Maritime Security Risks and Nigerian Maritime Trade-Related Economic Growth

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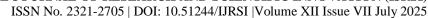
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ABSTRACT

The study examined the effects of maritime security risks on significance of Nigerian maritime trade-related economy. The objectives of the study were among other things: to examine the relationship between maritime security risks and the GDP contribution of the maritime trade-related in Nigeria, to examine the relationship between maritime security risks and unemployment rate in Nigerian maritime sector and to model the relationship between ship calls to Nigerian waters and variations in trend of maritime security risks. The study used quantitative research design method. Time series secondary data covering a duration of 22 years, that is, from 1999 to 2020 on pirate attacks against ships trading in Nigeria, attacks against offshore O&G infrastructure in Nigerian waters, frequency of illegal unreported unregulated (IUU) fishing activities in Nigerian waters, piracy related deaths and injuries affecting maritime personnel in Nigeria, Data sourced from the international Maritime Bureau (IMB) and Department of Petroleum Resources (DPR) were used as proxies for maritime security risks. Similarly, time series secondary data on value of Nigeria's non-oil shipping trade, ship calls to Nigeria ports, GDP contribution of the shipping and maritime sector were sourced from the Central Bank of Nigeria (CBN), Nigerian Ports Authority (NPA) and used as proxies for maritime trade-related in Nigeria. The multiple regression analysis method, Log-Log constant elasticity model and paired sample t-test were used to analyse the data obtained. It was found that for each 1% increase pirate attacks against ships trading in Nigerian waters leads to a 0.636% increase in value of Nigerian non-oil shipping trade over the 22 years period covered in the study. The result also indicates that for each 1% increase in piracy related deaths in Nigerian maritime industry, the value of Nigeria non-oil shipping trade increases by 0.043%; and a 1% increase in illegal unreported unregulated (IUU) fishing operations increases by 7.188%. For each 1% increase in security attacks on the offshore O&G industry, the value of non-oil shipping trade in Nigeria increases by 0.682% while a 1% increase in piracy related injury increases by 0.023%. The relationship between the value of Nigeria's non-oil shipping trade and variations in the trend of maritime security risks is not significant. The model showing the elastic relationship depicting the influence of maritime security threats on the GDP contribution of the Nigerian maritime transport industry is:

$$LOGGDP = 4.218 + 0.489LOGPIRATE + 0.61LOGPIRDEATH + 1.418LOGIUU + 0.497LOGOGTACKS + 0.054LOGINJUR + e$$

The model showing the elastic relationship depicting the influence of maritime security threats on the extent of unemployment in Nigerian maritime industry is:

$$LOGUNRATE = 1.796 - 0.193LOGPIRATE - 0.044LOGPIRDEATH + 1.585LOGIUU - 0.032LOGOGTACKS - 0.0351LOGINJUR + e$$

The model showing the relationship depicting the influence of maritime security risks on ship calls to Nigerian waters is:

LOGSHCALS = 8.437 - 0.010LOGPIRATE - 0.053LOGPIRDEATH − 1.059LOGIUU + 0.141LOGOGTACKS - 0.041LOGINJUR +e.

It was recommended among other things that in order to achieve increased growth in the value of Nigeria's maritime trade-related, the security challenges in the Nigerian waters must be tackled using suitable security risk management strategies owing to the study finding indicated that maritime security risks are the caused of about 66% variation in the value of Nigerian maritime trade-related over the 22 years period.

Keywords: maritime-security, risks, maritime trade-related, piracy, Nigeria.
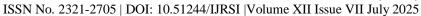
INTRODUCTION

Maritime trade is one of the key economic components that foster the growth of the word trade; contributing the greatest percentage of the world's trade by volume. In terms of the global economic income, maritime industry is estimated at 12.3 billion tons per annum [43]. The sector is a significant facilitator to other global trade links and effective in cost management in veneration of transport services, especially when it involves movement of large volume of cargo at a time.

In past eras, maritime transport system had been very opened and attractive with less security burdens until days criminals started invading the sea with various means of attacks against ships and the industry. In recent years, the industry has been so vulnerable to exploitations by security risks such as cargo theft, cybercrime, terrorism, armed robbery, piracy, drug trafficking, human trafficking, stowaway, maritime frauds and other unlawful acts that sometimes also happened at the port areas. Maritime security risks especially 'terrorism' became more notable after the horrendous terrorists' attacked of World Trade Centre (WTC) on September 11th 2001, leaving the international community with no option than to seek for alternative measure to protect the industry.

Consequently, International Maritime Organization (IMO) and other relevant stakeholders have in effort to curb the challenges sought to develop governing frameworks and legislative mechanisms that will conventionally focus on the security of lives and assets at sea, in the port facilities and protection of the marine environment. For instance, IMO had adopted and are already in enforced, the 'International Ship and Port Facility Security' (ISPS) code and Safety of life at sea (SOLAS) Chapter XI-1 and 2, as amended), the Suppression of Unlawful Acts against the Safety of Maritime Navigation (SUA) Convention, the STCW 2010 as amended to further strengthen measures to enhance maritime security and safety at sea. Many other efforts in terms of recommendations, guidance including the utilization of modern technologies have been made are widely commended for significant improvement in combating insecurity chiefly in the developed countries.

