political leaders, business executives, the blue and white collar works, students, peasant farmers, retired workers homemakers etc all have mobility requirements on a daily basis that transport must meet (Adiele, 2011). The adequacy of this vital infrastructure is an important determinant of the success of a nation's effort in diversifying its production base, expanding trade and linking together resources and markets into an integrated economy.

Vehicular accidents in Nigeria have become one of the worrying and growing concerns to most Nigerians in recent times. This is as a result of the tremendous negative effects of road traffic accidents on human lives, properties and the environment (Agbonkhese, *et al.,* 2013). The levels of road traffic accidents and casualties and therefore have both global and national social and

economic burden, especially in Nigeria. There is therefore the need for interventions and strategies to deal with the menace especially by reducing it by 50% by the end of 2020 as recommended in the United Nations (UN) Global Plan for the Decade of Action for Road Safety 2011- 2020. The economic cost of road crashes and injuries is also immense. Road Traffic Injuries is estimated to be 1% of Gross National Product (GNP) in low-income countries, 1.5% in middle-income countries and 2% in high- income countries. The global cost is estimated to be US $518 billion per year. Low-income and middle-income countries account for US $65 billion, more than they receive in development assistance (Safety-Net, 2006).

The objective of this study is to examine the effects of road traffic accidents on economic growth in Nigeria. After the introduction, section two presents the literature reviewed, the methodology used is found in section three, the results of the study is discussed in section four, finally section five concludes the study.

2.0   THEORETICAL LITERATURE

The Relationship between Transport and Economic growth

There are good reasons why the Government should seek to understand the nature of the relationship between transport provision and economic growth as fully and as clearly as possible. Government is committed to promoting sustainable development, embracing environmental, economic and social objectives. It is important that the economic justification for transport schemes is as robust as possible alongside consideration of their environmental and social impacts to ensure effective decision-making.

The channel of road infrastructural transmission to economic growth is manifested only through the economic growth indicators (GDP, industrial production, employment etc). The nature of transmission is determined by the role of road infrastructure capital in the production function i.e. whether it is a direct or intermediate input. As a direct input, it can either be guided by market forces; hence it is provided by the government as a public good. Where road infrastructure capital is an intermediate input in the production process, the indirect transmission channel through which road infrastructure affects growth is determined by three factors. These are productivity of physical capital which is in turn determined by reduction in adjustment costs and maintenance of existing infrastructure also derived from the facilitation of reallocation of capital. The second variable is higher labour productivity obtained from improved human capacity development. The transmission impact through human development can be realized through improving health better nutrition, education, better Roads, etc. The third factor is the externalities which transmit key technological innovations to other sectors leading to involve lower costs, and spill-over effects on other firms which are the positive externalities while the negative externalities are environmental pollution, congestion, road traffic accidents on the economy as a whole.

Similarly, in promoting economic growth, Government is often concerned about the distribution of such growth. Transport improvements, can form part of public policy packages deliberately aimed at stimulating regeneration in a particular area sometimes even at the expense of other areas. Government needs to be clear that such action is effective in meeting its goals. Government also directly and indirectly finances significant investment in transport.

Good roads are meant to facilitate improvement in the economic and business activities and translate these to making living more meaningful to the citizens, because excellent roads will cause considerable reduction in the cost of production and save time of movement of goods and persons from place to place. A serious problems that have bedeviled less developed countries especially Nigeria is that despite the colossus funds already sunk into construction, expansion, rehabilitation in the last three decades stem from faulty designs, inadequate drainage system, poor maintenance culture which most of the time leads to road traffic accidents.

The concept of transport intensity has some problems of definition and measurement which make it inappropriate as a target in its own right, but it has usefully focused concern about the economic and environmental costs of this road traffic growth by raising the question of whether it is possible and desirable to separate the two trends, in order to obtain the benefits of economic growth while reducing the costs imposed by traffic. Recent discussion has observed that they have not been growing at the same pace, but traffic has been growing faster than the economy as a whole. The result is that the 'transport intensity' of the economy has been increasing, i.e, each unit of output is associated with a greater amount of movement of people or goods. Roads provide virtually connectivity of countless origin and destination that are used for social, political and economic activities globally (Allen, 2003).

Global Road Safety Report

The World Health Organization (WHO) has identified through studies in disability–adjusted life years that road accidents would be the third leading cause of death by 2020 (see Table 1).

