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**INFLUENCE OF SUPPLY CHAIN RISK FACTORS ON THE
PRICE OF PETROLEUM PRODUCTS AMONG OIL
MARKETING COMPANIES IN KENYA**

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Influence of Supply Chain Risk Factors on the Price of Petroleum Products among Oil Marketing Companies in Kenya

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Abstract

Purpose: The purpose of the study is to investigate the influence of supply chain risk factors on the price of petroleum products among Oil Marketing Companies (OMCs) in Kenya with a view of making recommendations on mitigating supply chain risk factors.

Methodology: This research study adopted both descriptive and inferential statistics where data collected from 159 respondents using questionnaires is analysed and fitted into multiple regression model. The qualitative data generated was analysed by use of Statistical Package of Social Sciences (SPSS) version 22. Structured and semi structured questionnaires were used to collect data. Data gathered from the questionnaires administered was analyzed by the help of Ms Excel and SPSS version 22, while output was presented in form of frequency tables and charts.

Results and conclusion: The findings of the study demonstrated that supply chain risk factors i.e. that transportation and delivery, inbound cost fluctuations and geo-politics have a positive relationship with price of petroleum products among Oil Marketing Companies (OMCs). However, the coefficient of determination ($R^2 = 0.6$.) revealed that only 60% of variations in the price of petroleum product could be attributed to the supply chain risk factors under investigation. The remaining 40% is attributed to other variables that were not examined in this study. In Conclusion, the price of petroleum products among oil marketing companies can be influenced by transportation and delivery, inbound cost fluctuations and geo-politics

Policy recommendation: Finally, the study recommended that Oil marketing companies to develop sophisticated supply chain risk management systems in order become less vulnerable to shocks and disruptions; and reduce exposure.

Keywords: *transportation and delivery, inbound cost fluctuations and geo-politics*

1.1 Introduction

The world has become more globalized and interconnected, supply chains are not an exception; this has led to increased exposure to disruptions and all manner of shocks. With growth in technology and innovation, the speed of supply chain systems has also increased drastically hence increasing their exposure even further. Missteps that would otherwise be considered minor could have major repercussions on these complex supply chain networks (Woods, 2013). Supply chains are becoming even more complex and sophisticated due to the multiplication of information flow, suppliers, customers and compliance requirements or standards. It has become increasingly difficult to react to these issues especially with traditional approaches to supply chain.

An organisation will always face a myriad of challenges in responding to supply chain emerging issues, especially with conventional supply chain configuration. Most companies have a myopic approach to supply chain because they see themselves as single and independent entities that exist in isolation from others; and their sole objective is to compete in order to survive. This operational exclusiveness approach that has been adopted by most organizations is an unsustainable self-defeating corporate strategy since it kills the spirit of cooperation and abhors the concept of supply chain integration and management (Sunil & Meindl, 2013). In supply chain, an organization will link to its suppliers upstream and to its distributors downstream in order to meet its customers' requirements. Usually, capital, inventory, labour, materials, information, financial assets, technology and other resources flow along the supply-chain. Since the main objective of the firm is to maximise returns; the firm must optimize benefits and minimize costs along the supply-chain network. The firm must undertake a rigorous cost benefit analysis that weighs the advantages versus the subsequent value of every decision that is going to be made along its supply-chain network (Mathew & Mee, 2017).

Globally, oil industry has generally experienced significant changes in past decades; these changes are as a result of both external and internal forces. External forces are triggered by somewhat unpredictable global forces. However, internally, the oil industry has found ways of cutting down the cost of prospecting, extracting, processing and supplying oil products (Choy, 2011). It is not about minor or improvements but a total overhaul of the way of doing business with a primary emphasis on flexibility of the distribution model and agility which is ability to respond quickly to changing market dynamics. However, there is a need for a structured approach to assess and evaluate distribution systems within petroleum industry. Companies like British Petroleum (BP) have already employed a radical approach after the crisis in Gulf Mexico for the purpose of shaking up the organization's distribution network. BP's top leadership made decisions to reconfigure and restructure the firm's critical enterprises i.e. exploration and production; and to establish a global division with broad auditing and the power to set rules. BP's main objective is to ensure that it is among the best in the world at managing distribution risk going forward.

