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AN ASSESSMENT OF THE EFFECT OF ROAD NETWORKSON THE RURAL ECONOMY AND SECURITY IN NORTHERN NIGERIA

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Abstract

Road is the only way for the masses, particularly the rural dwellers, to move from one point to another, and also link up with the urban centres. However, the conditions of the roads in most rural areas pose a serious challenge to the economy and security of the areas. This paper examines the effect of road network on the rural economy and security in the Northern Nigeria. The study adopts a descriptive analysis, Multicollinearity and Cronbach Alpha Reliability tests as well as regression analysis on the primary data. Findings from the study reveal through the multicollinearity test, absence of significant correlation among the independent variables and the Cronbach Alpha confirms internal consistency of the variables. Furthermore, the regression analysis indicates that road network has a positive and statistically significant effect on rural economy and security. More so, rural development and transport infrastructure show positive significant effect on rural economy and security. Meanwhile, Security issues are not statistically significant to explain variations in the rural economy. The paper therefore, recommends that governments should extend effective road network to the rural areas to facilitate easy access to rural areas vis-a-vis rural to urban area, and to help the security agents respond promptly to any security challenge in the area.

Key words: Rural, Road Network, Security, Transportation, Infrastructure.

JEL Classification: O18

1. Introduction

Issues of bad road network have become synonymous with every government in many countries in Sub-Sahara Africa, for many decades now, Nigeria inclusive. In the Global Status Report on Road Safety in 2015, World Health Organisation (as cited in Okezie, 2019) reported that Africa had the highest rate of fatalities from road traffic injuries worldwide at 26.6 per 100,000 populations for the year 2013, mostly resulting from bad roads.

Poor roads and ineffective transport infrastructure have long been a major challenge for African trade, and are the major factors affecting the continent's competitiveness in the global market system (Donald, Jinhage & Verhoogen, 2017). A good road network would allow easy convey of farm inputs like labour and other equipment to the farm in the rural area where they can be used to improve their

productivity. Furthermore, farm produce, some of which are perishable in nature, need to be transported in large quantity at a low cost and in a good time to meet the industrial and household demands. Besides, good road network is critical to connecting rural economy to the national and regional markets.

In Nigeria, the national food production depends largely on farmers in the rural areas where they are the main producers and suppliers of food for the entire population, as the economy of the rural areas is predominantly primary production-based and mostly agricultural activities based (Saheed, 2020). However, many of rural areas, particularly in the northern part of the country, where majority of the population engage in subsistence farming, lacking in quality infrastructure like good road network and transportation system needed to access

market, reduced production costs and effective response to market demands. Good road network and effective transportation system would bring the rural areas closer to urban centres economically and security-wise. More so, areas with effective road network tend to experience increased production, easy access to markets, linking final producers to sources of raw materials, and promoting regional security and economic integration, and ultimately improving global economy linkages (Export-Import Bank of India, 2018).

As part of government effort to improve the country's rural infrastructure, the Nigerian government established the Directorate of Food and rural Infrastructure (DFRRI) in 1985, which significantly contributed to the rural areas development. For example, among the several achievements of the programme was the completion of over 278,526 km of roads between 1986 and 1993. Besides, the rural electrification programme of the agency benefitted more than 5,000 rural communities. This integrated approach to rural development, made available for the necessary basic infrastructure that can contribute to the growth of agro-allied small-scale enterprises in rural areas. More so, DFRRI assisted in the aspect of food production. For instance, between 1986 and 1993, the agricultural production index indicated that there was a substantial increase in agricultural output. The Directorate, however, could not meet many of its objectives as a result of low or lack of standards for project harmonization and effective mechanisms for co-ordination among the three tiers of government and between governments and DFRRI among other factors, until it was consequently abolished.

Consequently, many rural areas across the country are still disconnected from the urban centres and markets due to bad roads. Many farmers trek several kilometers to and from the farm, with the women carrying heavy loads of the harvests on their heads from the farm all the way to the local markets. Due to the unmotorable conditions of the roads, many transporters often avoid the rural areas and the few ones that take the pains to ply the roads charge exorbitant fares, which add to the cost of production and lead to increase in food stuff prices.

