

Estimating the Direct Economic Impacts of Disruptions Caused by Accidents on Road Freight System in Nigeria

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Abstract:- This study estimates the direct economic impact of disruptions caused by accidents on Road Freight System (RFS) in Nigeria. Road freight movement to various cities has resulted to various disruptions this study investigates. An experimental design was adopted and stratified random sampling method was used to select Lagos - Port-Harcourt highway through the East-West road, Lagos - Aba highway, and Lagos - Abuja highway as sample population. Questionnaires were designed, distributed and obtained. Accident data and cost accounting information were equally extracted from relevant authorities. Human capital method was adopted in the study, while statistical means was used for data analysis. The study concludes that RFS loses ₦6.4 billion annually to disruptions caused by accidents. The study therefore made various recommendations including an optimal investment in multimodal transport system in Nigeria to reduce the burden on highway. The significance of this study is that annual disruption cost represents 4.1% of Nigeria's Gross Domestic Product (GDP) from transport sector.

Keywords:- Direct Economic Impact, Disruptions, Road Freight System, Road Traffic Accident (RTA), Human Capital Method, Gross Domestic Product (GDP)

I. INTRODUCTION

The World Health Organization (WHO) stated that transport is fundamental to supporting economic growth, creating jobs and connecting people to essential services such as healthcare or education (WHO, 2023). Ramiani and Shirazian (2019) posited that tremendous growth of population, particularly in developing countries, has led to increased number of travels, especially those with load and freight specifications. Therefore, expanding the present facilities or developing new networks concerning freight and transportation is absolutely necessary. Ramiani and Shirazian (2019) further posited that among the various transportation systems, road freight has secured a significant place in sub-urban transportation, as it is responsible for transporting loads, decreasing transportation costs, and increasing the safety of highway users.

The relationship between a sound economy and a functional transportation system performance is one of the most vital relationships in transportation policy. As long as

commodities and goods need to move as part of the supply chain, providing reliable and cost-effective transportation capability is embedded in the supportive nature of transportation to economic productivity (Georgia Tech Research Corporation, 2012). However, in many developing countries, the benefits are not being realized. One billion people still live more than 2km away from an all-weather road, where lack of access is inextricably linked to poverty; road crashes claim over 1.35 million lives every year, 93% of them in developing countries (WHO, 2023).

Road freight is the oldest way of transporting cargo in the world (Ramiani & Shirazian, 2019). This days, majority of the cargo is still been transported by means of road freight, which with all its merits, yet has some demerits. One of them is accidents occurring on highways, which in addition to economic losses results in fatality or injury of road users as well. Road Traffic Accidents (RTA) are global health issues, this has deepened attention in researches in this area. Enu (2014) opined that when traffic accidents occur, quality of labour is affected adversely, human capital is lost, market size is reduced and potential economic growth is suffocated. The low- and medium-income countries are deprived of 2- 3 percent of their Gross Domestic Product (GDP) because of road traffic accident while the loss to the global economy is estimated at \$518billion annually (Enu, 2014).

Ramiani and Shirazian (2019) concluded that the costs of accidents are estimated to be about 500 million dollars all over the world. According to Ramiani et'al (2019), "this is equal to between 1 to 2 percent of GDP in the countries with low to average income". Estimates indicate that approximately 400,000 people die every year in road accidents around the world, deaths and injuries caused by road accidents result in significant social and economic costs and it has been estimated that in OECD countries (Ramiani & Shirazian, 2019).

Road transport system is often seen as the lifeblood of modern society. It was revealed further that road freight is the only mode involved in many door-to-door freight chains. The functionality of this system affects the other means of transport on the road. The absence of sustainable and functional multi-modal transport in Nigeria has resulted to the over dependency on Road Freight System (RFS) as a veritable means of conveyance of goods from the depots to various cities. This has generated negative externality as

accidents that have disrupted the economic flow. Despite this obvious disturbance on highways and city centers, RFS continues to show dominance in the contribution of the transportation sub sector to the GDP. It implies that the eradication or mitigation of this hindrance will stimulate more economic growth. It is imperative to know the extent the economy has suffered various erosions from this disruption. The study tends to measure the extent of direct economic impact of accident caused disruptions on road freight system in Nigeria. This research tends to provide empirical solutions to this problem and makes conclusion that will further stimulate economic activities.

