Trend Analysis of Maritime Security Threats and its Implications on Nigerian Seaborne Trade

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ABSTRACT

The study analysed the effects of maritime security threats on value of seaborne trade in Nigeria. The objectives of the study were among other things: to estimate the trend of maritime security threats to which shipping trade is exposed to in Nigerian waters, to determine coefficient of elasticity of the value of non-oil shipping trade to variations in trends of maritime security threats in Nigeria and to determine the elasticity of port revenue to changes in trend of maritime security risks in Nigeria.. The study used quantitative research design method. Time series secondary data covering a period of 22 years from 1999 to 2020 on pirate attacks against ships trading in Nigeria, piracy related deaths and injuries affecting maritime workers 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% 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 variations in maritime security threats on the value of non-oil shipping trade in Nigerian maritime industry is: LOGSEATRADE = 9.882+0.636LOGPIRATE + 0.043LOGPIRDEATH + 0.023LOGINJUR +e. The model showing the elastic relationship depicting the influence of variations in maritime security risks on the value of port revenue in Nigerian maritime industry is: LOGPOREV = 5.536 + 0.101LOGPIRATE + 0.108LOGPIRDEATH + 0.016LOGINJUR +e. It was recommended among other things that 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.

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

INTRODUCTION

The maritime industry is an indispensable economic segment that contributes more than 80% of the world's trade by volume to the growth of the global economy. The sector generates an estimated annual income worth billions of US dollars; enriching mostly major maritime nations and others. For instance, as at 2022, the world seaborne trade was estimated at 11.5 billion tons [39]. The industry is also an important facilitator to other global trade networks and cost-effective in terms of transport services within and outside any nation.

In recent years, great strides have been made to render maritime transport system as open and frictionless as possible in order to spur even greater economic benefits [13]. Nevertheless, it is perceptible that the more open and progress made in the industry, the more vulnerable it becomes to exploitations by security threats such as terrorism, armed robbery, piracy, cargo theft, drug trafficking, human trafficking, stowaway and other unlawful acts that sometimes occur at the port or sea.

The seaborne trade mostly around the developing nations is widely reported to be having challenges that are mainly linked to security threats. Notably, the Gulf of Guinea, the Horn of Africa and the Persian Gulf are currently having the highest maritime security incidents. For instance, in West Africa, incidents of piracy against ships have been reported to include 81 incidents in the year 2018 alone [19]. Prior to the year 2018, [18] reported 4,821 incidents of piracy and armed robbery between 1984 and 2008 globally, while [15], also reported 524 piracy and armed robbery attack between 2015 and 2016.

Maritime security threats are serious and are becoming much problematic in the world today, including Nigerian waters and imposing both human and economic costs. Human cost comes in the form not only of ships being hijacked and seafarers or passengers held hostage, but injury during attacks and sometimes death. The cost of maritime security threats has been estimated to cost between $10.5 and $12 billion (USD) per year [27]. For example, at the end of 2020, 600 seafarers from more than 18 countries were being held hostage by pirates and much money has been expended as well [27]. The security of sea ports and ships is essential to the efficiency and effectiveness of ports operations. The exporters want to be sure that the goods entering the seaport will safely get to the importers while the ship owners also need to be convinced that the ship is not sailing or anchored at owners' risk. In the same vein, wives, children and kinsfolks want their bread winners, friends and people (seafarers) return home safe and sound. The society and the international community want shipping operations to be free and as much environment friendly as possible. The International Maritime Organization (IMO), being the global maritime regulatory body wants the shipping business to be safe, secured and efficient on clean oceans. The world wants trillions of dollars of revenue that could be generated from maritime sector per annum to sustain.

Though, more efforts have been made both at the international level and national to sustain the industry. For instance, Nigerian government has deployed the services of security agencies and other organizations such as customs, immigration, Navy, National Drug and Law Enforcement Agency and the Nigeria Marine Police to enhance maritime security. There are still notably security gaps to be filled. These gaps are owing to incessant cargo thefts and attacks on ports, maritime facilities, oil and gas facilities and mostly ships coming into Nigerian waters, which at the same time have been thought to have negative impact on maritime trade in general. For instance, Nigeria has witnessed 233 armed robbery and piracy against ships between 2003 and 2011[14]. In 2018, 107 attacks by pirate were reported globally [15]. Recently, [15]. excerpt shows 26 attempted and actual attack incidents of armed robbery and piracy against ships between January and December 2019 in Nigerian waters. The prevalent insecurity dimension seems to be increasing and unacceptable for sustainable maritime trade and motivation.

THE SPECIFIC OBJECTIVES

(i)   To estimate the trend of maritime security threats in Nigerian waters.
(ii)   To determine coefficient of elasticity of the Value of Non-Oil Shipping Trade to variations in Trends of Maritime Security threats in Nigeria
(iii)   To determine the elasticity of Port Revenue to changes in Trend of Maritime Security risks in Nigeria

STUDY HYPOTHESES

H_01:   There is no significant increase in the trend of maritime security risks in Nigerian maritime domain

H_02:   The relationship between the value of Nigeria's non-oil shipping trade and variations in the trend of maritime security risks is not significantly elastic.

H₀3: There is no significant relationship between Port Revenue generated in Nigeria ports and trend of Maritime Security risks in Nigerian waters

LITERATURE REVIEW

The Global seaborne trade and security challenges

Study conducted by [24] on the 'world economic growth and the volume of seaborne trade' using a Vector Error Correction Model (VECM) to capture their long-run relationship with world GDP with particular focus on crude oil, petroleum products and dry cargo transportation using their respective annual data. The study from its findings suggested that all the three types of seaborne trade affected changed in the global economic atmosphere and to an extent their global demand and supply affect either positive or negatively the pattern of the world trade. By this study, the author opined that the negative effect is associated with the inefficiency in security risk management of the inherent risk in the affected system.

An empirical study conducted by [39], using 91 countries with seaports to inquiry into the broader economic contribution of seaborne trade, from a port infrastructure quality and logistics performance perspective. The authors used a structural equation model (SEM) to provide empirical evidence of significant economic impacts of port infrastructure quality and logistics performance. The results of the study revealed that high quality port infrastructure contributes to better logistics performance, which leads to higher seaborne trade, yielding higher economic growth. From this study, it could be deduced that seaborne trade can significantly enhance the economic growth of any nation which participate in it. At the same time, any factor that hinder the seaborne trade invariably impedes the growth of such nation's economy. At this point, this study aimed at investigating the extend insecurity of Nigerian waters could affect the progress of the seaborne trade in the country.