Again, the issues of kidnapping and Herdsmen-Farmers crises are some of the security challenges that have been threatening the rural economy in Northern part of the country in particular, and the nation in general. Farming activities in some parts of the country have been put to a halt as farmers in these affected areas have to stay away from their farms. The resultant effect is an acute shortage of farm produce supply to the market. Furthermore, the increasing waves of kidnapping and armed robbery on highways as a result of bad roads in the country is also preventing transporters from plying some of the rural areas, as many kidnappers and bandits take advantage of the dilapidated state of the roads.

In the recent history of Nigeria, no fewer than 133 highways across the six geopolitical zones in the country have been identified as major hotspots and flashpoints for banditry, kidnapping and allied criminal vices (Amaize & Dayo, 2019). Some of the roads are in dilapidated state; hence make it possible for kidnappers and bandits armed with sophisticated weapons to operate successfully. More so, many forests with no accessible road by vehicle have been a safe haven for several other kidnapping groups. In most of banditry attacks, the bandits do launch attacks on villages through motorcycles, because most of the roads are not motorable and can only be accessed by motorcycle. In most cases, the security personnel could not respond to all the distress call because the roads to the villages are not motorable, hence they find it difficult reaching the attacked villages at the right time (Sardauna, 2019). This has also made difficult, the mobility of farm labour and food crops from the rural areas to the market, thereby affecting the rural economy.

The objective of the paper therefore, is to critically assess the effect of road networks on the rural economy and security in the northern Nigeria, with a particular focus on the seven northern states affected by insecurity in each of the geopolitical region. To this end, the study is arranged into five sections. Following the introduction, this section two of the study presents the review of some related literature and theoretical framework on the subject matter. The third section captures the methodology. While the analyses and interpretation of the data make up the fourth section. The fifth section

summarises the observations and offer some policy recommendations.

2. Literature Review

Conceptually, Carlos et al. (2019) defines road network asset of intersecting roads and their interconnections which allows the selection of several different travel paths between the beginning and end points. Whereas, the Law Insider (n) describe road network as all categories of roads like international roads, feeders, district and mule tracks, such as but are not limited to forest roads, farm roads, power tiller roads, telecommunications road, power roads, mining and exploration roads, industry roads, health roads, education roads, public roads, private roads, project roads and all the types of bridges on that road. However, in the context of this study, road network is described as a system of interconnected roads designed to allow for easy traffic of vehicles and pedestrian.

Meanwhile, rural economy according to Miguel et.al (2022) is described as the economic activities through which the rural dwellers obtain incomes and the well being generated with such incomes. On its part, the ILO (2022) noted that the rural economy accounts for a significant share of employment and output in many developing countries but is widely characterized by severe decent work deficits and poverty, even though holds significant potential for creating decent and productive jobs and contributing to sustainable development and economic growth.

National security is viewed by Meiers (1990) as a capacity to control those domestic and foreign conditions that the public opinion of a given community believes necessary to enjoy its own self-determination or autonomy, prosperity and wellbeing. Meanwhile, the Indian National Defence College (1996) defined national security as an appropriate and aggressive blend of political resilience and maturity, human resources, economic structure and capacity, technological competence, industrial base and availability of natural resources and finally the military might.

In a more recent definition Paleri (2008) describes national security as the measurable state of the capability

of a nation to overcome the multi-dimensional threats to the apparent well-being of its people and its survival as a nation-state at any given time, by balancing all instruments of state policy through governance, that can be indexed by computation, empirically or otherwise, and is extendable to global security by variables external to it.

Makinda (1999) define it as the preservation of the norms, rules, institutions and values of society. He argues that all the institutions, principles and structures associated with society, including its people are to be protected from military and non-military threats, including terrorist, banditry and insurgences.