A study by Mohammed (2016) concluded indicated that the cost of road traffic crashes in Iran for the year 2009 was approximately 114,455 billion Iranian Rials (about \$US 11.458 billion), which accounted for 1.41% of Iran's Gross National Product (GNP) in that year. Traffic accidents tend to be clustered in low and middle income countries, where about 97% of road accidents occur (Osayomi, 2013). Road traffic injuries pose significant economic losses to individuals, families, nations and the globe. These losses emanate from medical cost and lost productivity for those killed or disabled by their injuries, and also for the dependants who suffer various losses in work and school as a result of taking care of the injured. Road traffic crashes cost most countries 3% of their gross domestic product (WHO, 2022). Despite various measures adopted in recent time to confront the problem, the morbidity and mortality from road accidents in Nigeria is still high with statistic of 20.75 deaths per 100,000 population annually (WHO, 2019).

The economic implications of road traffic accident apart from physical, social and emotional implications are huge. Several diseases related studies of traffic accidents revealed that most victims of accidents are economically active adults between the ages of 30 and 49 years (Bhandari, 2022). The resultant economic effects are the huge loss not only families and their loved ones but the economy of the nation at large. Adekunle (2010) posited that direct cost of traffic accidents can best be understood in terms of the labour lost to the nation's economy with consequential reduction in productivity. Developing countries especially the African region which account for only 2% of the world's vehicle fleet, bear 16% of the global death toll (Yusuff, 2015). Yusuff (2015) further concluded that in Africa, Nigeria has the highest record of road traffic accident. A study of WHO in 2013 showed that more than one in four deaths in Africa region occurs on Nigerian road and the country together with South Africa, Democratic Republic of Congo, Kenya, Ethiopia, Tanzania and Uganda accounted for 64 per cent of all road deaths in Africa (WHO, 2013).

II. METHODOLOGY

The study gave a national picture of the 32,000km of federal road in the country using the 696 kilometers route connecting the commercial city of Lagos through Benin and the East-West road to Port-Harcourt, 705 kilometers Lagos to Aba and 750 kilometers Lagos to Abuja. An experimental design was adopted to estimate the various impacts since it

involved various forms of data gathering. Human capital method was used to determine the values of life assured by insurance companies both third party and comprehensive. The statistical mean was adopted to estimate averages.

The data for this research were collected using both primary and secondary approaches. Primary sources of data collection like the use of person assisted electronic questionnaires were used to collect data for the number of hours spent per disrupted space and the average turns lost due to accidents. Also extracts of cost information from published documents of the Federal Road Safety Corp (FRSC), Zenith Insurance Limited and Promasidor Nigeria Limited and National Bureau of Statistics were obtained.

The data realized from Federal Road Safety Corps (FRSC) were used to determine the Average Annual Daily Traffic of trucks and also to determine frequency of occurrence of Road Traffic Accidents based on classification of fatal, serious, property damage only Accident (PDO). The data obtained from Zenith Insurance Limited was used to determine the indemnity payable for property damage and value of life assured for loss of life. Data from Promasidor Nigeria limited is to determine the value of time loss. This is measured from the cost of transportation paid to logistics operators on various highways. These figures were converted into hourly rate and used to estimate the total travel time loss per highway corridor. The data from Nigeria Bureau of Statistics (NBS) were used to benchmark performance especially on the value of total Gross Domestic Product (GDP) of the Nigeria and transportation sector Gross Domestic Product of the Nigeria. It was the NBS that provided the exchange rate used in converting the total annual disruptions costs to United States dollars.

Nigeria has a total of 32,000 kilometers federal road network. The three sample roads selected for the study has a total road length of 2151 kilometers representing 6.7 %. Nigeria is subdivided into various geo political spaces. In order to embrace the national outlook, a stratified random sampling method was used to select one major highway in different major regions. Stratified random sampling is a method of selecting a sample in which the researcher first divides a population into smaller subgroups, or strata, based on shared and unique characteristics of the units and then randomly choose among each group to form one sample for research. While we have Lagos as the origin representing the Western part of Nigeria, Port-Harcourt, Abuja and Aba are the various destinations representing the Southern, Northern and Eastern parts of Nigeria. Hence, the study was carried on the corridors of these federal roads connecting these cities.