However, achieving maritime security remains rarely unattainable, exclusively as it bothers on the developing nations' incapability to acquire the needed technical expertise and the relevant technologies to combat insecurity within their respective maritime zones. Maritime trade-related around these nations is extensively recounted to be hampered and primarily associated with security risks [6]. Conspicuously, the Gulf of Guinea, the Horn of Africa, Malacca Straits, Indian Ocean and the Persian Gulf, which are largely bounded by developing nations, are currently having the highest maritime security incidents. For instance, in West Africa, incidents of pirate attacks against ships were reported to comprise 81 occurrences in 2018 [20] and before the year 2018, [19], [21], [22], [23] had already reported 4,821 incidents of piracy and armed robbery between 1984 and 2008 globally. [17], also reported 524 piracy and armed robbery against ships between 2015 and 2016. Remarkably, within these years, amongst the most vulnerable maritime domains in Africa were the Gulf of Aden, the Somali Coast, Nigerian Coastal waters and the Mozambique Channel/Cape Sea route in Southern Africa [17].

Maritime insecurity of large magnitude may unacceptably have negative influence on the socio-economic and political development of the affected nations [7]. This may further adversely affect the rate of foreign

investments in maritime activities and its related trade in the affected states. Morally, ship owners, importers, exporters and carriers would always prefer to do business where their assets are secured and business can be sustained. Even some seafarers may get frightened when the sea appears unsafe and unsecured. Their family members want to have them safe and happily welcome home during their shore leave other than receiving sad news. In Nigeria, for instance, the ever concern for oil and gas, and other multinational businesses may only attract foreign investors and sustain when there is a secured and enabling business environment and vice versa.

This study aimed at providing relevant discussions and establishes the relationship between maritime security risks and Nigerian maritime trade-related economic growth with particular focus on armed robbery and piracy as risk factors. The study also attempts to offer some risk management stratagems and the relevant security management approaches, which could form integral measures for security cost-effectiveness for the Nigerian maritime trade-related growth..

The Specific Objectives

(i) To examine the relationship between maritime security risks and the gross domestics products (GDP) contribution of the maritime sector in Nigeria

(ii) To examine the relationship between maritime security risks and unemployment rate in Nigerian maritime sector.

(iii) To model the relationship between ship calls to Nigerian waters and variations in trend of maritime security risks in Nigerian maritime trade.

Study Hypotheses

H01: There is no significant relationship between maritime security risks and the gross domestics products (GDP) contribution of the maritime sector in Nigeria

H02: There is no significant relationship between maritime security risks and unemployment rate in Nigerian maritime sector

H03: There is no significant relationship between ship calls to Nigerian waters and maritime security risks in Nigeria.

LITERATURE REVIEW

The Maritime trade

The notion of maritime trade involves a transaction between exporters and importers, where the transportation of cargoes is done by ships from certain port of origin to another port of destination [34]. Many studies have confirmed that maritime trade is significant to international trade development as more than 70% of world merchandise in terms of volume is being done through the sea [26]; [19]; [39],[41]. The maritime trade is conversely seen as a facilitator of global trade, with the sea-going ships providing the efficient and effective means of movement of large volume of basic goods and finished product from one maritime zone to another. In 2019, despite the trade been badly affected by covid-19 global pandemic then, yet in comparison with other trade, its volume hit 11.08 billion tons and secured global 811.2 TEUs handling of containers in ports [35].

Beneath is table 2.1 indicating the maritime global trade achievements between the years 1970 and 2020. The table presents trade participation by main bulk ships, tanker ships and other dry cargo ships and are all measured in million tons per year. Hence, since Nigeria is oil/gas production and a maritime nation with extensive coastline of about 750Km and as well retains eight major ports, others which are oil terminals and local terminals, derives much benefits from maritime trade-related opportunities. For example, related studies showed Nigerian ports have a cargo handling capacity of 35million tonnes per annum [2]; [27]; [1]; and they have for past years been handling approximately 99% by volume and 95% value of the nation's overall maritime trade [29].

Table 2.1: Development of international maritime trade, selected years (Million tons loaded)

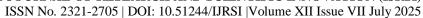| Year	Tanker trader (Million Tons)	Main bulk (Million Tons)	Other dry cargo (Million Tons)	Total (all cargo) (Million Tons)
1970	1440	448	717	2605
1980	1871	608	1225	3704
1990	1755	988	1265	4008
2000	2163	1186	2635	5984
2005	2422	1579	3108	7109
2006	2698	1676	3328	7702
2007	2747	1811	3478	8036
2008	2742	1911	3578	8231
2009	2641	1998	3218	7857
2010	2752	2232	3423	8408
2011	2885	2364	3626	8775
2012	2840	2564	3791	9195
2013	2828	2734	3951	9513
2014	2825	2964	4054	9842
2015	2932	2930	4161	10023
2016	3058	3009	4228	10295
2017	3146	3151	4419	10716
2018	3201	3215	4603	11019
2019	3169	3225	4682	11076

Source: UNCTAD (2020)

Nigerian Maritime Trade and Economic Growth

In a study performed by [24] on the 'world economic growth and the volume of seaborne trade' utilizing a Vector Error Correction Model (VECM) to measure their long-term effect with the world GDP, with particular attention on petroleum products, dry cargo and crude oil transportation using their corresponding yearly data. The study revealed that, all the three mentioned trade types of cargo caused change in the global economic sphere and their respective rate of global demand and supply also have effect on either positive or negative on the pattern of the world trade. Through this study, Nigerian could be seen as having full participation in aforementioned three trade types and that such negative effect on the pattern of trade may be assumed to be associated with the inefficiency in security risks management of the inherent risk in the affected system.