National security is the requirement to maintain the survival of the state through the use of economic power, diplomacy, power projection and political power. Security threats involve not only conventional foes such as other nation-states but also non-state actors such as violent non-state actors, narcotic cartels, multinational corporations and non-governmental organisations; some authorities include natural disasters and events causing severe environmental damage in this category.

In the context of this study, the definition of national security as provided by Paleri (2008) shall be adopted, as it is very relevant to the subject matter of the research, particularly referring to the capability of Nigeria as a country to overcome the multi-dimensional threats of which terrorism, kidnapping and banditry are major part, that threatens the well-being of the citizens.

Theoretically, the study is anchored on unbalanced growth theory propounded by Hirschman who believe that owing to unavailability of adequate resources in less developed countries, creating imbalances in the system would be the best strategy for development. According to the theory, rather than investing in the entire sector simultaneously, investment should be made in the strategic sector of the economy, which will create trickle-down effect on other sectors to develop. For instance, public investment in social overhead capital like roads, electricity, power, transport and communication infrastructures will stimulate the growth of other sectors of the economy. Similarly, irrigation facilities will lead to

development of agriculture. As imbalance is created in social overhead capital, it will lead to investment in directly productive activities (DPA).

Alternatively, initial investment according to the theory, could create shortages, thereby providing the incentive for other sectors to meet needs for backward linkages. For example, the development of a textile factory would create demand for more cotton, and the establishment of shoe factory would create a demand for leather. The appropriate direction would vary with the linkages that were most significant for a particular country. However, in case investment is made first in directly productive activities, the private investors would be facing a lot of challenges if there is no adequate or there is lack of social overhead capital (infrastructure). It may be difficult for any industry in a particular region to grow if social overhead capital facilities or infrastructures are not available. Thus, excess social capital overhead or infrastructures will be a pressure-relieving for the rural economy, which will form the basis for providing conducive environment through adequate security to protect live and properties of the citizens.

Empirically, Ewetan (2014) examines the pertinent issue of insecurity in Nigeria and its implication on socio-economic development. Available data on the level and dimensions of insecurity in Nigeria reveals an increase over time, which constitutes serious threat to lives and properties, hinders business activities and discourages local and foreign investors, all which stifles and retards Nigeria's socio-economic development. This rising wave of insecurity has not abated but has assumed a dangerous dimension which is threatening the corporate existence of the country as one geographical entity.

Vambe (2006) uses majorly documentary sources of data to argue that the heightened rate of social insecurity especially, among the youth is largely responsible for the increase in crime rate in the country with adverse consequences on national development. The paper identifies the effects of poverty and insecurity on national development to include unsafe political and business environment for economic investment; loss of human and financial capital that would have been invested for

national development; and limited capacity to harness the resources that will improve living conditions.

Stewart (2004), reviews the connections between development and security both within developing countries and globally. It interprets security as human security, and within this category focuses on political violence as an important source of insecurity. Three connections are hypothesised: that human security forms an important part of people's wellbeing and is therefore an objective of development; that lack of human security has adverse consequences on economic growth and poverty and thereby on development; and that lack of development, or imbalanced development that involves sharp horizontal inequalities, is an important cause of conflict. Evidence supporting these relationships is surveyed for developing countries.

Owabumoye and Ajala (2018) examine the impact of roads conditions on crime reportage to the police in Akure, South-western Nigeria. Primary data were obtained through coordinate points of crime scenes and information from key informants. The results revealed that roads that good road were found to significantly encourage report of crime incidence, hence victims were able to report crime incidence to police quickly and police were able to respond to distress call. while roads that were bad were found toward the outskirts. Crime incidences were insignificantly reported in areas with bad roads.

Ogunleye, Ajibola, Enilolobo and Shogunle (2018) adopt Granger Causality and Ordinary Least Square approaches to investigate the road transport infrastructure's impact on agricultural sector development in Nigeria within the period of 1985 - 2014. The findings reveal a positive and statistically significant relationship. The results further confirmed a unidirectional causality relationship from agricultural sector development to transport infrastructure.