Another study conducted by [42] 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; vc (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 deduced that seaborne trade such as involve 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 commence attack on ships making frequent traffic along the trade route, especially if there is absent of adequate security. The author's findings give an insight 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 seaborne trade to the global economic growth, maritime security risk, particularly, piracy has been acknowledged as a serious challenge to the sustainability of the growth. For instance, [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 show a negative impact and suggested that the international community must enhance measures to curb the menace of piracy.

Study conducted by [30], using quantitative analysis of maritime piracy. The findings from the study indicate 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 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 from the analysis showed that the estimated cost of piracy for international trade was 24.5 billion dollars. The above studies and their findings are giving a limelight on the negative impact of piracy on global economic development and hence indicate 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 [39].

According to [34], maritime piracy has long troubled both the world shipping and the people living near the coast. The modern day piracy has even becoming a common threat to international commercial shipping today [20]. The investigation study by [20] on the global incidents of piracy between 2000 and 2020 provided in figure 2.10 shows attack incidents of 229 in the year 2020, including incidents of wounding and holding hundreds of people hostage.
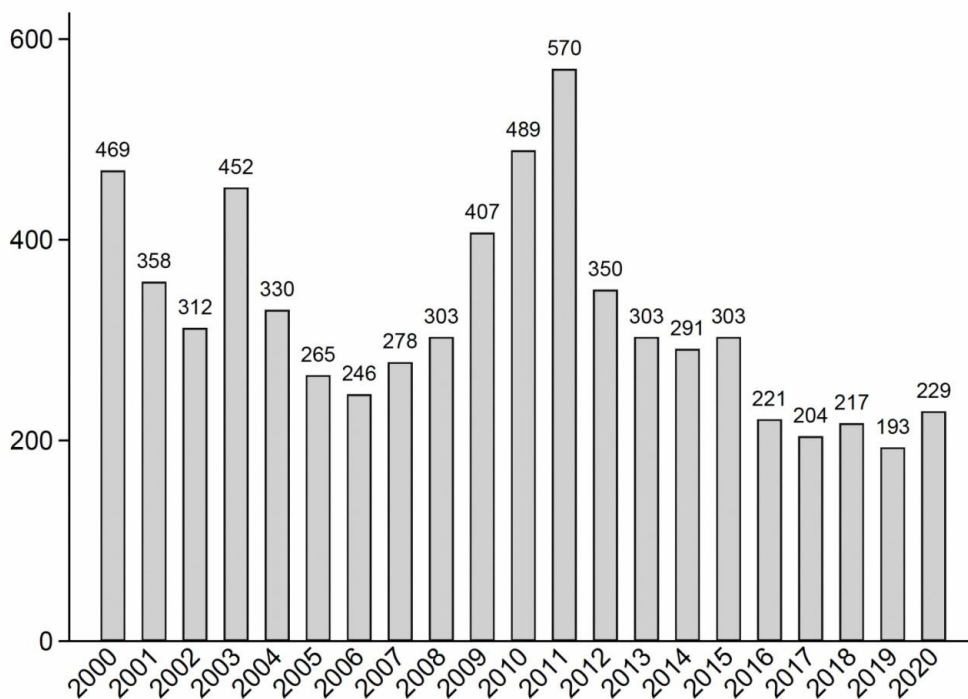

Figure 2.1: Worldwide piracy incidents per year

Source: Sandkamp et al. (2021)

Apart from taking the crew hostage, piracy incidents can also lead to unnecessary ship delays, sometimes result in vessel and cargo damage and shipping companies ending up in rerouting their ships on expensive diversions [6].

Nigerian seaborne trade and maritime security challenges

The notion of seaborne 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 [35]. Many studies have confirmed that seaborne trade is significant to international trade development as more than 70% of world merchandise in terms of volume is being done through the sea [27]; [19]; [39],[42]. Therefore, maritime industry is 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 region to another. In 2019, though the maritime trade was badly hit by covid-19 global pandemic, yet its volume reached 11.08 billion tons and 811.2 TEUs handled in container ports globally [38]. Below is table 2.6 presenting the development of maritime global trade from selected years between 1970 and 2020. This covers trade done by tanker vessels, main bulk vessels and other dry cargo vessels and are measured in million tons per annum.

So, Nigeria having been a maritime nation that has about 750Km coastline and eight major ports, some oil terminals and local terminals, benefits a lot from this trade links and opportunities. In relation to studies, Nigerian ports have a cargo handling capacity of 35million tonnes per annum [2]; [28]; [1];. These ports have

for past years been handling about 99 per cent by volume and 95 per cent by value of the nation's entire seaborne trade [30].

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)

Globally, Nigeria as a maritime state also have a share value of trade potentials recorded in the selected years as shown in the above table 2.1, though not specifically mentioned in the table. Furthermore, [20] had also provided Nigerian Maritime statistics as at January 2019 as follows:

i.   Ship recycling   -   6146 GT
ii.   Fleet – National flag -   4360 thousands DWT (vessels of 100GT and above)
iii.   Fleet – National flag -   696 ships
iv.   Fleet ownership   -   5565 DWT (vessels of 1000GT and above)
v.   Container throughput -   1, 484,000TEU
vi.   Number of seafarer   -   5760
vii.   Number of port calls   -   4420 (vessels of 1000GT and above).

While the seaborne trade may have acted as a catalytic agent for the growth of Nigerian economy, however, it is widely noted that seaborne trading may have been hampered by some unlawful acts against it, specifically the maritime security risks such as armed robbery and piracy, which can further undermine its development [4];[37]. For instance, it is often observed that each time an attack occurred, the insurance premiums will suddenly increase and this usually affect ships routing the affected countries. Some ships may decide to divert their route to other areas where there is cheaper operational cost and ports located in the high risk environment may likely suffer loss in ship traffic, overcapacity and high operating costs. Pirate attack on any ship has significant impact on the shipping economy as well as the maritime domain where the attack took place [29]. Port's revenue usually comes mostly from charges from ships and cargo throughput.