Maritime trade is widely known to be significant to the economy growth. An empirical study conducted by [36], using 91 countries with seaports, to examine the level of economic input of maritime trade with respect to port infrastructure quality and logistics productivity. The study used a structural equation model (SEM) to provide empirical evidence; the authors affirmed that high quality port infrastructure enhances better logistics performances, which result to higher output of maritime trade and stronger economic growth. This study has supported a strong relationship between maritime trade and economic growth of any nation that participate in it. Therefore, it could be deduced that if insecurity may hamper the utilization of the port infrastructure, then, the growth of such nation's maritime economy could also be affected.

The world maritime trade and security risks challenge

Another study conducted by [37] on "Seaborne trade between developed and developing countries", analysing the international grain trade flow using the gravity equation of trade to examine grain exports and imports between pairs of countries. The author attempted to examine the effect of economic factors, population, and country development on grain trade using data of 41 major trading countries over 14 years (1996-2009) and the gravity equation of two different specifications was deployed for the investigation. The findings in the study showed that the importer's Gross Domestic Product (GDP) lead to grain trade moving much faster than exporter's GDP. Meaning that the developing countries tend to import less grain but developed countries

import more, especially when the population is higher. From this study, it could be presumed that maritime trade such as grain trading improves the GDP of the countries that export more of the grain. However, the fast flow of grain trade could aid to create an imaginary crime scene (according to the routine activity theory) and aid potential pirates who may be motivated to consider attack on ships making frequent traffic along the trade route, especially if there is inadequate and effective security apparatuses [4]. The author's findings provide an assumption about the potential trade growth and also make room for proactive action to protect ships intending to trade along such route. However, despite the importance of the maritime trade to the global economic growth, maritime security risks, principally, piracy and armed robbery have been acknowledged as a serious challenge to the sustainability of the growth in maritime sector. Notably, [10], studied the effects of maritime piracy on global seaborne trade development between 2003 and 2008 in the Far East-Europe container liner shipping operation. The findings of the study showed a negative impact and suggested that the international community must enhance measures to curb the menace of piracy and armed robbery at sea.

Study conducted by [30], using quantitative analysis of maritime piracy. The findings from the study indicated that piracy attacks caused a significant increase in costs of maritime trade between Asia and Europe. The authors also noted that the main reason for piracy impact on the region is lack of economic power to combat the piracy. [5], studied on the "impact of maritime piracy on international trade between the main European and Asian countries in 1999-2008". The study findings provided an estimated cost of piracy for international trade within the period covered under study at 24.5 billion dollars. The estimated amount suggests a potential negative impact of piracy on global economic development [12] and hence indicates the demand for international community action to address the challenge. Also, acknowledging the United Nations Security Council concern on the "cost of piracy to the States and its economic impact on trade, investments, development, and growth" with particular reference to the findings from the study conducted by United Nations Office on Drugs and Crime (UNODC) on "Pirates of the Gulf of Guinea, a cost analysis for the coastal states", was noted that piracy has "significant direct, indirect and opportunity costs to the region where it occurred", and thereby requesting for a regional cooperation to strengthen the measures to combat piracy [38].

According to [32], maritime piracy has long troubled both the world shipping and the people living near the coast. The modern day piracy and armed robbery have even becoming a common threat to international commercial shipping as well [20].

Maritime security risks and maritime economic challenges in Nigerian

Maritime security risks are serious and are becoming much problematic in the world today, especially in Nigerian waters [3]. Maritime security risks impose both human and economic costs on shipping industry. Human cost comes in the form not only of ships being hijacked and seafarers or passengers held hostage, injury during attacks and sometimes death [11]. The cost of maritime security risks such as armed robbery, terrorism, piracy, militancy, smuggling, documentary fraud, vandalism, cargo theft, kidnapping, illegal unreported unregulated (IUU) fishing and hijacking in the maritime industry on the global economy has been estimated to be between $10 to $12 billion (USD) per year [14]. At the end of 2020, 600 seafarers from more than 18 countries were being held hostage by pirates [14]. Previously, Nigeria, for instance, has witnessed 233 armed robbery and piracy against ships between 2003 and 2011[15]. In 2018, 107 attacks or piracy were reported globally [17]. [17] excerpt showed 26 attempted and actual attack incidents of armed robbery and piracy against ships between January and December 2019 in Nigerian waters.

Maritime business involving international seaborne trade attracts high patronage from both local and international investors. Foreign vessels coming in and out of Nigerian waters, including those involved in mobile offshore drilling unit operation and its associated businesses supposed to form the basis for Nigerian maritime huge income generation. Whereas, according to [42], the United Nations Office for West Africa and the Sahel (UNOWAS), "preceding the year 2018, Nigeria has suffered an estimated loss of $2.8 billion in revenues from oil related alone due to the activities of sea pirates and armed robbers".

Every nation has the principal responsibility of territorial protection and as well as upholding its international relations. The tripods upon which national interests are found are integrity of national sovereignty, the economic well-being as well as international prestige [17]. Nigeria as International Maritime Organization

(IMO) member state, which depends largely on imported consumable commodities and largely on foreign services supposed to put in place adequate force and other intelligent measures that will protect its maritime environment and ensure high security level within the jurisdiction of the nation's territorial water and her Exclusive Economic Zones (EEZ) [40]. Although, much has not been written on this area of study, specifically on the Nigerian maritime security risks and its impact on its maritime trade-related, however, a number of empirical studies conducted and research papers presented revealed that there is need for further work and much of these work require a holistic research approach on some focus area of study, a path which motivated the researcher into this study. For instance, study conducted by [8] on maritime security and threat assessments, using descriptive statistics with a one way ANOVA, only established the link between maritime security and economic threat level that affect the marine insurance companies in terms of economic risk communication, but does not extensively discuss its effect on other indices that constitute in the maritime trade. So, this study also considers establishing the relationship between maritime security risks and the relevance variables identified as part of the Nigerian maritime trade such as employment, GDP contribution and the number of ships call in relation to revenue generation.