Anh (2005) posits that there are seven methods, namely: gross output method, human capital method, net output method, Life insurance method, court-award method, implicit public sector valuation method, and willingness to pay method. Miller (1991) states that two general approaches exist to quantify human safety: the human capital method and the comprehensive method. Human

capital method is a combination of various costs during and after traffic accidents. The costs include administrative costs, related vehicle repair costs, medical treatment costs, present value estimates of accident victims, and loss of income due to accidents. In order to estimate the economic

value of output loss, some average assumptions were made as accidents occur randomly to people of different income level. This methodology was adopted to satisfy objective one of the study.

III. RESULTS AND DISCUSSIONS

The objective of the study is to determine direct economic impact of disruptions caused by accidents on road freight system. The data provided by the Federal Road Safety Corps (FRSC) shows that accident types were classified into fatal, serious accidents and property damage only (PDO) accidents. The data further presented the numbers of trucks involved in accidents. Table 3.1 showed the road crashes data from the FRSC in 2021.

Table 1 Road Traffic Crashes (RTC) of Trucks as a Percentage using 2021 National Figure

Quarters (2021)	Total RTC	Truck	Percentage (%)
Q1 2021	5193	674	12.98
Q2 2021	5134	634	12.35
Q3 2021	4946	673	13.6
Q4 2021	5323	689	12.94
Total	20,596	2,670	12.96

Source: Federal Road Safety Corps (FRSC), 2022

It is recorded that a total of 20,596 Road Traffic Accidents were recorded in the year 2021 with 2670 involving Trucks which represented the activities of the Road Freight System (RFS). Figure 3.1 shows that 11% of the total Road Traffic Crashes nationally are contributed by Road Freight System represented by trucks using the 2021 national figures by the Federal Road Safety Corps (FRSC).

It is recorded that a total of 3218 crashes were fatal, 8324 were serious and 1485 were classified as minors as represented in figure 2.

➤ *Average Cost of Repairs*

To determine the direct economic impact of accident on road freight system, a simulation by multiplying the average amount from the field with the number of trucks involved in fatal, serious or Property Damage Only (PDO) accidents while incorporation the average amount payable by insurance companies.

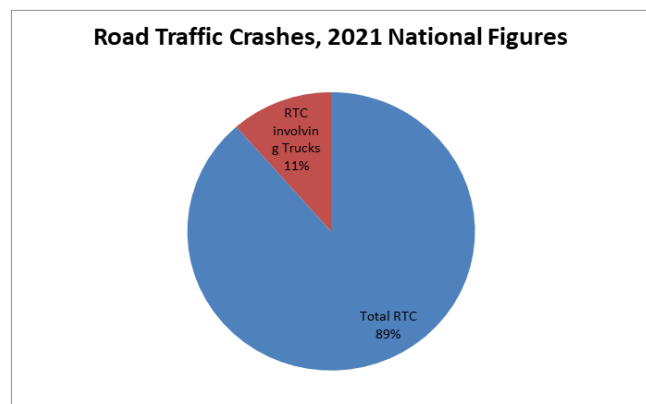


Fig 1 Road Traffic Crashes, 2021
Source: Author’s Design, 2023

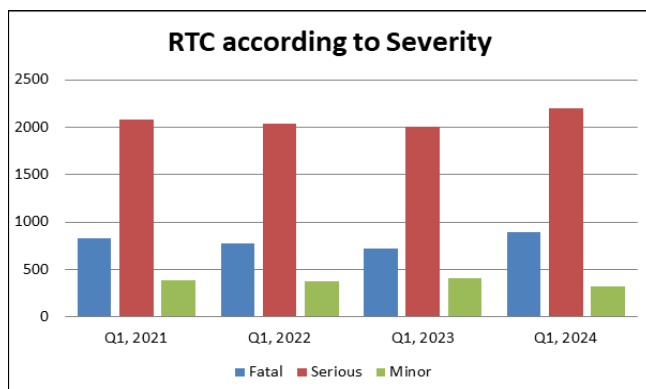


Fig 2 Road Traffic Crashes, according to Severity
Source: Author’s Design, 2023

Table 2 Total Repairs Cost of during Fatal Accident

Average Repair Cost per vehicle (in Naira)	₦5,000,000.00
Number of trucks involved in a fatal accident	417
Repair cost per fatal crash (in Naira)	₦2,085,000,000.00