Maritime security challenges in Nigerian waters

[26], analyzed maritime piracy incidents in the Gulf of Guinea region between the year 2002 and 2015. The study result showed that most attacks incident happened in Nigeria. Study performed by [35] on the impact of maritime piracy on trade and transport, shows that piracy attacks are not homogenously distributed across the oceans of the world but rather affected the coastal areas of developing countries more than others and presented the frequency of attack distribution between 2015 and 2020 in figure 2.1. From figure 2.1 below, majority of the attack occurred in the Gulf of Guinea totaling 385, seconded by the South China Sea with 344 incidents and then the Malacca Strait with 283 incidents.
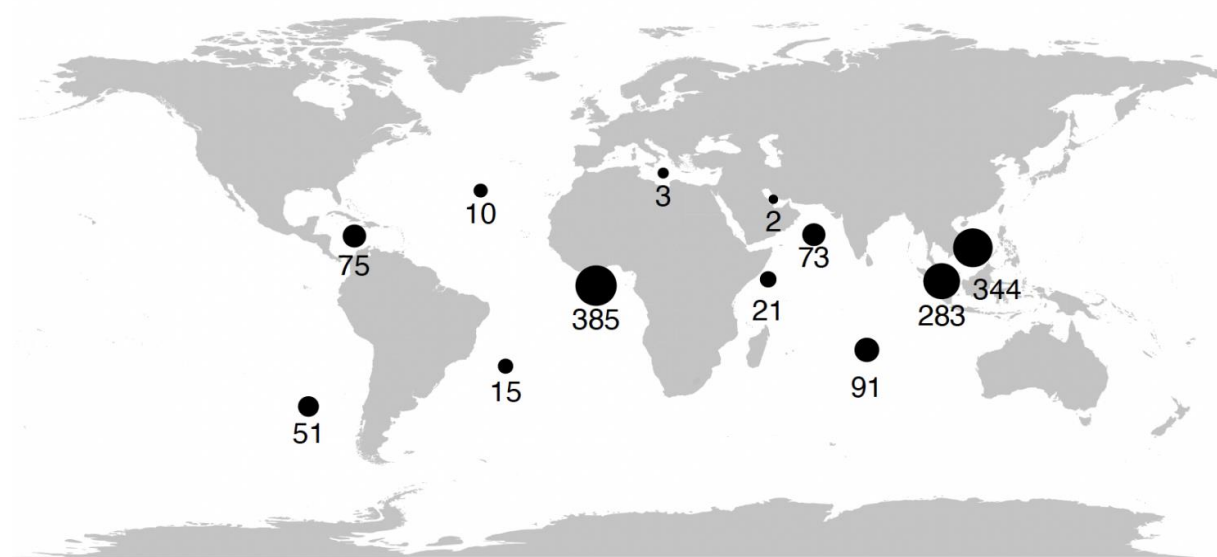

Figure 2.2: The map shows the total number of piracy incidents from 2015 to 2020 by region Source: Sandkamp et al. (2021).

It is important to note that Nigeria falls within the West African countries (The Gulf of Guinea Region), where the attacks mostly occurred and the impact also severely felt. Again, Nigeria being the major producer of oil in the region attracts much present of ship traffic, especially the oil tankers and hence attracting pirates present as well. Study conducted by [7], attempted to examine the security challenges in Nigerian waters with particular focus along the commercial water routes of Bayelsa State using both descriptive and inferential statistics for the data analysis. The authors' findings shows that certain water routes in the state were economically viable and hence attract the present of pirates attacking both ships and oil facilities that are operating along same route. Furthermore, that lack of effective water policing renders the route more insecure for maritime transport operation. The study attributed poor state of security to the high level of illiteracy, poverty and lack of interest by government to develop the area. This study shows the effect of deplorable state of a failed state enshrined in a "fail state theory". A state owes her citizen duty to provide basic needs and in the absent of these basic provisions, illegality of various magnitude, including insecurity has been highlighted by several scholars to characterized such state [9]; [3];[32]. Therefore, these challenges seem to undermine the progress of the seaborne trade in any nation.

Maritime Security threats Management Strategies

This study adapted the concept of performing security risk assessment from US Department of Homeland Security–United States Coast Guard (USCG) on guidance on performing security assessments. This concept is appealing for this study in that, it provides a comprehensive details necessary to aid mitigation of security threats against ships through a risk-based decision making approach. Risk-based decision making is one of the best tools to complete a security assessment and to determine appropriate security measures for a vessel. It is systematic and analytical process to consider the likelihood that a security breach will endanger an asset, individual, or function to identify actions to reduce the vulnerability and mitigate the consequences of a security breach [38].

However, before any decision could be taken on plan, a security risk assessment has to be conducted first. For example, a security assessment will reveal weaknesses in an organization's security systems or unprotected access points such as the pilot boarding ladder not being raised or side ports not being secured or monitored after stores. To mitigate this threat, a vessel would implement procedures to ensure that such access points are secured and verified by some means.

Another security enhancement might be to place locking mechanisms and/or wire mesh on doors and windows that provide access to restricted areas to prevent unauthorized personnel from entering such spaces. Such assessments can identify vulnerabilities in vessel operations, personnel security, and physical and technical security. The following figure 2.3 is the simplified risk-based security assessment that could be further refined and tailored to specific vessels. The processes and results may be documented when performing the assessment.
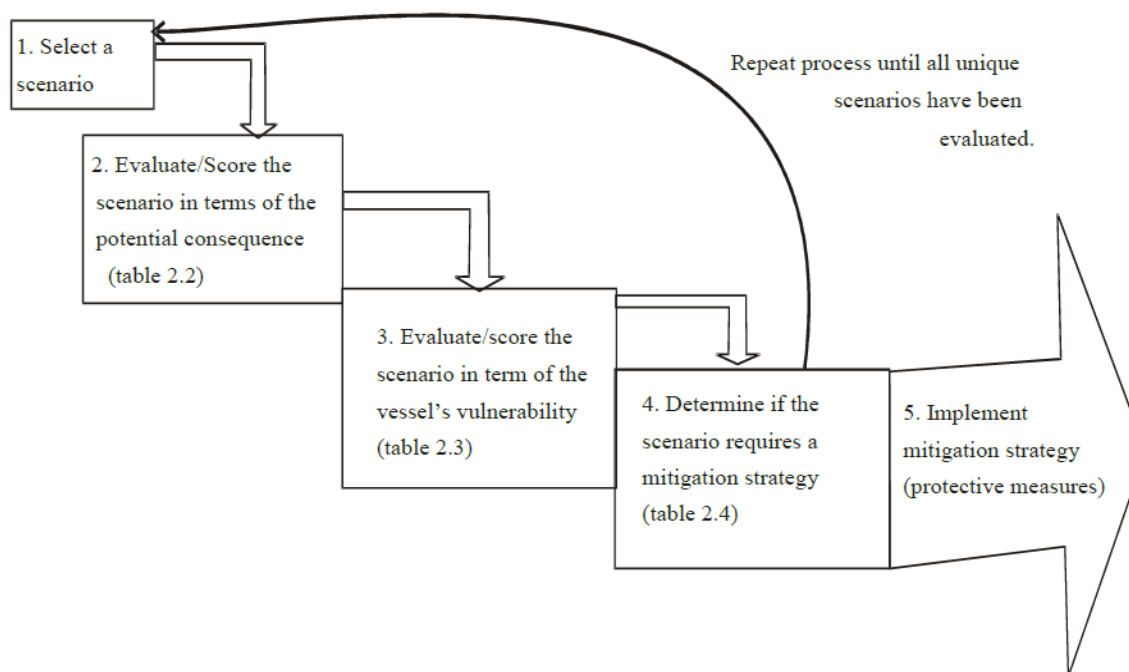
Figure 2.3: A simplified risk-based security assessment process for vessels