A study investigated by [33] on the effects of the level of global and local attacks against ships on economic development in Nigeria using an ex-post facto research design method with the time series secondary data was opined that marine economic growth decreases with increase in attacks against ships in Nigerian maritime sphere and also decreases with increase in volume of cargo pilfered from the ports. The author further expressed that a unit increase in the level of local attacks and cargo theft caused a decrease in Gross Domestic Product (GDP) by certain unit and concluded that piracy has a significant impact on the growth of Nigerian seaborne economy.

Similar study conducted by [9] on Piracy and Economic Growth of Countries in the Gulf of Guinea, using secondary time series data of piratical attacks, GDPs and GDP growth rates of countries in the gulf of guinea between 2003 and 2018 revealed that maritime security risks such as hostage taking, oil theft and armed robbery have significant adverse effect on the economic growth of countries in the Gulf of Guinea. Another study performed by [31] on the analysis of the influence of economic growth on trend of sea piracy and armed robbery attacks in Nigeria using Log linear multiple regression analysis and trend analysis methods indicated that "a unit annual increase in GDP (economic growth) causes the pirate attacks against ships to decrease by 3.81units while a unit increase in revenue generated by the maritime transport sub-sector induces a 0.007 unit decrease sea pirate attacks against ships in Nigeria. A unit increase in youth unemployment rate increases pirate attacks against ships in the Nigeria waters by 0.158units.

Maritime security risks management

Strategy adopted by the US Department of Homeland Security–United States Coast Guard (USCG) [44]on security risks management is much appealing for study. [44] provided guidance for performing security assessments including measures to aid risks mitigation through an effective risk-based decision making. Risk-based decision making is often regarded as the best conclusive component when performing a security assessment and helps to determine appropriate security measures to take [13]. It is logical and critical progression to contemplate the probability that a security breach will endanger an asset, personnel, or function to identify actions to reduce the exposure to dangers and mitigate their potential consequences [16]. Normally, during the assessment process, possible weaknesses could be identified, for example, unprotected access points such as the pilot boarding ladder not being raised or side ports not being secured or monitored after stores [18]. To mitigate this threat, a vessel would implement a kind of standard operating procedures that ensure access points must always be secured and verified by some means while the vessel is operational either while at sea or berth in the port [25].

MATERIALS AND METHODOLOGY

In order to achieve the objectives of the study, a quantitative research designed method was used in which a time series secondary data of the frequency of armed robbery and piracy incidents covering a period of 22 years from 1999 to 2020 was used. Again, data on the Gross Domestic Product (GDP) was obtained from the

Nigerian National Bureau for Statistics (NBS) annual statistical reports covering the same period and used as a proxy for maritime economic growth in Nigeria.

The data obtained was analyzed using the Log linear multiple regression method, the relationship showing the influence of pirate attacks against ships in Nigerian waters over the period of 22 years is given by equation (3.1) to (3.3):

$$PIRATE = \beta_0 + \beta_1 T + e \qquad (3.1)$$

$$PIRINJUR = \beta_0 + \beta_1 T + e \qquad (3.2)$$

$$PIRDEATHS = \beta_0 + \beta_1 T + e \qquad (3.3)$$

Where:

PIRATE = Pirate attacks against ships trading in Nigeria waters over the period of 22 years.

OGATTACKS = attacks against offshore oil and gas infrastructure over the period of 22 years..

IUU= illegal unreported unlawful fishing activities in Nigerian maritime domain over the period

PIRINJUR = piracy related injuries affecting maritime workers in Nigeria over the period of 22 years.

PIRDEATHS = piracy related deaths affecting maritime workers in Nigeria over the period of 22 years.

The Log-log constant elasticity model was used to analyze objectives of the study. The Model specifications are shown below:

  i. For the elastic relationship depicting the influence of maritime security risks on the GDP contribution of the Nigerian maritime trade is:

$$LOGGDP = \beta_0 + \beta_1 LOGPIRATE + \beta_2 LOGPIRDEATH + \beta_3 LOGIUU + \beta_4 LOGOGTACKS + \beta_5 LOGINJUR + e \qquad (3.4)$$

  ii. For the elastic relationship depicting the influence of maritime security risks on the extent of unemployment in Nigerian maritime industry is:

$$LOGUNRATE = \beta_0 + \beta_1 LOGPIRATE + \beta_2 LOGPIRDEATH + \beta_3 LOGIUU + \beta_4 LOGOGTACKS + \beta_5 LOGINJUR + e \qquad (3.5)$$

  iii. For the elastic relationship depicting the influence of maritime security risks on ship calls to Nigerian waters is: $LOGSHCALS = \beta_0 + \beta_1 LOGPIRATE + \beta_2 LOGPIRDEATH + \beta_3 LOGIUU + \beta_4 LOGOGTACKS + \beta_5 LOGINJUR + e \qquad (3.6)$

RESULTS AND DISCUSSION OF FINDINGS

Table 4.1: Descriptive Statistics of the Parameters of Maritime Security Risks and Maritime Sector Performances in Nigeria

	N	Minimum	Maximum	Sum	Mean
PIRATE	22	9.00	45.00	528.00	24.0000
UNRATE	22	6.00	23.10	226.10	10.2773
GDPMRT	22	5482.35	154252.32	1243949.61	56543.1641
PIRDEATH	22	.00	30.00	160.00	7.2727
PIRINJUR	22	6.00	69.00	458.00	20.8182
SHIPCALS	22	3762.00	5369.00	100168.00	4553.0909