Table 1 Change in Rank for the 10 Leading Causes of the Global Burden of Disease

1990	2020
1. Lower Respiratory infections	1. Ischaemic heart disease
2. Diarrhoeal diseases	2. Unipolar major depression
3. Conditions during Perinatal period	**3. Road traffic injuries**
4. Unipolar major depression	4. Cerebrovascular disease
5. Ischaemic heart disease	5. Chronic obstructive pulmonary disease
6. Cerebrovascular disease	6. Lower respiratory infections
7. Tuberculosis	7. Tuberculosis
8. Measles	8. War
9. Road traffic injuries	9. Diarrheal diseases
10.Congenital abnormalities	10. HIV

Source: WHO (2004) World Report on Road Traffic Injury Prevention, Geneva.

In a research of the WHO's Ad-hoc Committee on Health Research Relating to Future Intervention Options, the most economically active and productive age group, specifically those aged between 15 and 44 years, figures heavily in road traffic injuries. This will inevitably affect the economy by the slack that they create in the workforce. In addition, the physically disabled victims that are within the lowest-income group's earning capacity are heavily affected since they "most likely rely on physical activity" (WHO 1996). Moreover, road accident victims represent between 30 to 86% of all hospital trauma admissions.

According to a World Health Organization (WHO) & World Bank (1999) report on "The Global Burden of Disease", deaths from non-communicable diseases are expected to climb from 28.1 million a year in 1990 to 49.7 million by 2020 (an increase in absolute numbers of 77%). Road traffic crashes will contribute significantly to this rise. According to the report, road traffic injuries are expected to move from ninth place to take third place in the rank order of disease burden by the year 2020. In assessing the magnitude of the problem of road traffic crashes, according to WHO, 1.2 million people die through road traffic crashes annually. On the average, in the industrialized countries, and also in many developing countries, one out of every ten hospital beds is occupied by a road traffic crash accident victim.

Empirical Literature

It was argued that the links between transport systems in developing countries are different from those of industrialized nations, because of transport infrastructure shortage in developing countries (Haynes and Button, 2001, pp.264). Transportation infrastructure may affect economic productivity by changing aggregate demand through the creation and increased demand for intermediate inputs from other sectors with related multiplier effects in the economy. Such infrastructure can also indirectly enhance the productivity of existing resources.

A World Bank study in 2004 has shown that the economic development of regions and nations is associated with an increase in the number of injuries and deaths from road traffic crashes (Kopits, et al., 2005). However, the achievement of higher GDP is threatened by inadequate and diminishing connections to national and global markets by air, sea, rail and road. As population

grows geometrically, the transportation infrastructure has not been developed to the extent that it can effectively address the problems of accessibility and mobility needs for the movement of people and goods.

Canning *et al* (2004 cited Zhu, 2009) used physical measures like kilometers of paved road to investigate "the long run consequences of infrastructure provision on per capital income in a panel of countries" covering the period between 1950 and 1992. His estimate results suggested that for paved road the sign of the impact of an increase in provision on GDP per capital varies across countries. Some studies also show that public capital can lead to economic growth by raising total factor productivity of all inputs. Aschauer, (1989 cited Rosik 2006) find evidence that a one percent increase in public capital stock lead to a 0.39 percent increase of total factor productivity. Yamaguchi, (2008) conducted a regression analysis on panel data of five nations between 1992 and 2004 to identified road investment impact on macro-economic multi factor productivity growth (MFP) and reported that physical improvement of the road capital stock has positive effect on income. He obtained a coefficient of 0.1782.

Agyemang *et al.,* (2013) attempted to show statistical evidence of relationship between road traffic accidents and population growth in Ghana, where time series data on yearly road traffic accidents and population values for Ghana covering the period 1990 to 2012 was used. The results from the analysis shows three key findings: a systematic visible pattern of growth in both road traffic accidents and population over the period; evidence of statistical relationship between road traffic accidents and population growth in Ghana as given by the correlation coefficient (r) of 0.854, with a corresponding coefficient of determination (r-square) of 72.9% indicating that for the period under study based on the available data, population is able to account for 72.9% of the changes in accidents in Ghana; and finally a regression model developed for the purposes of estimating and forecasting on the basis of the analysis, specifically based on test of hypothesis and model validation.

Esmael *et al.,* (2013) observed that about 1.3 million people lose their life worldwide, and this is set to double by 2030 if status quo continues. It is the developing countries which account for overwhelming part of the current fatalities, and forecasted accident fatalities. There are local as well global initiatives to address the safety issues, in developing countries in particular. However, there are emerging issues in developing countries that may result in safety trend different from that of industrialized countries. This has huge policy implication as it may make innovative measures inevitable. Therefore, to address the safety issues effectively it is necessary to grasp its nature and trend in developing countries. They analyze the dynamics in traffic accident trend in Asian countries, re-evaluates the current traffic safety approaches for strategic policy recommendations for emerging trends in the region.