Source: Adapted from US Department of Homeland Security – USCG (2004)

There is an increasing demand for maritime security risks management. In principle, security risk management entails an initial acquisition of the primary knowledge security risk assessments. [22], studied on Methodology, which encompasses threats from terrorism, using a systematic computation of ratings supported by logical arguments backed by factual data. The authors used procedural approach to compile the results of the threat assessment, vulnerability assessment and impact assessment to represent a numeric value for the risk to each asset against a specific threat, which was given by:

Risk Rating(R) = Threat Rating (T) x Vulnerability Rating (V) x Impact Rating (I) …. (2.1)

The findings from this study indicated that the systematic approach could aid decision-makers in choosing risk management strategy through ranking different threats in line with their respective Risk Profile. This method helps to explore which mitigation measures could be effective to reduce the risk for valuable assets, and probably provide an idea for logical prioritization for implementation. The approach use in the above study is similar to method used by [38]on risk management and both studies provide information on risk assessment and management strategy. Likewise, considering this study, the effect of maritime security threats on Nigerian seaborne trade, it is important that the level of risk is identified and its trend effect on respective elements of seaborne trade in Nigeria. However, the authors are specifically dealing on terrorism whereas this study focused on piracy attack against ships doing business within Nigerian waters and its impact on the nation seaborne trade.

Generally, risk management strategies and its mechanisms, such as risk assessment and risk analysis; have been adopted since the 1950s for the prevention of major accident hazards in the sphere of space travel and industrial plants [21]. Similarly, these risk component is widely utilized for controlling of security threats vulnerabilities in maritime industry [38]; [23]. [21], in his study on "Risk-based security analysis", further depicts the risk mechanisms or components as shown in figure 2.3:
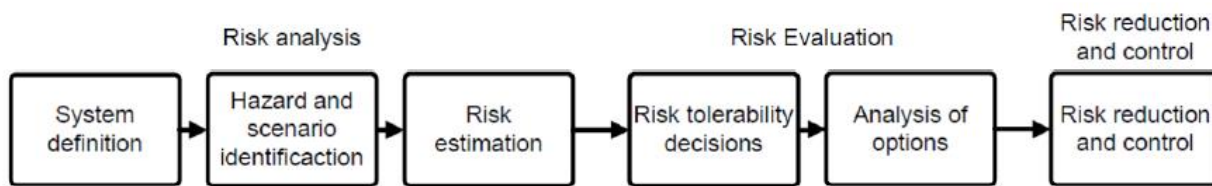
Risk management and its components (.Figure 2.3)

Source: Liwång (2012)

As affirmed by [15] and [27] when performing the risk analysis, the outcome must always be weighed against both risk tolerability levels and other operational parameters, which include financial involvement, the required reliability and possible operational benefits. Usually, higher risks are tolerable if the possible operational benefit is higher than the cost.

Maritime Security Risk Assessment and Management

Though, there is a serious need to adapt a general and comprehensive sustainable approach to security risk assessment and management in the maritime sector, it is observed that only few approaches are available that involve 'a real-time and live' scenarios. These include study, the mitigation approach involved in a study conducted by[35], on dynamic supply chain maritime cyber risk assessment methodology for a Smart Trends in Systems, Security and Sustainability and another study conducted by [36] on a dynamic supply chain cyber risk assessment methodology. [11], also earlier conducted similar study on towards empirical evaluation of automated risk assessment methods, which actually automate the risk assessment process, in a way of making users and stakeholders to collaboratively and asynchronously produce their input for the conduction of dynamic security reassessments. Despite the support for some automation, however, this cannot be considered as self-directed risk assessment systems. Therefore, we see the lack of generic adaptive risk assessment methodologies in the maritime sector. This variation could be a challenge in some scene where vulnerabilities to the attack vary rapidly with time and other changes. This could also be a problem in formulating an acceptable international framework on risk assessment and management strategy, which may be very useful for small maritime states.

MATERIALS AND METHODOLOGY

To achieve the objectives of the study, a quantitative research design method was used. A time series secondary data covering a period of 22 years from 1999 to 2020 was used.

Using the Log linear multiple regression method, the relationship showing the influence of the trend of pirate attacks against ships in Nigerian waters over the period of 22 years is given by equation (3.1) to (3.3)

$$PIRATE = \beta_0 + \beta_1 T + e \tag{3.1}$$

$$PIRINJUR = \beta_0 + \beta_1 T + e \tag{3.2}$$

$$PIRDEATHS = \beta_0 + \beta_1 T + e \tag{3.3}$$

Where:

PIRATE = Pirate attacks against ships trading in Nigeria waters over the period

PIRINJUR = piracy related injuries affecting maritime workers in Nigeria over the period

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

The Log-log constant elasticity model was used to analyse objectives two and three. The Model specifications are shown below:

(i)   The coefficient of elasticity of value of non-oil shipping trade to variations in maritime security threats can be estimated using the model below:

$$LOGSEATRADE = \beta_0 + \beta_1 LOGPIRATE + \beta_2 LOGPIRDEATH + \beta_5 LOGINJUR + e \tag{3.4}$$

(ii)   For the elastic relationship depicting the influence of variations in maritime security threats on the value of port revenue in Nigerian maritime industry is:

$$LOGPOREV = \beta_0 + \beta_1 LOGPIRATE + \beta_2 LOGPIRDEATH + \beta_5 LOGINJUR + e \tag{3.5}$$

RESULTS AND DISCUSSION OF FINDINGS

The data was transformed, analysed and findings and results discussed in subsequent sections.

Table 4.1: Ship Calls to Nigeria Waters and Security incidents

Year	Ship calls (counts)	Piracy related Deaths	Piracy Related Injuries
1999	3,762.00	9	16
2000	4,087.00	4	6
2001	4,473.00	5	10
2002	4,143.00	2	13
2003	4,315.00	4	12
2004	4,553.00	3	11
2005	4,586.00	7	15
2006	4,800.00	30	35
2007	4,644.00	7	69

2008	4,477.00	4	37
2009	4,620.00	4	42
2010	4,962.00	-	28
2011	5,232.00	5	21
2012	4,837.00	12	13
2013	5,369.00	3	14
2014	5,333.00	8	8
2015	5,014.00	11	6
2016	4,373.00	8	8
2017	4,292.00	9	14
2018	4,009.00	5	16
2019	3,814.00	13	36
2020	4,473.00	7	28

Sources: (i) Nigerian Ports Authority (NPA). (ii) IMB reports (iii) Global Initiative against Transnational Organized Crime. Department of Petroleum Resources (DPR)

Table 4.1 indicates the dataset collected from various sources for the study. Each dataset covered a period of 22 years from 1999 to 2020.