OGATTACKS	22	481.00	3700.00	40990.00	1863.1818
MARITIMETRADE	22	.00	35115000000.00	353297560120.00	16058980005.4545
Valid N (listwise)	22				

Descriptive Statistics	
	Std. Deviation
PIRATE	11.57995
UNRATE	3.71029
GDPMRT	35014.72557
PIRDEATH	6.04886
PIRINJUR	15.30837
SHIPCALS	452.47246
OGATTACKS	1066.87678
MARITIMETRADE	9847946620.72285
Valid N (listwise)	

Source: Author's calculation

Table 4.1 above shows the descriptive statistics of the dataset used in the study. The result indicates the mean value of pirate attacks against ships trading in Nigerian waters per annum over the 22 years covered in the study is 24.0 with a standard deviation of 11.579 while the average unemployment rate related to maritime security risks in Nigeria over the period is 10.27 with standard deviation 3.710. Similarly, the mean GDP contribution of the maritime sector over the period is 56543.164 billion naira with standard deviation 35014.0. The average piracy related deaths and injuries suffered by maritime workers over the period are 7.27 and 20.81 respectively with respective standard deviations of 6.04 and 15.30.

Table 4.2: Relationship between Maritime Security Risks and the Gross Domestics Products (GDP) Contribution of the Maritime Sector in Nigeria

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	Durbin-Watson
1	.760[a]	.582	.295	.58247	1.763

ANOVA[a]						
Model		Sum of Squares	Df	Mean Square	F	Sig.
1	Regression	4.196	4	1.049	3.902	.046[b]
	Residual	5.428	16	.339		
	Total	9.624	20			

Coefficients[a]						
Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	4.218	7.136		.591	.563
	LOGPIRATE	.489	.314	.351	1.558	.139
	LOGPIRDEATH	.061	.249	.053	.243	.811
	LOGIUU	1.418	10.048	.043	.141	.890
	LOGOGATTACKS	.497	.302	.478	1.648	.119
	LOGINJUR	.054	.252	.048	.265	.765
a. Dependent Variable: LOGGDP						

Source: Authors Calculation.

Table4.2 shows the result of the relationship between the Gross Domestic Product (GDP) contribution of the maritime transport sector and trend of maritime security threats in Nigerian waters. The result of the study shows that the coefficient of correlation R which measures the degree of correlation between the GDP contribution of the maritime sector and trend of maritime security threats in Nigerian maritime industry is 0.760. This implies that the existence of about 76% correlation between the GDP contribution of the maritime

sector and maritime security threats in Nigeria maritime industry measured by pirate attacks against ships, attacks on offshore oil and gas (O&G) installations in Nigeria, illegal unregulated (IUU) fishing, piracy related deaths and piracy related injuries in Nigerian waters.

The model showing the elastic relationship depicting the influence of maritime security threats on the GDP contribution of the Nigerian maritime transport industry is:

LOGGDP = 4.218 + 0.489LOGPIRATE + 0.61LOGPIRDEATH + 1.418LOGIUU + 0.497LOGOGTACKS + 0.054LOGINJUR +e   **(4.1)**

This implies that a 1% increase pirate attacks against ships trading in Nigerian waters leads to a 0.498% increase in GDP contribution of the maritime transport sector while a 1% increase in piracy related deaths in Nigerian waters leads to 0.6% increase GDP contribution of the maritime transport sector over the 22 years period covered in the study. The result also indicates that for each 1% increase in illegal unregulated fishing activities in Nigerian waters, GDP contribution of the maritime transport sector in Nigerian ports increased by 1.418% and for each 1% increase in offshore O&G attacks, GDP contribution of the maritime transport sector increased by 0.497% while the GDP contribution of the maritime transport sector increased by 0.054% for each 1% increase in piracy related injuries affecting maritime workers in the Nigerian maritime industry.
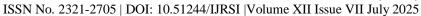
The result show the existence of inelastic relationship between the GDP contribution of the maritime transport sector and trend of pirate attacks against ships, attacks against offshore O&G sector, piracy related deaths and piracy related injuries in the Nigerian maritime domain. It however shows the existence of elastic relationship between GDP contribution of the maritime transport sector and trend of IUU fishing operations in Nigerian maritime industry (1.418>0). The implication is that the trend of maritime security threats in Nigerian waters limits the extent of growth of GDP contribution of the maritime transport sector in Nigeria over the years.

The coefficient of determination r^2 which measures the explanatory power of the model is 0.582. This indicates that about 58% variation in the GDP contribution of the maritime transport sector in Nigeria is explained by the variables of maritime security challenges in Nigerian waters.