Source: Computed by the Author, 2023

Table 3 Average Repair Cost of Trucks during Serious Accident

Average Repair Cost per vehicle (in Naira)	₦1,875,000.00
Number of trucks involved in a serious accident	1079
Repair cost per serious crash (in Naira)	₦2,023,125,000.00

Source: Computed by the Author, 2023

Table 4 Average Repairs Cost per Truck during PDO Accident

Average Repair Cost during PDO	₦316,667
Number of trucks involved in a PDO	192
Total Repair Cost during PDO	₦60,800,000.00

Source: Author’s Computation, 2023

➤ *Productivity Loss*

Productivity loss results from the fact that road casualties can no longer work temporarily due to injuries. Gross production loss has been calculated by using the number of injuries, the average length of time a person cannot work due to the crash and wages due to the injured staff as an indicator of the value of gross production per unit of time. Figure 3.3 shows the number of casualties per annum and findings an average one month recovery period for injured truck drivers.

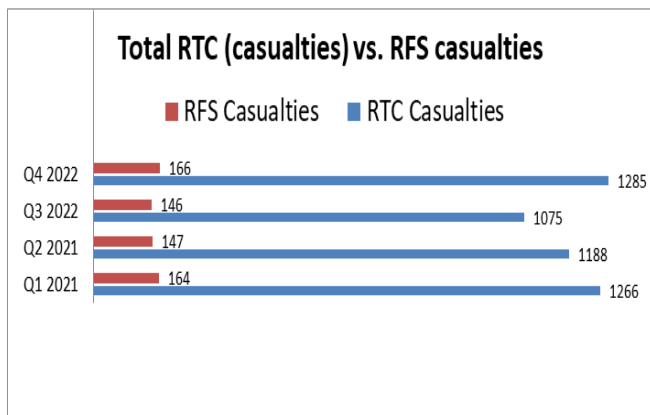


Fig 3 Road Traffic Crashes (Casualties) and Road Freight System Casualties

Source: Author’s Design, 2023

Table 5 Productivity Loss in Fatal Accident

Average Salary of a Driver per Month	₦152,333.
Average Salary of a Driver per Annum	₦1,827,996
Number of Casualties during Fatal Accidents in RFS	623
Total Productivity Loss	₦1,138,841,508.00

Source: Author’s Computation, 2023

Therefore, the study concludes that the productivity loss during fatal accident is estimated to be ₦1.14billion naira. The result indicates a strong impact on road freight system.

➤ *Medical Cost of Injured Persons on RFS*

The research surveyed the average cost of treatment when a truck driver is involved in various degrees of accidents. The research reported various kinds of injuries including severe fracture and some permanent disabilities. The study shows that about ₦300,000.00 is spent when a truck driver sustains injuries. Table 3.6 revealed that 3658 several forms of injuries are sustained annually by road freight system. This figure was used to estimate the total medical cost of ₦ 1.1 billion per annum.

Table 6 Medical Cost of Injured Persons on RFS

Average Medical Cost per Injured Person (in Naira)	₦300,000.00
Number of Injured Persons	3658
Total Medical Costs (in Naira)	₦1,097,400,000.00

Source: Author’s Computation, 2023

IV. CONCLUSION

The main aim of this study is to estimate the direct economic impact of disruption to road freight system in Nigeria. It was therefore concluded that disruptions impact strongly and negatively on road freight system with a direct economic impact of about ₦6.4 billion. The study equally concludes that disruptions represent a significant 4.1% of the Gross Domestic Product (GDP) of Transport Sector. Specifically, repairs cost during fatal accident contributes ₦2,085,000,000.00, repairs cost during serious accident contributes ₦2,023,125,000.00, repairs cost during Property Damage Only (PDO) accident contributes ₦60,800,000.00, productivity loss contributes ₦1,138,841,508.00 and medical cost contributes ₦1,097,400,000.00.

A reasonable approach to tackle the issues of disruption in Nigeria is to reduce the vehicular density on our highways. This can be achieved by diversifying or utilizing other modes of transportation. The study therefore recommends the creation of a functional multimodal system to reduce pressure on the highways. This can easily be achieved by utilizing the vast inland waterways in Nigeria and the use trains. The gap in literature pointed to poor empirical studies of direct economic impacts of disruptions caused by accidents on road freight system in Nigeria. This study contributed to knowledge by closing this gap in literature in the transportation field and made conclusions that may form the basis for future relevant studies.

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