Table 4.2:Natural Log Transformation of the dataset Collected for the Study.

lnPIRATE	lnRECOST	UNRATE	lnPOREV	lnGDP	lnDEATH	lnINJUR	lnSHICALS	lnSEATRADE
2.71	7.76	2.26	7.98	8.61	2.2	0.85	8.23	21.44
2.2	1.13	2.26	8.02	10.07	1.39	0.85	8.32	21.8
2.94	1.39	2.25	8.04	10.14	1.61	0.83	8.41	21.89
2.64	1.99	2.25	7.96	10.27	0.69	0.88	8.33	21.77
3.66	2.62	2.26	7.94	10.36	1.39	0.9	8.37	23.16
3.33	3.04	2.25	8.01	10.46	1.1	0.88	8.42	23.41
2.77	3.04	2.24	8.06	10.53	1.95	0.89	8.43	23.57
2.48	2.06	2.22	8.12	10.6	3.4	0.88	8.48	22.72
3.74	2.42	2.2	8.18	10.67	1.95	0.9	8.44	23.75
3.69	2.84	2.25	8.24	10.74	1.39	0.92	8.41	23.96
3.37	2.8	2.24	8.3	10.82	1.39	0.92	8.44	23.32
2.94	3.06	2.25	8.35	10.91		0.89	8.51	23.68
2.3	3.12	2.26	8.25	10.96	1.61	0.88	8.56	23.94
3.3	3.26	2.27	8.23	11	2.48	0.88	8.48	23.89
3.43	2.69	2.29	8.27	11.05	1.1	0.9	8.59	23.78

Source: Authors calculation

Table4.2 above is the natural Log transformation of the dataset on table4.1 and table4.2 to make it amenable for use in implementing the analysis in order to achieve the objectives of the study.

Table 4.3: Descriptive Statistics of the Parameters of Maritime Piracy and Maritime Sector Performances in Nigeria

	N	Minimum	Maximum	Sum	Mean
PIRATE	22	9.00	45.00	528.00	24.0000
PRECOST	22	3.10	2349.66	2782.04	126.4564
UNRATE	22	6.00	23.10	226.10	10.2773
POREV	22	2804.00	5833.00	85642.00	3892.8182
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
SEATRADE	22	.00	35115000000.00	353297560120.00	16058980005.4545
Valid N (list wise)	22				

Descriptive Statistics

	Std. Deviation
PIRATE	11.57995
PRECOST	496.67479
UNRATE	3.71029
POREV	845.61038
PIRDEATH	6.04886
PIRINJUR	15.30837
SHIPCALS	452.47246

SEATRADE	9847946620.72285
Valid N (list wise)	

Source: Author's calculation

Table4.3 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. Similarly, the mean revenue generated by the seaports over the period is 3892.82billion naira per annum with standard deviation of 845.610. 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. The mean value of Nigeria's non-oil shipping trade per annum over the period is 160.58billion with standard deviation of 1066.87.

Table4.4: Trend of Maritime Security threats in Nigeria Relative to the Performances of the Nigeria Maritime sector

Equation/Variable	Model Summary						Parameter Estimates/coefficients			
	Mean	r^2	F	df_1	N	Sig.	Constant	B_1	T	Sig.
PIRATE	24.0000	0.085	1.863	1	22	0.187	18.013	0.521	1,365	0.187
PIRDEATHS	7.2727	0.017	0.355	1	22	0.558	5.857	0.123	0.596	0.558
PIRINJUR	**20.8182**	0.004	0.090	1	22	0.767	19.00	0.158	0.301	0.767

Source: Authors Calculation.

The result of the study as shown in table4.5 above indicate that the model equation showing the trend of pirate attacks against ships in Nigerian waters over the period of 22 years covered in the study is:

PIRATE = 18.013+ 0.521T + e   **(4.1)**

The positive coefficient of regression indicates that relative to the trend of growth in value of Nigerian's non-oil shipping trade, ship traffic in Nigerian waters, among other factors, over the period, pirate attacks in Nigerian waters witnesses an increasing trend. The results also reveals that each unit increase in time (in years) over the period causes a 0.521 unit increase in pirate attacks against ships in Nigeria waters. The coefficient of determination r^2 value of indicates that only about 8.5% variation in attacks is influenced by time as an explanatory variable. The f-score of 1,86 and p-value of 0.187 indicate that there is no significant increase in trend of pirate attacks against ships trading in Nigerian maritime domain over the period. However, the fact that there is no significant increase in trend, it is important to note that 0.521 unit increase could mean a lot to any shipping company under attack within reach of this unit increase. For instance, as earlier mentioned in the literature, [31] that pirate attack against any ship has both moral and economy impact on the ship and the nation where the incident took place. [29] also emphasized that, once an attack occurred within the nation, the insurance premium for ships going toward that region would suddenly increase.

Furthermore, the result of the study also indicate that the model equation showing the trend of piracy related deaths affecting maritime workers in Nigeria over the period of 22 years covered in the study is:

PIRDEATHS = 5.857+ 0.123T + e   **(4.2)**

The positive coefficient of regression also indicates that the trend of piracy related deaths in Nigerian waters over the 22 years period covered in the study is increasing. The results also reveal that each unit change (increase) in time (in years) over the period witnessed a 0.123 unit increase in piracy related deaths affecting maritime workers in Nigeria waters. The coefficient of determination r^2 value of indicates that only about 1.7% variation in piracy related deaths is influenced by time as an explanatory variable. The f-score of 0.355 and p-value of 0.558 indicate that there is no significant increase in trend of piracy related deaths in Nigerian maritime domain over the period. Though, there is no significant increase in death due pirates attack in Nigeria, however, death of any magnitude mean a lot to the family of the victim and also may create a gap in the availability of expertise in the field. Saving life at sea is one of IMO cure mandate and all IMO member states share same value of enhancing maritime security so as to save life at sea. Protection of life at sea is one the key responsibilities of the state. As earlier discussed in the literature, this is not done without commitment and acquiring knowledge on risk assessment and management. Lack of comprehensive approach to risk assessment and mitigation is one the gaps earlier identified in this study, which the researcher aimed at providing solution.