Table 4.3: Relationship between Maritime Security Risks and Unemployment Rate in Nigeria

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	Durbin-Watson
1	.731[a]	.534	.430	.30515	1.120

ANOVA[a]

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	.158	4	.040	3.524	.046[b]
	Residual	1.490	16	.093		
	Total	1.648	20			

Coefficients[a]						
Model		Unstandardized Coefficients		Standardized Coefficients	T	Sig.
		B	Std. Error	Beta		
1	(Constant)	1.796	3.739		.480	.637
	LOGPIRATE	-.193	.165	-.333	-1.170	.259
	LOGPIRDEATH	-.044	.131	-.095	-.340	.738
	LOGIUU	1.585	5.264	.116	.301	.767
	LOGOGATTACKS	-.032	.158	-.075	-.203	.841
	LOGINJUR	-.035	.153	-.086	-.331	.0681
a. Dependent Variable: LOGUNRATE						

Table 4.3 shows the result of the result of the relationship between the unemployment rate in Nigeria and the trend of security risks in the Nigerian maritime domain over the 22 years period covered in the study. The result of the study shows that the coefficient of correlation R which measures the degree of correlation between the unemployment rate and extent of maritime security risks in Nigerian maritime domain is 0.731. This implies that the existence of about 73% correlation between the unemployment rate in Nigeria and maritime security threats in Nigeria maritime industry measured by pirate attacks against ships, attacks on offshore oil

and gas (O&G) installations in Nigeria, illegal unregulated and unlawful (IUU) fishing operations, piracy related deaths and piracy related injuries in Nigerian waters.

The model showing the elastic relationship depicting the influence of maritime security threats on the extent of unemployment in Nigerian maritime industry is:

LOGUNRATE = 1.796 - 0.193LOGPIRATE – 0.044LOGPIRDEATH + 1.585LOGIIUU - 0.032LOGOGTACKS - 0.0351LOGINJUR +e **(4.2)**

This implies that a 1% increase pirate attacks against ships trading in Nigerian waters leads to a 0.193% decrease in the unemployment rate in Nigeria. A 1% increase in piracy related deaths in Nigerian waters leads to 0.044% decrease in unemployment rate in Nigeria while a 1% increase in IUU fishing activities increases unemployment rate in Nigeria by 1.585% over the 22 years period covered in the study. The result also indicates that for each 1% increase in attacks in the offshore O&G sector in Nigerian waters, the unemployment rate in Nigeria decreases by 0.032% and for each 1% increase in piracy related injuries, the unemployment rate in Nigeria decreases by 0.035%. The coefficient of determination r^2 which measures the explanatory power of the model is 0.534. This indicates that about 53% variation in the unemployment rate in Nigeria is explained by maritime security threats and challenges affecting maritime operations in Nigeria.

Table 4.4: Relationship between Ship Calls to Nigerian Waters and Variations in Trend of Security Risks in Nigeria Maritime Industry
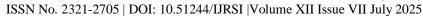
Model	R	R Square	Adjusted R Square	Std. Error of the Estimate			Durbin-Watson
1	.747[a]	.558	.447	.07428			1.857

ANOVA[a]

Model		Sum of Squares	Df	Mean Square	F	Sig.	
1	Regression	.111	4	.028	5.047	.008[b]	
	Residual	.088	16	.006			
	Total	.200	20				

Coefficients[a]

Model		Unstandardized Coefficients		Standardized Coefficients	T	Sig.
		B	Std. Error	Beta		
1	(Constant)	8.437	.910		9.271	.000
	LOGPIRATE	-.010	.040	-.049	-.244	.810
	LOGPIRDEATH	-.053	.032	-.323	-1.659	.117
	LOGIUU	-1.059	1.281	-.223	-.827	.421
	LOGOGATTACKS	.141	.038	.943	3.670	.002
	LOGINJUR	-041	.029	-.312	-1.54	.211
a. Dependent Variable: LOGSHIPCALS						

Table 4.4 shows the result of the result of the relationship between ship calls to Nigerian waters and maritime security challenges in Nigerian waters. The result of the study shows that the coefficient of correlation R which measures the degree of correlation between ship calls to Nigerian waters and maritime security challenges in Nigerian maritime domain is 0.747.

This implies the existence of about 75% correlation between the ship calls to Nigerian waters and maritime security threats in Nigeria maritime industry measured by pirate attacks against ships, attacks on offshore oil and gas (O&G) installations in Nigeria, illegal unregulated and unlawful (IUU) fishing, piracy related deaths and piracy related injuries in Nigerian waters.

The model showing the relationship depicting the influence of maritime security risks on ship calls to Nigerian waters is:

LOGSHCALS = 8.437 - 0.010LOGPIRATE - 0.053LOGPIRDEATH – 1.059LOGIIUU + 0.141LOGOGTACKS - 0.041LOGINJUR +e **(4.3)**

This implies that a 1% increase pirate attacks against ships trading in Nigerian waters leads to a 0.010% decrease in ship calls to Nigerian ports. A 1% increase in piracy related deaths in Nigerian waters leads to 0.053% decrease in ship calls to Nigerian ports while a 1% increase in IUU fishing activities decreases ship traffic in Nigerian waters by 1.059% over the 22 years period covered in the study. The result also indicates that for each 1% increase in attacks in the offshore O&G sector in Nigerian waters, the ship traffic in Nigeria waters increased by 0.141% while a 1% increase in piracy related injuries affecting maritime workers led to a 0.041 decrease in ship calls to Nigerian waters over the 22 years covered in the study.

The coefficient of determination r^2 which measures the explanatory power of the model is 0.558. This indicates that about 56% variation in the ship traffic in Nigerian waters is explained by maritime security threats and challenges in Nigeria maritime domain.

Table 4.5: Differences in Pirated Related Death and Injury by Seafarers in Nigeria Waters

		Mean	N	Std. Deviation	Std. Error Mean
Pair 1	PIRDEATH	7.2727	22	6.04886	1.28962
	PIRINJUR	20.8182	22	15.30837	3.26376

Paired Samples Test

		Paired Differences			
		Mean	Std. Deviation	Std. Error Mean	95% Confidence Interval of the Difference
					Lower
Pair 1	PIRDEATH - PIRINJUR	-13.54545	15.52180	3.30926	-20.42744

Paired Samples Test

		Paired Differences		t	df	Sig. (2-tailed)
		95% Confidence Interval of the Difference				
		Upper				
Pair 1	PIRDEATH – PIRINJUR	-6.66347		-4.093	21	.001

Source: Authors Calculation.