Agbonkhese *et al.,* (2013) examines road traffic accident problems in Nigeria. The causes of accidents and their general preventive measures are discussed. They observed that road accidents have become a normal and re-occurring phenomenon in Nigeria which constitutes a menace in modern times. Although both the developed and developing nations of the world have suffered from varying degrees of road accidents, the developing countries clearly dominates with Nigeria having the second highest rate of road accidents among 193 ranked countries of the world. Deaths from reckless driving are the third leading cause of death in Nigeria. In 2012, at least 473 persons died from a total of 1,115 vehicular accidents nationwide. There could be more

unreported cases, and as often happens, some of the injured die without making the statistics. There is need to view road traffic accident as a very serious issue requiring urgent attention aimed at preventing untimely deaths, reducing the health, social and economic impacts it portends to the average Nigerian.

Bobai and Abarshi (2014) analyzed the trend of road traffic accidents in Nigeria for a period of six years; from 2007 to 2012. The tool of analysis used was descriptive statistic, tables, averages, graphs and percentages. However, the study observed that the casualty trend in Nigeria has been declining in the country. And that the trend and nature of road traffic crashes in Nigeria was on the increase with serious and fatal crashes, which is about 79.7 percent fatality rate in Nigeria. Only 21.3 percent of the crashes were minor. It was also discovered that 159,086 persons were killed or injured in 47,036 accidents. This means that, on the average three persons were either killed or injured in every accident. In other words, every accident involved an injury or a death in Nigeria. This study also revealed that most accident prone states in Nigeria are Kaduna, Ogun, Kano, F.C.T. Abuja, Kogi, Edo, Oyo, Kastina, Niger, Ondo and Nasarawa. The study concludes that measures to reduce this trend should involve Governments effort and that of the citizens, as causes of these deaths in most cases are avoidable.

Good road infrastructure is vital to economic growth and development. It promotes factor mobility and reduces trade costs. Furthermore, it promotes market integration, thereby providing avenue for the reduction of price volatility and reallocation of resources in line with comparative advantage. Transport infrastructure growth along with economic development which is a complex process, particularly in developing countries like Nigeria. Thus, this study intends to fill the gap which exists between road traffic accident and economic growth in Nigeria.

3. METHODOLOGY

Data source
The data set for this paper consists of annual time series spanning 1990 through 2013. They were obtained from Central Bank Statistical Bulletin and various issues of Annual Abstract of statistics, Federal Road Safety Corps and the Nigerian Police Force (MTD) data on road traffic accident in Nigeria. GDP represents Gross Domestic Product, GERT represents Government Expenditure on Road Transport, LBF represents Labour force and RTA represents Road Traffic Accidents.

Model specification
This study adopted the Cobb Douglas production function which is a growth model that has been often used to show the linkages between economic growth and other macroeconomic variables. However, the model was adapted, to suit the context of this study given the fact that it deals with the facts that growth relate with the variables under consideration.

The Extended Cobb-Douglas production function used for the study is specified as
$$Y_t = G_t L_t^{\alpha 1} R_t^{\alpha 2} G_t \ldots \ldots \qquad \ldots \qquad \ldots \qquad (1)$$

where:

$Y_{(t)}$ = Output of growth in the economy
$G_{(t)}$ = Government Expenditure on Road Transport
$L_{(t)}$ = Labour Force;
$R_{(t)}$ = Road Crashes
$\alpha 1, \alpha 2, =$ coefficient respect to road crashes and government expenditure on road transport.

Taking the natural logarithm of both sides of the equation produces a linear equation in levels of the form
$$Log Y_{(t)} = Log G_{(t)} + \beta_1 Log L_{(t)} + \beta_2 log R_{(t)} \ldots (2)$$
In this study, G is the total of amount of money spent by government on road transport each year. Hence, the empirical model to be estimated in this study is given as:

$$Log\text{GDP} = \beta_0 + \beta_1 Log\text{GERT} + \beta_2 Log\text{LBF} + \beta_3 Log\text{RTA} + \mu_t \quad (3)$$

Where:

GDP = Gross Domestic Product
GERT = Government Expenditure on Road Transport
LBF = Labour Force
RTA = Road Traffic Accidents
μ_t = the Stochastic Error Term
$\beta_0, \beta_1, \beta_2,$ and β_3 are coefficients to be estimated.