Lastly, the result of the study indicate that the model equation showing the trend of piracy related injuries affecting maritime workers in Nigeria over the period of 22 years covered in the study is:

PIRINJUR = 19.00+ 0.158T + e (4.3)

The positive coefficient of regression also indicates that the trend of piracy related injuries in Nigerian waters over the 22 years period covered in the study is increasing. The results also reveal that each unit change (increase) in time (in years) over the period witnessed a 0.158 unit increase in piracy related injuries affecting maritime workers in Nigeria waters. The coefficient of determination r^2 value of indicates that only about 0.4% variation in piracy related injuries is influenced by time as an explanatory variable. The f-score of 0.090 and p-value of 0.767 indicate that there is no significant increase in trend of piracy related injuries in Nigerian maritime domain over the period.

Using the trend lines established for maritime security threat above, we forecasted/extrapolated the maritime security threats facing operators in the Nigeria maritime industry for a five years period between 2024 and 2028 as shown in the table below for each component of maritime security risk.

Table4.5: Forecasting/Extrapolating the Risks of Maritime Security risks in Nigeria between 2024 and 2028

Equation/Variable	2024	2025	2026	2027	2028	Total	Average
PIRATE	31.546	32.08	32.601	33.122	33.643	162.992	32.5984
PIRDEATHS	9.055	9.178	9.301	9.424	9.547	46.505	9.31
PIRINJUR	23.108	23.266	23.424	23.582	23.74	117.12	23.424

Source: Authors Calculation.

Table4.5 above shows the forecasted values of the components of maritime security threats in Nigerian waters for each year between 2024 and 2028 based on the trends established in the first objective of the study in table4.3. The result shows an increasing trend in all the component variables of maritime security threats in the Nigerian waters. The result also indicates that between 2024 and 2028, a total of 162.992 pirate attacks against ships, 46.51 piracy related deaths and 117.12 piracy related injuries to seafarers is expected to occur in Nigerian waters. These translates to averages of 32.598 pirate attacks against ships, 9.31 piracy related deaths to seafarers and 23.42 piracy related injuries to seafarers per annum between 2024 and 2028. This have implications in the development of maritime and security measures and policies to address the increasing incidences of maritime insecurity in Nigerian waters.

Table4.6: Elastic Relationship of the Value of Non-Oil Shipping Trade to variations in Trends of Maritime Security Risks in Nigeria

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	Durbin-Watson
1	.812ᵃ	.659	.568	.57299	1.060

ANOVAᵃ

Model		Sum of Squares	Df	Mean Square	F	Sig.
1	Regression	9.520	4	2.380	7.249	.002ᵇ
	Residual	4.925	15	.328		
	Total	14.445	19			

Coefficientsᵃ

Model		Unstandardized Coefficients		Standardized Coefficients	T	Sig.
		B	Std. Error	Beta		
1	(Constant)	9.882	7.021		1.407	.180
	LOGPIRATE	.636	.327	.350	1.948	.070
	LOGPIRDEATH	.043	.246	.031	.174	.864
	LOGINJUR	0.023	..134	.030	0.141	.962

a.   Dependent Variable: LOGSEATRADE

Source: Authors Calculation.

Table4.6 shows the result of the elastic relationship of the value of non-oil shipping trade 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 value of non-oil shipping trade and trend of maritime security threats in Nigerian maritime industry is 0.812. This implies the existence of about 81% correlation between the value of non-oil shipping trade and maritime security threats in Nigeria maritime industry measured by pirate attacks against ships.

The model showing the elastic relationship depicting the influence of variations in maritime security threats on the value of non-oil shipping trade in Nigerian maritime industry is:

$$LOGSEATRADE=9.882+0.636LOGPIRATE+0.043LOGPIRDEATH+0.023LOGINJUR+e \qquad (4.4)$$

This implies that a 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 for each 1% increase in security attacks on ships calls in Nigerian waters, 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 result show the existence of inelastic relationship between the value of Nigerian non-oil shipping trade and each of pirate attack against ships, piracy related deaths and piracy related injuries as proxies for maritime security threats in Nigerian waters. It also shows that there is elastic relationship between value of non-oil shipping trade in Nigeria (7.188>1). The trend of maritime security threats in Nigerian waters limits the extent of growth of the value of non-oil shipping trade in Nigeria over the years.

The coefficient of determination r^2 which measures the explanatory power of the model is 0.659. This indicates that about 66% variation in value of non-oil shipping trade in Nigeria is explained by the variables of maritime security challenges in Nigerian waters.

Table4.7: Elastic Relationship of Port Revenue to changes in Trend of Maritime Security risks in Nigeria

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	Durbin-Watson
1	.875[a]	.766	.181	.19623	1.429

Model		Sum of Squares	Df	Mean Square	F	Sig.
1	Regression	.324	4	.081	5.106	.027[b]
	Residual	.616	16	.039		
	Total	.941	20			

Coefficients[a]

Model		Unstandardized Coefficients		Standardized Coefficients	T	Sig.
		B	Std. Error	Beta		
1	(Constant)	5.536	2.404		2.303	.035
	LOGPIRATE	.101	.106	.231	.954	.354
	LOGPIRDEATH	.108	.084	.304	1.284	.217
	LOGINJUR	.016	.121	.203	1.534	..265
a. Dependent Variable: LOGPOREV						

Source: Authors Calculation.

Table 4.7 shows the result of the elastic relationship of port revenue generated in Nigeria ports 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 port revenue and trend of maritime security threats in Nigerian maritime industry is 0.875. This implies that the existence of about 88% correlation between the port revenue and maritime security threats in Nigeria maritime industry measured by pirate attacks against ships related deaths and piracy related injuries in Nigerian waters.

The model showing the elastic relationship depicting the influence of variations in maritime security threats on the value of port revenue in Nigerian maritime industry is:

LOGPOREV = 5.536 + 0.101LOGPIRATE + 0.108LOGPIRDEATH + 0.016LOGINJUR +e **(4.5)**

This implies that a 1% increase pirate attacks against ships trading in Nigerian waters leads to a 0.101% decreased in port revenue generated over the period while a 1% increase in piracy related deaths in Nigerian waters leads to 0.108% decreased port revenue generated over the 22 years period covered in the study. While port revenue decreased by 0.016% for each 1% increase in piracy related injuries in the Nigerian maritime industry. The result show the existence of inelastic relationship between the port revenue generated and trend of pirate attacks against ships related deaths and piracy related injuries in the Nigerian maritime domain.

It however shows the existence of elastic relationship between port revenue and pirate attack against ships in Nigerian maritime industry (1.92>0). The implication is that the trend of maritime security threats in Nigerian waters limits the extent of growth of port revenue in Nigeria over the years. The coefficient of determination r^2 which measures the explanatory power of the model is 0.766. This indicates that about 77% variation in value of port revenue in Nigeria is explained by the variables of maritime security challenges in Nigerian waters.