On his part, Ajiboye(2016) examines how transportation systems affect food marketing and security in Nigeria by using a primary data sourced from 300 respondents selected randomly and analyzing using a frequency table and percentage distribution of the research variables. The

findings reveal that the shortage of transportation facilities, high transport cost and wastage resulting from ineffective storage and processing facilities, adversely affected food security in the study area.

Orakwue, Umeghalu and Ngini (2015) also assess road transport's effect on agricultural productivity in Ayamelum Local government area of Anambra State. The study adopted descriptive and graphical methods on the primary data obtained through structured questionnaires administered to about twenty rural farmers in the study area. The results indicate that road transport show positive effect as well as negative effect on agricultural development.

In another study, Selepe, Sabela, and Musuku, (2014), assess the implication of infrastructural inadequacy on food security in Ntambanana, KwaZulu-Natal, South Africa. The study adopted primary data subjected to econometric analysis to test for the reliability of information obtained from the respondents. The findings indicate that poor infrastructure, lack of adequate support and bad road network are hindering smooth access to market facilities. More so, inefficient and ineffective transportation system negatively affected the small-scale farmers' productivity in the area.

Meanwhile, Orji, Doki and Jatto (2010) by using descriptive analysis, study the effectiveness of good road network in resolving the rural-urban drift problem in Nigeria. The findings reveal that good road network in the rural areas significantly improves the income of the rural dwellers and the government.

3. Methodology

3.1 Area of Study

Kaduna State was founded in 1976, when the then North Central State with capital at Kaduna was renamed Kaduna State. It shares common borders with Zamfara, Katsina, Niger, Kano, Bauchi, Nasarawa, Plateau States, and the Federal Capital Territory. The total land mass of the State is estimated at 46,053 sq km which is about 5% of the total land area of Nigeria.

The population of the state according to 2006 census stands at 6,113,503. The State's population structure shows that majority of the citizenry currently live in urban and semi urban towns like Kaduna, Zaria, Kafanchan, Kgoro, Zonkwa, Birnin Gwari, Makarfi and Zangon Kataf. The rural population is estimated at 3,682,034 (2006 Census). The economy of Kaduna state is mainly agriculture with the majority of the people actively engaged in farming of produce includes yam, cotton, groundnut, tobacco, maize, beans, guinea corn, millet, ginger, rice and cassava. Some of the population also involve in livestock include poultry, cattle, sheep, goats and pigs (KSG, 2013).

Katsina State was created out of the former Kaduna State in 1987. It is a geographical and political expression of an area that comprises two ancient kingdoms of Katsina and Daura. These kingdoms were among the oldest Hausa States like Kano, Gobir, Zazzau, Rano, and Biram. The area is located in the Sahel Savannah region of northern Nigeria, and share borders with Zamfara and Sokoto States to the west, Jigawa and Kano to the east, Maradi and Damagaram in Niger Republic to the east and north east, and Kaduna State to the South.

According to the 2006 provisional census, the State has a population of 5.79 million people. The main occupations of the people include: farming, traditional handicrafts and animal husbandry, with maize, millet, guinea corn, cassava, irish potato, yams and beans as the major food crops, while cotton, tobacco, sugarcane, soya beans and groundnuts are the major cash crops. The state is also one of the major producers of tomatoes, pepper and onion in the country. Apart from crop farming, the State is one of the major producers of livestock such as cows, sheep, goats and camels (Katsina State Government, 2016).

Zamfara State was created from the old Sokoto State in 1996. It is populated with the Hausa and Fulani peoples. With an area of 38,418 square kilometres, it is bordered in the North by Niger republic, to the South by Kaduna State. In the east, it is bordered by Katsina State and to the West by Sokoto and Niger States. According to the

2006 census, it has a population of 3,278,873 and contains fourteen local government areas.

Agriculture is the main occupation of the people of the state and the central source of income. In 2009, gold mining became a greater source of income in Zamfara State as worldwide gold prices rose dramatically. High concentrations of lead in the ore from which gold was being extracted led to a lead poisoning epidemic in the state, requiring national and international intervention.