Unit Root Tests
It is always expected that time series data should be stationary to avoid spurious regression. Thus, the unit root test was conducted to ascertain the order of intergration of the variables. All the variables are tested at levels for stationarity using the Augmented Dickey-Fuller (ADF) test. Consider the equation below:

Where:
$$\Delta\lambda_t = \alpha_1 + \alpha_2 + \varphi\lambda_{t-1} + \beta\sum_{i=1}^{m} \Delta\lambda Xt - 1 + \varepsilon_t \dots \dots \qquad 4$$
Where:

λ_t is our variables of interest(GDP, GERT, LBF and RTA) Δ is the difference operator, t is the time trend and ε is the white noise residual of zero mean and constant mean and constant variance; $(\alpha_1, \alpha_2, \beta_1, \dots \beta_m)$ is a set of parameters to be estimated. The null and the alternative hypotheses in the unit root tests are:

H_0: $\varphi\neq0$ (λ is non stationary)

H_1: $\varphi=0$ (λ is stationary)

3. EMPIRICAL ANALYSES AND RESULTS

Trends of Road Traffic Accidents in Nigeria

Casualty is defined as those accidents in which people are killed or injured. In other words, every other accident involved an injury or a death. Thus, in 2011, Nigeria is ranked 191 out of 192 countries in the world with unsafe roads with 162 death rates per 100,000 populations from road traffic accidents (Gungul 2012). According to Bolade and Ogunsanya 1990, Nigeria led 37 other nations with 240 deaths in 10,000 vehicle crashes followed by Ethiopia with 200 and Malawi with 180 deaths per10, 000. However, in 2000 there were 12,705 road accidents which resulted to 6,521 deaths, while in 2001 the magnitude of road traffic accidents increased to 13,801 with as high as 8,109 deaths. It was noted that the lives claimed by road accidents were very high in 2008 however; this cannot be compared to the lives lost in 2001.

From figure 1 shows the trend of Road Crashes in Nigeria, however a total of 145,910 lives were lost between 1990 and 2013. The trend indicated that 1992 recorded the highest number of death, where 8701 people died through road accidents. While from 2009 to 2013 Nigeria witnessed less mournful period compared to the previous years for as many as 5,693, 4,065, 4,372, 4,260 and 5693 souls were lost in 2009, 2010, 2011, 2012 and 2013 respectively or had their lives terminated prematurely in various road accidents in the country. Even though Federal Road Safety Corp (FRSC) has improved safety records, in Nigeria, the effect of this cannot be felt because traffic disobedience is growing faster than road safety enforcement. The study revealed that there is a decline in the occurrence of road traffic accident but it was also discovered that more person die yearly due to road traffic accidents. In a total number of 31,895 reported accidents case it was discovered that about 630515 persons are killed or injured. Thus, on an average two or more people whenever accidents occurs from 1990-2013. The implication of these findings is that two or more people are seriously injured or killed whenever an accident occurs in Nigeria.

Acoording to FRSC and Balogun (2006) one person is killed in less than two hours, as at 2006 one road traffic accidents occurs every 58 minutes and 54 deaths occur in every 100,000 population. In 1992 the death rate was 37.9%, while in 2001, 2008 and 2009 the death rate had increase to 58.7%, 58.7% and 52.4% respectively. The study further observed that from the year 2010 to 2013 the number of the reported cases of road crashes in Nigeria was declining; those killed due to road crashes within the period are 4065, 4372, 4260 and 4531. However, looking at the death rate this signifies a rise in the number of people killed due to road traffic accidents. The study revealed that 76.2% in 2010, 91.7%, 67.7% and 74.2% are the death rate respectively for

2011 to 2013. More people are killed due road traffic accidents in Nigeria lately. This implies that road traffic accident affects productivity negatively in Nigeria.
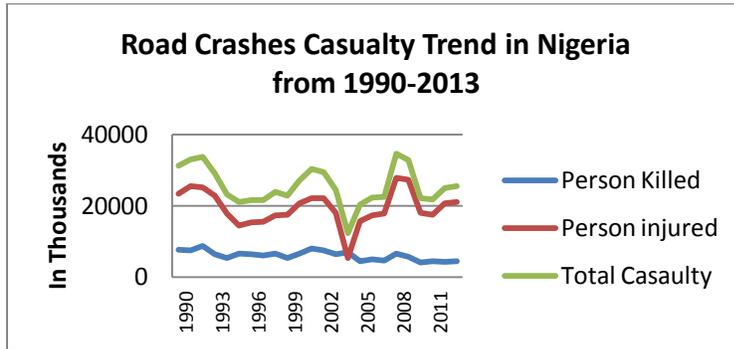

Figure 1: Trend of Road Traffic Accidents in Nigeria from 1990-2013

Sources: Authors estimation using excel

Unit Root Results

The unit root test on table 2 shows that RTA is stationary at levels, GDP and GERT are stationary at first difference, while LBF was stationary at second difference. Hence the variables are stationary at different orders. Since the model is a linear equation, the study proceeded with a multiple regression analysis.