Table4.8: 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

LOGOGATTACKS	.141	.038	.943	3.670	.002
LOGINJUR	-041	.029	-.312	-1.54	.211
a. Dependent Variable: LOGSHIPCALS					

Table 4.8, 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, piracy related deaths and piracy related injuries in Nigerian waters.

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

LOGSHCALS=8.437-0.010LOGPIRATE-0.053LOGPIRDEATH-0.041LOGINJUR+e   **(4.6)**

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 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 4.9: 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.

Table4.9 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.

Test of Hypotheses

Table 4.10: Test of Hypotheses H_{01}: There is no significant increase in the trend of maritime security threats in Nigerian maritime domain

Variables	hypotheses	F-score.	F-critical	p-value/sig.	Alpha value	Decision
PIRATE	H_{01a}	1.863	3.10	0.187	0.05	Accept H_{01a}
PIRDEATHS	H_{01b}	0.355	3.10	0.558	0.05	Accept H_{01b}
PIRINJUR	H_{01c}	0.090	3.10	0.767	0.05	Accept H_{01c}

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

The test of hypothesis H_{01a}, 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 $H0_{1a}$ 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..

Furthermore, the test of hypothesis H_{01d} 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_{01b} 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_{01e} 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_{01c} 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.

Table 4.11: Test of H$_{02}$: The relationship between the value of Nigeria's non oil shipping trade and variations in the trend of maritime security threats is not significant.

Hypotheses	F-cal.	F-critical	p-value/sig.	Decision
H$_{02}$	7.249	3.10	0.002^b	Reject *H$_{02}$*
Variable	**t-cal.**	**t-critical**	**p-value/sig.**	**Decision**
LOGPIRATE	1.948	1.86	.050	significant
LOGPIRDEATH	.174	1.86	.864	Not Significant
LOGINJUR	0.141	1.86	.962	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 above shows F-score of 7.249, F-critical of 3.10, and p-value of 0.002. Since F-score is greater than F-critical, (7.249> 3.10), we reject the null hypothesis H$_{02}$ and accept the alternate. We conclude that the relationship between the value of Nigeria's non-oil shipping trade and variations in the trend of maritime security risks is not significant.

Table 4.12: Test of H$_{03}$: There is no significant relationship between Port Revenue generated in Nigeria ports and trend of Maritime Security Challenges in Nigerian waters

Hypotheses	F-cal.	F-critical	p-value/sig.	Decision
H$_{03}$	5.106	3.10	0.027	Reject *H$_{03}$*
Variable	**t-cal.**	**t-critical**	**p-value/sig.**	**Decision**
LOGPIRATE	.954	1.86	.354	Not significant
LOGPIRDEATH	1.284	1.86	.217	Not Significant
LOGINJUR	1.534	1.86	.265	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$_{03}$ shown table4.15 above shows F-score of 5.106, F-critical of 3.10, and p-value of 0.027. Since F-score is greater than F-critical, (5.106> 3.10), we reject the null hypothesis H$_{03}$ and accept the alternate. We conclude that there is significant relationship between port revenue generated 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, 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, have significant effects on the port revenue generated over the period.

CONCLUSION

The study has been able to analyse the effects of maritime security risks on Nigerian seaborne trade 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 0.636% increase in growth 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%; while a 1% increase in piracy related injury increases by 0.023%. The result show the existence of inelastic relationship between the value of Nigerian non-oil shipping trade and each of pirate attack against ships, piracy related deaths and piracy related injuries as proxies for maritime security risks in Nigerian waters. Based on the study findings, we reject the null hypothesis H_{02} and accept the alternate. The relationship between the value of Nigeria's non-oil shipping trade and variations in the trend of maritime security risks is not significant.

(ii) 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, while port revenue increased by 0.016% for each 1% increase in piracy related injuries in the Nigerian maritime industry.

(iii) There is significant relationship between maritime security threats and the GDP contribution of the maritime transport sector in Nigeria. None of pirate attacks against ships trading in Nigerian waters, piracy related deaths, piracy related injuries 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 [40], 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.

(v) 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 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 seaborne trade 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 include severe penalties for the offenders so as to serve as deterrence to others.

REFERENCES

1. Abiodun. S., Amanze, A. C., Igboanusi, C & Onyemechi, C. (2017). Port Service Quality Study of Nigerian Sea Ports. Journal of Shipping and Ocean Engineering 7 (2017) 59-64. https://www.davidpublisher.com/Public/uploads/Contribute/59521d167de29.pdf.
2. Akonye, E. J.& Eleagu, G. I. (2018). Seaports Administration in Nigeria: A Study of Apapa Port Complex. European Scientific Journal June 2018 edition Vol.14, No.17 https://eujournal.org/index.php/esj/article/view/10949
3. Alari, E. F. (2019) The Maritime Industry of Nigeria. Challenges and Sustainable Prospects. The Journal of Territorial and Maritime Studies. Vol. 8, No. 1, pp. 5-26 (22 pages). Published By: McFarland & Company
4. Anele, K. K. (2021). The Potential Impact of Piracy on the ACFTA. The Journal of Territorial and Maritime Studies. Vol. 8, No. 1 (WINTER/SPRING), pp. 5-26 (22 pages). Published By: McFarland & Company. https://www.jstor.org/stable/48603076
5. Bensasi, S & Martinez-Zarsorro, I. (2012). How costly is modern maritime piracy to the international community?" Review of International Economics, vol. 20, pp. 869-883.
6. Bendall, H B (2010). Cost of piracy: A comparative voyage approach, Maritime Economics and Logistics, 12(2): 178–195
7. Chinda, C. H., Emenike G. C. & Odeh, A. (2020). Analysis of Security Challenges along Commercial Water Routes of Bayelsa State, Nigeria. Volume 6, Issue 3. DOI: 10.31695/IJASRE.2020.33775 IJASRE.
8. Egan, C. (2014). Nigeria aims to ease Lagos congestion by pushing use of other ports. https://www.joc.com/maritime-news/international-freight-shipping/nigeria-aims-ease-lagos-congestion-pushing-use-other-ports_20141003.html
9. Elijah, O., Nwoloziri, C. N., Chinyere, O. C. Hilary, O. E., Onyemechi, C. (2021). Maritime Security Strategies and Crime Prevention in Nigeria Waterways. International Journal of Latest Engineering Science (IJLES) E-ISSN: 2581-6659 DOI: 10.51386/25816659/ijles-v4i6p102
10. Fu, A. K. &. Lau, Y. (2010). The impacts of maritime piracy on global economic development: the case of Somalia. The Flagship Journal of International Shipping and Port Research, vol. 37, pp. 677-697.
11. Gadyatskaya, O., Labunets, K & Paci, F. (2016). Towards empirical evaluation of automated risk assessment methods. In International Conference on Risks and Security of Internet and Systems; Springer: Cham, Switzerland, 2016; pp. 77–86.
12. Hans-Liwång; Karl, S. & Cecilia, Ö. (2015). Managing Security Risks at Sea: A Challenge for the Shipping Industry. http://www.scirp.org/journal/jss
13. Hilary, O. E. (2016). Perspective on Maritime Security Principles and Management;
14. Dorand Publisher, Uyo, AKS, Nigeria
15. ICC-IMB (2003-2011). Piracy and Armed Robbery against Ships. Annual report between 2003 and 2011.
16. IACS. (2004). A guide to risk assessment in ship operations. London: International
17. Association of Classification Societies.
18. IMB. (2019). Piracy and Armed Robbery against Ships: Report for the period January
19. December 2019. London: International Chamber of Commerce.
20. ICC-IMB(2017). Piracy and Armed Robbery against Ships. Annual report. 2017.
21. ICC-IMB (2023). Piracy and Armed Robbery against Ships. Annual Reports. January – December 2019 - 2023.
22. IMO (2009). Reports on acts of piracy and armed robbery against ships. MSC.4/Circ.133
23. IMO (2019). Reports on acts of piracy and armed robbery against ships. MSC.4/Circ.263
24. IMO (2021). International Ship and Port Facility Security Code, 2021 edition. Reports on acts of piracy and armed robbery against ships, MSC.4 265.