Table4.5 shows the result of the paired sample t-test carried out to compare piracy related deaths and injuries in Nigerian maritime domain. The result indicates that the average piracy related deaths affecting seafarers in Nigeria per annum over the period covered in the study is 7.3 maritime workers with a standard deviation of 6.048. Similarly, the average number of maritime workers affected by piracy related injuries in Nigerian maritime domain over the period covered in the study is an average of 20.818 workers per annum with a standard deviation of 15.308. The difference of means between piracy related deaths and injuries is 13.545 maritime workers. The t-score of -4.093 and p-value of 0.001 at alpha value of 0.005 indicates that the number of maritime workers in Nigeria affected by piracy related injuries is significantly higher than the number of maritime workers affected by piracy related deaths.

Table 4.6: Test of H_{01}: There is no significant Relationship between Maritime Security Threats and the Gross Domestics Products (GDP) Contribution of the Maritime Sector in Nigeria

Hypotheses	F-cal.	F-critical	p-value/sig.	Decision
H_{01}	3.902	3.10	0.046	Reject H_{01}
Variable	t-cal.	t-critical	p-value/sig.	Decision
LOGPIRATE	1.558	1.86	.139	Not significant
LOGPIRDEATH	.243	1.86	.811	Not Significant
LOGIUU	.141	1.86	.890	Not significant
LOGOGATTACKS	1.648	1.86	.119	Not Significant
LOGINJUR	.265	1.86	.765	Not significant

Source: Authors calculation. Reject *null hypotheses if F-cal > f-critical; Accept null hypotheses if F-cal.< F-critical*

The test of hypothesis H_{01} shown table 4.6 above shows F-score of 3.902, F-critical of 3.10, and p-value of 0.046. Since F-score is greater than F-critical, (3.902> 3.10), we reject the null hypothesis H_{01} and accept the alternate. We conclude that there is significant relationship between maritime security threats and the GDP contribution of the maritime transport sector in Nigeria.

Similarly, t-test was conducted to investigate the significances of the individual effects of the pirate attacks against ships in Nigeria waters, piracy related deaths, illegal unregulated unlawful (IUU) fishing operations, offshore O&G sector attacks and piracy related injuries affecting maritime workers in Nigeria. The result reveal that non-oil pirate attacks against ships trading in Nigerian waters, piracy related deaths, piracy related injuries, IUU fishing operations and security attacks against the offshore O&G sector have significant effects on the GDP contribution of the maritime transport sector in Nigeria over the period.

Table 4.7: Test of H_{02}: There is no significant relationship between Nigeria's unemployment rate and maritime security threats in Nigeria waters

Hypotheses	F-cal.	F-critical	p-value/sig.	Decision
H_{02}	4.978	3.10	0.047	Reject H_{06}
Variable	t-cal.	t-critical	p-value/sig.	Decision
LOGPIRATE	-1.170	1.86	.259	Not significant
LOGPIRDEATH	-.340	1.86	.738	Not Significant
LOGIUU	.301	1.86	.767	Not significant
LOGOGATTACKS	-.203	1.86	.841	Not Significant
LOGINJUR	-.331	1.86	.068	Not significant

Source: Authors calculation. Reject *null hypotheses if F-cal > f-critical; Accept null hypotheses if F-cal.< F-critical*

The test of hypothesis H_{02} shown table 4.7 above shows F-score of 4.978, F-critical of 3.10, and p-value of 0.047. Since F-score is greater than F-critical, (4.978>3.10), we reject the null hypothesis H_{06} and accept the alternate. We conclude that there is significant relationship between unemployment rate in Nigeria and trend of maritime security challenges in Nigeria waters. Similarly, t-test was conducted to investigate the significances of the individual effects of the pirate attacks against ships in Nigeria waters, piracy related deaths, illegal unregulated unlawful (IUU) fishing, offshore O&G sector attacks and piracy related injuries affecting maritime workers in Nigeria. The result reveal that non-oil pirate attacks against ships trading in Nigerian waters, piracy related deaths, piracy related injuries, IUU fishing operations and security attacks against the offshore O&G sector have significant effects on the unemployment rate in Nigeria.

Test of Hypotheses H_{03}: There is no significant relationship between ship calls to Nigerian waters and variations in trend of maritime security risks in Nigeria.

Variables	hypotheses	F-score.	F-critical	p-value/sig.	Alpha value	Decision
PIRATE	H_{03a}	1.863	3.10	0.187	0.05	Accept H_{01a}
OGATTACS	H_{03b}	3.558	3.10	0.047	0.05	Reject H_{01b}
IUU	H_{03c}	5.168	3.10	0.034	0.05	Reject H_{01c}
PIRDEATHS	H_{03d}	0.355	3.10	0.558	0.05	Accept H_{01d}
PIRINJUR	H_{03e}	0.090	3.10	0.767	0.05	Accept H_{01e}

Source: Authors calculation. *Accept null hypotheses if P-value>0.05; Reject null hypotheses if p-value<0.05*

The test of hypothesis H_{03a}, reveals an f-score of 1.863; p-value of 0.187 and alpha-value of 0.005. Since p-value>alpha-value (0.187>0.05), we accept the null hypothesis H_{03a} and conclude that there is no significant increase in the trend of pirate attacks against ships in Nigerian waters over the period covered in the study. Though the trend of pirate attacks against ships in Nigeria is increasing, the rate of increase in not significant.