Kogi is a state in the central geo-political zone of Nigeria. It is popularly called the *Confluence State* because of the confluence of River Niger and River Benue at its capital, Lokoja, which is the first administrative capital of modern-day Nigeria. The state was created in 1991 from parts of Kwara State and Benue State. There are three main ethnic groups and languages in Kogi: Igala, Ebira, and Okun (a Yoruba Group) with other such as BassaNge, a people of Nupe extraction in Lokoja and Bassa Local Government Area, Bassa-Komo of Bassa Local Government Area, Gwari, Kakanda, Oworo people (A Yoruba Group), Ogori, Magongo, and Idoma.

Agriculture is the main part of the state economy with fishing in the riverine areas like Lokoja, Idah, Ibaji, Ogugu, etc., and the state also has coal, petroleum, limestone, steel and other mineral industries.

Benue State is one of the Middle Belt states in Nigeria with a population of about 4,253,641 in 2006 census. It is inhabited predominantly by the Tiv, Idoma and Iggede peoples, who speak Tiv, Idoma, and Iggede languages respectively. Its capital is Makurdi. Benue State is named after the Benue River and was formed from the former Benue-Plateau State in 1976, along with Igala and some part of Kwara State. In 1991 some areas of Benue state (mostly Igala area), along with areas in Kwara State, were carved out to become part of the new Kogi State. Igbo people are found in the boundary areas like the Obi, Oju etc.

Benue is a rich agricultural region; popularly grown crops includes; oranges, mangoes, sweet

potatoes, cassava, soya bean, guinea corn, flax, yams, sesame, rice, groundnuts, and Palm Tree.

Yobe State is in northeast geo-political zone of Nigeria. Yobe State was carved out of Borno State in August 27, 1991. The capital of Yobe State is Damaturu, while the largest city being Potiskun. The state borders four states: Bauchi, Borno, Gombe, and Jigawa. It borders to the north the Diffa and Zinder Regions of Niger. Because the state lies mainly in the dry savanna belt, conditions are hot and dry for most of the year, except in the southern part of the state which has more annual rainfall.

The major ethnic groups in the state are Kanuri and Fulani, with other ethnic group include: Bolewa, Ngizim, Karai-Karai, Bade, Hausa, Ngamo, Shuwa, Bura, Marghi and Manga. Apart from agriculture that the state is known for, Yobe State is also rich in mineral deposits including gypsum and kaolin found in Fune Local Government Area. The agricultural produce includes gum Arabic, groundnut, beans and cotton. It also has one of the largest cattle markets in West Africa.

Borno State is the north-eastern geo-political zones of Nigeria. Its capital and largest city is Maiduguri. The state was formed in 1976 from the split of the North-Eastern State. Borno is the homeland of the Kanuri people in Nigeria and several other ethnic groups. The state has a predominance of Kanuri people. Other ethnic groups such as Lamang, Babur/Bura and Marghi are also found in the southern part of the state. Shuwa Arabs are mainly the descendants of Arab people

Borno has been the epicenter of the Islamist group Boko Haram since it began its insurgency in 2009. The conflict in Borno drew media attention in 2009 after clashes between Boko Haram and government security forces in which the founder of Boko Haram Mohammed Yusuf was reportedly captured alongside 300 of its members. Days later Mohammed Yusuf was announced dead after he reportedly attempted to escape from detention

All the states under study are experiencing one form of security challenge of the other ranging from banditry in the North-West Geo-political zone, to Kidnapping and herdsman attacks in the Central Geo-political zone and Terrorism in the North-East Geo-political zone of the country.