Table 2: Augmented Dickey Fuller (ADF) Unit Root Test Result[1] Trend & Intercept, None

Variable	Lag	ADF Test Statistic	5% Critical Value	Order of Integration
GDP	2	-5.018251	-3.632896	I(1)
GERT	2	-3.906429	-3.632896	I(1)
LBF	2	-4.670931	-1.958088	I(2)
RTA	2	-3.631362	-3.622023	I(0)

Source: Author estimation using Eviews 8

Regression Results

Table 3 shows the results of the estimated Multiple Regression model. The different diagnostic tests such as: Breusch-Godfrey serial Correlation LM test, Heteroskedasticity: Breusch-Pagan-Godfrey test, Jacque-Bera normality test and Ramsey RESET specification test revealed that the model is robust. The under lying econometric properties are met i.e., it has a correct functional form and the residuals are serially uncorrelated, normally distributed and homoskedastic, hence making the model valid for interpretation. The R-square of 0.74 implies about 74 percent of the total variation on economic growth is explained by road traffic accidents included in the model. Thus, the model shows a high explanatory power and is therefore considered to be a good fit.

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[1] • Optimal lag for conducting the ADF tests was selected based on the Schwartz and Akaike Information Criteria and also the auto-correlation function of the series. The optimal lag length in all cases was 2. Mackinnon(1991) critical value for rejection of hypothesis of unit root applied.

The results on Table 3 show that intercept ($\beta_{0=}$ 1.482) suggests that economic growth would stabilize positively irrespective of the changes in value of GERT, LBF and RTA. A one percent increase on government expenditure on road transport will increase economic growth by about 0.61 percent. This suggests that government expenditure on road transport (GERT) is very crucial for the economic growth in Nigeria. The relationship between the labour force (LBF) and economic growth is positive. It shows that a one percent increase on Labour force will lead to about 6.76 percent increase in economic growth. This suggests that as the size of the labour force expands it will increase economic activities, hence, pushing the economic growth trend upwards. Road Traffic Accident has an adverse effect on Economic growth in Nigeria. One percent increase on road traffic accident will reduce economic growth by about 0.16 percent. The implication of the findings is that as road traffic accidents continues to increase these may create more problems to the Nigerian economy by diminishing economic growth as well as also reducing the country's productivity.

Table 3: Regression Result
Dependent Variable: D (LOGGDP)

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	1.482944	0.617977	2.399676	0.0274
D(LOGGERT)	0.612742	0.088314	6.938234	0.0000
D(D(LOGLBF))	6.767104	11.08766	0.610327	0.5493
LOGRTA	-0.163501	0.068382	-2.391006	0.0279
1. Model Criteria: R^2 = 0.74; DW =1.8; F-statistic =17.5[0.000]				
2. Diagnostic Tests: Hetero Test = 5.73[0.006]; LM=0.56[0.579]; JB = 0.75[0.686]; Ramsey RESET= 0.94[0.344]				

Source: Author estimation using Eviews 8

5. Conclusion and Recommendation

The study revealed government expenditure on road transport has a positive and statistically significant relationship with economic growth. This implies that increasing road network would increase economic growth. Road traffic accident was found to have a negative and statistically significant relationship with economic growth. The implication of this is that a rise in traffic accidents would decrease economic growth. It is clear from the result that investment in road infrastructure is a very important policy issue in the attainment of economic growth, however, the negative consequences that arrive from road traffic accidents should be addressed to maximize the benefits that accrue, to achieve the overall goal of economic growth.

Therefore, it was recommended that government should increase her budget allocation to transport infrastructure. This increase should be balanced by other efforts, like transportation regulations, strict monitoring of implementation of the allocation, improving the quality of human resources and the involvement of the private sector. This will go a long way to reduce road traffic accidents and this will further lead to positive impact on the economic growth in the Nigerian economy.

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