25. Liwång, H. (2012).   Risk-based ship security analysis – an approach based on civilian and military methods. Thesis for the Degree of Licentiate of Engineering. Department of Shipping and Marine Technology, Chalmers University of Technology, Gothenburg, Sweden.

26. Liu, C; Chong-Kuan, T., Fang, Y. & Tat-Seng, L. (2012). The Security Risk Assessment Methodology. Procedia Engineering 43 (2012) 600 – 609. ELSEVIER

27. Mejia, M. O. (2002). Defining Maritime Violence and Maritime Security.In Mukherjee, P. K., Mejia, M. O. and Gauci, G. M. (Eds), Maritime violence and other security issues at sea. Proceedings of the international symposium held at the World Maritime University. Malmö, Sweden. Pg. 27-38.

28. Michail, N. A.   (2020). World economic growth and **seaborne trade** volume: Quantifying the relationship. Transportation Research Interdisciplinary Perspectives, Vol 4, Elsevier. https://eds.p.ebscohost.com/eds/detail/detail?

29. Munim, Z. H. & Schramm, H. (2018). The Impacts of Port Infrastructure and Logistics Performance on Economic Growth: the Mediating Role of Seaborne Trade. Journal of Shipping and Trade, Vol. 3, Iss 1, Pp 1-19 (2018). Springer Open.

30. Nnadi, K. U., Nwokedi, T. C., Nwokoro, I. A., Ndikom , O. C., Emeghara, G. C., & Onyemechi, C. (2016). Analysis of maritime piracy and armed robbery in the gulf of guinea maritime domain, Journal of ETA Maritime Science, vol. 4, pp. 271-287, Oct 2016.

31. NATO Standardization Agency. (2007). Allied joint doctrine for force protection, AJP-

32. 3.14. Brussel: North Atlantic Treaty Organization.

33. Okonna, K. O. (2021). Requirements for the Management of Maritime Safety and Security. Cle-Print Venture Ltd. Uyo, AKS, Nigeria.

34. Okon, A. (2017). Expert blames Apapa gridlock on ports' low capacity. Punch Newspaper. 26 October 2017. https://punchng.com/expert-blames-apapa-gridlock-on-ports-low-capacity/

35. Oyetunji, A. (2012). Nigeria loses two trillion yearly to oil theft, piracy. The Nation Newspapers, 23rd July, 2012.

36. Onwuegbuchunam, D. , Aponjolosun, M. , Igboanusi, C. & Okeke, K. (2021). Maritime Security Regimes and Impacts on Nigerian Seaports. Open Journal of Safety Science and Technology, 11, 158-170

37. Özdemir, Ü & Güneroğlu, A.(2017). Quantitative analysıs of the world sea piracy by fuzzy ahp and fuzzy topsis methodologies. International Journal of Transport Economics, vol. 44, pp. 427- 448.

38. Ofosu-Boateng, N. R. L. (2017). Oil, Risk Analysis Techniques, Maritime Security and Safe Passage in Pirate Infested

39. Papastergiou, S. & Polemi, N.(2018). A dynamic supply chain cyber risk assessment methodology. In Smart Trends in Systems, Security and Sustainability; Springer: Singapore; pp. 1–9

40. Polemi, N., Mouratidis, H., & Schauer, S (2019). A dynamic supply chain cyber risk assessment methodology. Journal of Transport Security. Vol. 12, 1–35. [CrossRef]

41. Sandkamp, A, Stamer, V. & Yang, S. (2021). Where has the rum gone? The impact of maritime piracy on trade and transport. Review of World Economics, forthcoming. https://cepr.org/voxeu/columns/rum-gone-impact-maritime-piracy-trade-and-transport

42. Stopford, M. (1997), Maritime Economics. 2nd ed. Routledge,Taylor & Francis Group, New York.

43. Soppo, A. L. Z. (2021). Addressing the Roots of Maritime Piracy in the Gulf of Guinea. Titan, Risk Analysis   &   Insights,   News,   Sub-Saharan   Africa,   April   7,   2021. https://www.internationalaffairshouse.org/addressing-the-roots-of-maritime-piracy-in-the-gulf-of-guinea/

44. USCG(2004). Automatic identification system overview. Navigation Center. Department of Home Security, US. http://www.navcen.uscg.gov/enav/ais/default.htm on 5th May 2019

45. United Nations Conference on Trade and Development (UNCTAD) (2018). Review of Maritime Transport New York & Geneva.

46. United Nations Conference on Trade and Development (UNCTAD) (2020). Review of Maritime Transport New York & Geneva.

47. United Nations Conference on Trade and Development (UNCTAD) (2023). Review of Maritime Transport New York & Geneva.

48. United Nations Security Council (2020). Spread of 1 Billion Small Arms, Light Weapons Remains Major Threat Worldwide, High Representative for Disarmament Affairs Tells Security Council. SC/14098;

8713th Meeting. https://reliefweb.int/report/world/spread-1-billion-small-arms-light-weapons-remains-major-threat-worldwide-high

49. Voytenko, M. (2023). New trend in smuggling drugs on board of mega container ships. https://www.fleetmon.com/maritime-news2023

50. Yip, T. L. (2012). Seaborne Trade between Developed and Developing Countries. Asian Journal of Shipping and Logistics 28(3):369–389. DOI:10.1016/j.ajsl.2013.01.005