3.2 Research Design

The descriptive research design was used in this study, and the survey method was specifically applied which is found suitable for this study because it is a very valuable tool for assessing opinions and trends. It consists of a predetermined set of structured questionnaires built on 5-point Likert scale to collect information from a representative sample of the population of selected rural communities in seven (7) states across the three geo-political zones in the northern Nigeria, include Kaduna, Katsina, Zamfara, Kogi, Benue, Yobe and Borno States. However, it would be unrealistic to study this large group of people whose population may be undetermined due to inaccessibility of information. Therefore, a total sample of 600 respondents from the states is selected from the population across rural communities in the states using Yamane (1973) statistical formula. The study utilized mainly primary data obtained through the administration of questionnaire. In order to collect the data, the researcher adopted a personal and on the spot delivery and recovery approach during the administration of the instrument. A total of 700 questionnaires were distributed, and out of this number, 600 of the retrieved questionnaires provided the required information. The study utilized mainly primary data obtained through the administration of questionnaire.

3.3 Model specification

In order to assess road transport system's effect on the development of the agricultural sector, the conceptual framework was developed by Ogunleye, Ajibola, Enilolobo and Shogunle. (2018) and stated as thus:

$$AG = f(RT, EX, K) \text{ ----- (1)}$$

Where;

AG = Agricultural output proxy by GDP of agricultural sector

RT= Road Transport Infrastructure proxy by the length of paved road per square kilometer of area.

EX= Export

K= Capital

The model is then modified as follows:

$$RE = f(RN, RD, TI, SC) \text{ (2)}$$

Modifying equation (2) in stochastic form as:

$$RE = \beta_0 + \beta_1 RN + \beta_2 RD + \beta_3 SC + \beta_4 TI + \mu \text{ (3)}$$

To capture the effect of Road Network on Security, the model is further rearranged thus:

$$SC = \beta_0 + \beta_1 RN + \beta_2 RD + \beta_3 RE + \beta_4 TI + \mu \text{ (4)}$$

Where:

RE = Rural Economy

RN = Road Network

RD = Rural Development

SC = Security Challenges

TI = Transportation Infrastructure

3.4 Method of Data Analysis

The primary data obtained were coded and analyzed using descriptive statistics and inferential statistics. Econometrics tools like multicollinearity, Cronbach Alpha for reliability test and multiple regression analysis were adopted in analyzing the data. Thereafter, both quantitative and qualitative data are triangulated for better research results with the help of STATA 13 software package.

4. Empirical Results and Discussion

The results of descriptive analysis are reported in this section.

Table 1**Results of descriptive analysis**

Variable	Observation	Mean	Standard Deviation.	Minimum	Maximum
RE	600	3.601	1.105	1.3	5
SC	600	3.412	0.818	1	4.5
RN	600	3.585	0.889	1	5
RD	600	4.427	0.812	1	5
TI	600	3.337	1.105	1	5

Source: STATA 13 Outputs

The descriptive statistics shown in Table 1, reveals that variables Security Issues (SC), Rural Network (RD), Rural Development (RD), and Transport Infrastructure (TI) have a mean of about 3.5, with minimum of 1 and maximum of 5, except for Rural Economy with a minimum of 1.3. Road Development variable has a mean of about 4.4 with minimum of 1 and maximum of 5,

while the rural Security issues variable with a mean of about 3.4 and maximum of 4.5. The standard deviations of all the variables, except for the rural economy and transport infrastructure, are less than one, indicating that the individual responses are concentrated around the mean. In other word, they are less than one point away from the mean.

Table 2**Results of reliability test using Cronbach Alpha**

Item	Observation	Sign	item-test correlation	item-rest correlation	average interitem covariance	Alpha
SC	600	+	0.580	0.390	.172	0.562
RE	600	+	0.473	0.235	.197	0.613
RN	600	+	0.743	0.503	.117	0.497
RD	600	+	0.527	0.260	.185	0.609
TI	600	+	0.554	0.307	.177	0.589
Test scale					.168	0.617

Source: STATA 13 Outputs

The Cronbach Alpha test shows the internal consistency or the reliability of the data. The results in Table 2 show alpha coefficient of the variables to be 0.617, suggesting that the variables have internal consistency and can be

affirmed to have good reliability. The implication of the result is that the test actually measures the effect of all the independent variables (RN, RD, SC and TI) on Rural Economy and Security