The test result reveal that the hypothesis H_{03b} has F-score coefficient of 3.558, p-value of 0.047 and alpha value of 0.05. Since the p-value is less than the alpha value (0.047<0.05); we reject the null hypothesis H_{01b}

and accept the alternate that there is significant increase in the trend of attacks against offshore O&G operations in Nigerian waters over the period covered in the study.

Similarly, the result of the test of hypothesis H_{01c} reveal an f-score of 5.168, p-value of 0.034 and alpha value of 0.05. Since the p-value is less than the alpha value (0.034<0.05), we reject null hypothesis H_{01c} and accept the alternate that there is significant increase in the trend of illegal unregulated unlawful (IUU) fishing operations in Nigerian maritime industry over the 22 years covered in the study.

Furthermore, the test of hypothesis H_{03d} reveal an f-score 0.355, p-value of 0.558 and alpha value of 0.05. Again since the alpha value is less than the p-value, we accept null hypothesis H_{01d} and conclude that there is no significant increase in the trend of piracy related deaths affecting maritime workers in Nigerian maritime industry over the years. Though piracy related deaths in Nigerian maritime domain is increasing in trend, the rate of increase in not significant.

Lastly, the test of hypothesis H_{03e} reveal f-score 0.090, p-value of 0.767 and alpha value of 0.05. Since alpha value is less than p-value (0.05<0.767), we accept the null hypothesis H_{01e} to conclude that there is no significant increase in the trend of piracy related injuries affecting maritime workers in Nigeria over the period covered in the study. Though the trend of piracy related injuries is increasing over the period, the rate of increase is not significant.
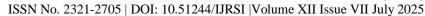
CONCLUSION

The study has been able to analyse the effects of maritime security risks on Nigerian maritime trade-related in relation to maritime sector operations and performances in Nigeria. The study concludes in line with the aim and objectives of the study that:

i.   For each 1% increase pirate attacks against ships trading in Nigerian waters leads to a 0.101% increase in port revenue generated over the period while a 1% increase in piracy related deaths in Nigerian waters leads to 0.108% increase port revenue generated over the 22 years period covered in the study. The result also indicates that for each 1% increase in illegal unregulated fishing activities in Nigerian waters, port revenue in Nigerian ports increased by 1.92% and for each 1% increase in offshore O&G attacks, port revenue increased by 0.068% while port revenue increased by 0.016% for each 1% increase in piracy related injuries in the Nigerian maritime industry.

ii. There is significant relationship between unemployment rate in Nigeria and trend of maritime security challenges in Nigeria waters. The result reveal that none of pirate attacks against ships trading in Nigerian waters, piracy related deaths, piracy related injuries, IUU fishing operations and security attacks against the offshore O&G sector have significant effects on the unemployment rate in Nigeria.

iii. There is significant relationship between maritime security threats and the GDP contribution of the maritime transport sector in Nigeria. non of pirate attacks against ships trading in Nigerian waters, piracy related deaths, piracy related injuries, IUU fishing operations and security attacks against the offshore O&G sector have significant effects on the GDP contribution of the maritime transport sector in Nigeria over the period.

RECOMMENDATIONS

Having identified some critical issues in relation to maritime risks and the Nigerian seaborne trade, and knowing the significance of addressing those challenges to the maritime security as earlier discussed in the study, this study therefore make the following recommendations:

(i) In order to achieve increased growth in the value of Nigeria's non-oil shipping trade, the security challenges bedevilling the Nigerian waters must be addressed. This is because maritime security threats are responsible for about 66% variation in the value of Nigeria's non-oil shipping trade over the period. One way of tackling this issue is for the government through its maritime administration, adapt a comprehensive security risk management strategy, a typical of USCG (2004), home security management approach earlier discussed in the study. This approach has been

found to have drastically enhanced security status at the USA maritime home front

(ii)   Maritime security threats comprised of pirate attacks against ships, piracy related deaths, piracy related injuries, attacks against offshore O&G operations and IUU fishing operations are responsible for about 77% variations in revenue generated in the Nigerian ports. Maritime security policies should therefore be strategically implemented to limit the influences of these security threats in the Nigerian maritime industry.

(iii)   Piracy related injuries affecting maritime workers are significantly higher than piracy related deaths. Therefore operators should prioritize the implementation of maritime security policies that seeks to reduce piracy related injuries affecting maritime workers in Nigeria.

(iv)   The trend of security threats and challenges in Nigeria waters in increasing over the period covered in the study and this have negative implications on the development of the maritime sector in Nigeria. The Nigeria maritime administration and safety agency (NIMASA) should implement policies to reverse the increasing trend pirate attacks, IUU fishing operations, offshore O&G sector attacks, and piracy related deaths and piracy related injuries affecting maritime workers in Nigeria.

The finding of the study indicates that maritime security risks are responsible for about 53% variations in the unemployment rate in Nigeria. Therefore, Nigeria's maritime security governance strategies should seek to limit the occurrence of maritime security incidents in addressing the challenges of youth unemployment and the other causes behind the cause of maritime insecurity in Nigeria.

The recommendations highlighted above based on the empirical findings of the study show the necessity of enhancing maritime security in Nigeria in order to sustain the growth of maritime trade-related in the nation. Taking a holistic policy and technical intervention programme to curb the security challenges would maximize positive security perception about Nigerian maritime environment and hence encourage more patronage from maritime global sphere. Such policy framework should also aim at providing the basic needs and as well improving the socio-economic wellbeing of teeming youths in the nation.

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