Table 3**Results of VIF & Tolerance Level**

Variable	VIF	1/VIF
SC	1.25	0.802
RN	1.18	0.845
RD	1.16	0.865
RE	1.14	0.875
TI	1.08	0.923
Mean VIF	1.16	

Source: STATA 13 Outputs

The results of the multicollinearity test in Table 3 reveal the independent variables. Hence changes in any of the that the VIF for all the variables is closer to 1, which is an variables cannot be attributed to shifts in another variable. indication that there is absence of high correlation among

Table 4

Results of regression analysis on the effect of Road Network on the Rural Economy

RE	Coef.	Std. Err.	T	P>t	[95% Conf. Interval]	
SC	.045	.031	1.48	0.140	-.015	.106
RN	.086	.027	3.20	0.001	.033	.140
RD	.225	.030	7.62	0.000	.167	.283
TI	.410	.022	18.98	0.000	.368	.453
_cons	.771	.213	3.63	0.000	.353	1.188
Prob> F = 0.000						
R ² = 0.4441						
Adj R ² = 0.4404						

Source: STATA 13 Outputs

The results in Table 4 reveal the effect of Security and other Independent variables, including Road Network, Rural Development and Transport Infrastructures on the Rural Economy in the Northern part of the country. The results reveal F-stat value of 0.0000, indicating a very good fit for the regression model, and all the variables' (SC, RN, RD, and TI) coefficients are jointly statistically significant. Besides, the R-Square indicates that about 44.4 percent of the variation in rural economy in the northern Nigeria can be explained by factors in the model, while about 55.6 percent can be attributed to other factors outside the model.

Furthermore, the results also reveal that Security (SC) in the northern Nigeria, with a coefficient of 0.045, t-stat of 1.48 and p-value of 0.140, has a positive effect on the rural economy, however, it is not statistically significant enough to explain the variation in the rural economy in the Northern Nigeria.

Meanwhile, Road Network (RN) variable shows a coefficient of is 0.086, with a t-value of 3.20 and p-value of 0.001. It follows that road network has a positive and statistically significant effect on the rural economy.

Hence, any improvement in road network in the rural area by one percent, will likely improve the area's economy as much as 0.09 percent, provided all other variables remain unchanged. More so, Rural Development (RD) shows a coefficient of 0.225, with a t-statistical value of 7.62 and p-value of 0.000. The result reveals that rural development also has a positive and statistically significant effect on the rural economy. It implies that if all other factors remain constant, one percent effort towards the development of the rural areas in the Northern Nigeria will bring about improvement in the rural economy by as much as 0.23 percent.

Transport Infrastructure on the other hand, has a coefficient of 0.410, with t-statistical value of 3.63 and p-value of 0.000. It implies a positive and statistically significant effect on the rural economy in the region. If all other variable is hold constant, an increase of one percent improvement in transport infrastructure improve the rural economy of the region by as much as 0.41 percent.

Table 5

Results of regression analysis on the effect of Road Network on Rural Security

SC	Coef.	Std. Err.	T	P>t	[95% Conf. Interval]	
RN	.150	.358	4.20	0.000	.799	.221

RD	-.232	.402	-5.77	0.000	-.311	.153
RE	.081	.545	1.48	0.140	.026	.188
TI	.165	.359	4.58	0.000	.939	.235
_cons	3.060	.258	11.86	0.000	2.553	3.561
Prob> F = 0.000						
R ² = 0.2007						
Adj R ² = 0.195						

Source: STATA 13 Outputs

The results in Table 5 reveal the effect of Road Network and other Independent variables, including Rural Development, Rural Economy, and Transport Infrastructures, on the Security in the Northern Nigeria.

The results reveal F-stat value of 0.0000, indicating a very good fit for the regression model, and all the variables' (RN, RD, RE, and TI) coefficients are jointly statistically significant. Besides, the R-Square indicates that only 20.1 percent of the variation in the security of the Northern Nigeria food security can be explained by factors in the model, while about 79.9 percent can be attributed to other factors outside the model.

Furthermore, the results also reveal that Road Network (RN) with a coefficient of 0.150, t-stat of 4.20 and p-value of 0.000, has a positive and statistically significant impact on the security of the Northern Nigeria. It implies that when all other factors remain constant, one percent improvement in road network will tend to improve the security of the region by about 0.15 percent.

The results also indicate that the coefficient of the rural development (RD) variable is 0.23, with a t-value of 5.77 and p-value of 0.000. It follows that rural development has a negative and statistically significant effect on security challenges. Hence, any rise in rural development by one percent, will likely lead to a decrease in security challenges of the region by 0.23 percent, provided all other variables remain unchanged. More so, Rural Economy shows a coefficient of 0.081, with a t-statistical value of 1.48 and p-value of 0.140. The result reveals that rural economy, though has a positive effect on the security, however it is not statistically significant enough to explain any variation in the security of the region. Transport Infrastructure has a coefficient of 0.165, with t-statistical value of 4.58 and p-value of 0.000. It implies a positive and statistically significant effect on the security of the region. In fact, all

other variable being constant, any increase of one percent improvement in transport infrastructure improve the security of the region by as much as 0.17 percent.

4.2 Discussion of Findings

From the analysis of the primary data obtained, the results reveal that road network has a positive and statistically significant effect on rural economy and security in the Northern Nigeria. The results converge to *a priori* expectation, in the sense that a good road network in the rural area shows a strong effect on rural economy, as it makes it easy for the farmers to convey farm inputs including labour and harvests from the farm to the local market for easy accessibility by consumers. More so, good road network will reduce the transportation and production costs for the rural dwellers, and consequently improving their productivity and income. The results agree with the results obtained from the work of Ogunleye, Ajibola, Enilolobo and Shogunle (2018) who confirmed a positive relationship between transport infrastructure and agricultural development in Nigeria. More so, good road network in the rural areas will help to open-up the area and provided a good economy and security linkages with the urban areas through easy access, as rightly observed by Orji, Doki and Jatto (2010) who observed that good road network in the rural area has a positive relationship with the rural dwellers income.

Transport infrastructure is expected to provide easy movement of people and goods to and from the rural area in their daily economic activity involving exchange of goods between the producers, who in the context of the study, are the farmers and the potential buyers or consumers. The result is in line with a prior expectation.

5. Conclusion and Recommendations

The paper is set to assess the effect of road network on the rural economy and security, with specific objectives to

assess the effect of rural development, and transport infrastructure on rural economy and security in the Northern part of the country. Based on the results obtained from analysis of the primary data collected from the study area, it is observed that all of the variables. Hence, it can be concluded that good road networks has a positive effect that is statistically significant on the rural economy and security in the Northern Nigeria.

Given the foregoing, the study therefore, recommends thus:

i. Many of the rural areas lack access roads, and the few ones available are in terrible shape, which discourages commercial transporters from plying the routes, hence, the few ones who choose to do so charge high fares, which in turn affects food prices. Therefore, construction of new roads and repairing of the existing ones in the rural areas should be carried out regularly by the state government when the need arises, to create easy access, and facilitate easy movement of farm inputs and harvest from the farm in the rural area to local markets for accessibility

by consumers. Furthermore, good road network will give security agents easy access to most of the remote areas and the ungoverned forest form where most of the criminal groups hide and carry out attack on the state.

ii. The government developmental projects should be extended to the rural areas through provision of socioeconomic infrastructures which will improve the wellbeing and secure the live and properties of the rural dwellers, and by extension the urban populace.

iii. Considering the importance of transportation in achieving food security in the country, it is necessary for the government and the private sector to extend transportation infrastructure to the rural areas, in order to bridge the distance with the city centres. Apart from the Mass Transits in operation within the city, there should also be provision for trucks and vans to enable the rural farmers convey their agricultural produces from the farm to the market at a cheaper fare, thereby improving the rural economy.

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