1.2 Statement of the Problem

Supply chains are exceptionally complex systems, with numerous parallel physical, financial and information flows happening in order to guarantee that goods are delivered at the right place, right quantity, in the right time and at a reasonable cost. Subsequently, some authors have suggested that the term supply systems is a more accurate term than supply chains as it downplays its sheer complexity (Axsater, 2015). The push towards more efficient and responsive supply chains in the

recent past has led to supply chains getting to be more vulnerable to disturbance and shocks; and hence more to challenges (Angulo, 2013).

According to a report by Delloite (2014) in Kenya, out of a sample of 30 companies in the oil industry, only 11 had a clear supply chain risk policy. Among many other reasons cited, this resulted to losses amounting to over 13 Million at Shell BP in the (FY) 2013/2014. In a customer satisfaction survey of 2012 and 2013, carried out by m/s House of Procurement Consultants, it was visibly notable that the percentage index had been decreasing that is, 52% and 43% respectively (Shale & Rahma, 2014). Shell BP faces a major challenge in controlling the overall operating cost because of the constant increase of procuring cost due to lack of supply chain risk policy; this is evident by Shell BP posting a decrease in profit prior to tax of Sh1.2 billion compared to Sh1.8 billion noted in the previous year according to a Shell BP 2011 annual report.

In spite of the significance of the oil industry in daily life, the critical role it plays in economic growth and the operational issues it faces; the topic regarding the effect of supply chain risk factors on the price of petroleum products among OMCs has received hardly any noteworthy consideration in supply chain and operations management literature. There has been little to no discussions in literature on issues affecting supply chain management in the oil industry as evidenced by several studies; existing literature has been restricted to single organizations particularly in the developed world (Noor, 2011).

Knowledge derived from the developed world and in single company setting may be difficult to apply in supply chain management orientation of a less developed country like Kenya because supply chain management systems in the developed and the less developed countries vary to a very large extent. Therefore, the goal of this study is to bridge this knowledge gap and to determine the influence of supply chain risk factors on the price of petroleum products among oil marketing companies in Kenya.

.1.3 Objectives of the Study

- ii. To establish the influence of transportation and delivery on the price of petroleum products among oil marketing companies in Kenya.
- ii. To find out how inbound cost fluctuations influence the price of petroleum products among oil marketing companies in Kenya.
- iii. To assess the influence of geo-politics on price of petroleum products among oil marketing companies in Kenya.

2.0 LITERATURE REVIEW

2.1 .1 The Logistics Theory

Mentzer (1988) was the proponent of the logistics theory. He defined the term logistics as the set of activities including planning, organization and controlling of the material flow, from the point of extraction (raw material) until consumption of the finished product and reverse flows of the manufactured goods, with the objective of satisfying the customer's and stakeholders' needs and interests: to provide a good customer service, at low cost, low tied-up capital and minimal negative environmental impact (David & Robert, 2013). In the oil sector, logistics is also characterised activities that relate to delivering the right product or service in the right quantity and quality, at the right place and right time, to the right customer whilst maintaining the right cost. The logistics function also incorporates procurement and sourcing, production planning, packaging, scheduling, assembly, and customer service. The logistics function is part and parcel of all levels of planning

and execution i.e. tactical, operational, and strategic. Logistics management plays an integrating role that coordinates and optimizes all logistics activities, as well as linking logistics activities with other functions, including marketing, sales, manufacturing, and information technology in the oil sector (Eskola, 2014). This theory is linked to transportation and delivery variable.

2.2 Supply Chain Risk Factors

2.1.1 Transportation and Delivery and Price of Petroleum Products

Gyongyi and Karen (2011) undertook a study in Nigeria on the influence of transportation and delivery risk factors in the oil industry on economic growth performance. The methodology applied to analyse the influence of transportation and delivery risk on Nigeria's Gross Domestic Product (GDP) is multiple regression analysis. The results of the study revealed existence of high transport costs, utter neglect of the populace, abandonment of the oil sector and somewhat afar contribution to the gross domestic product with a variation in trend. Due to rampant corruption in Nigeria, the oil sector has contributed poorly to economic growth in Nigeria. However, this study was restricted to influence of the oil industry in economic growth of Nigeria; inclusion of additional variables would have improve the study. Also, more sophisticated and robust econometric models could have been employed. There is a similarity between this study and the current investigation since both delve into the challenges facing the oil industries of respective countries; however, the current study is more interested in supply chain risk factors in the oil sector in relation to company margins rather than economic performance of Kenya.

2.1.2 Inbound Cost Fluctuations and Price of Petroleum Products

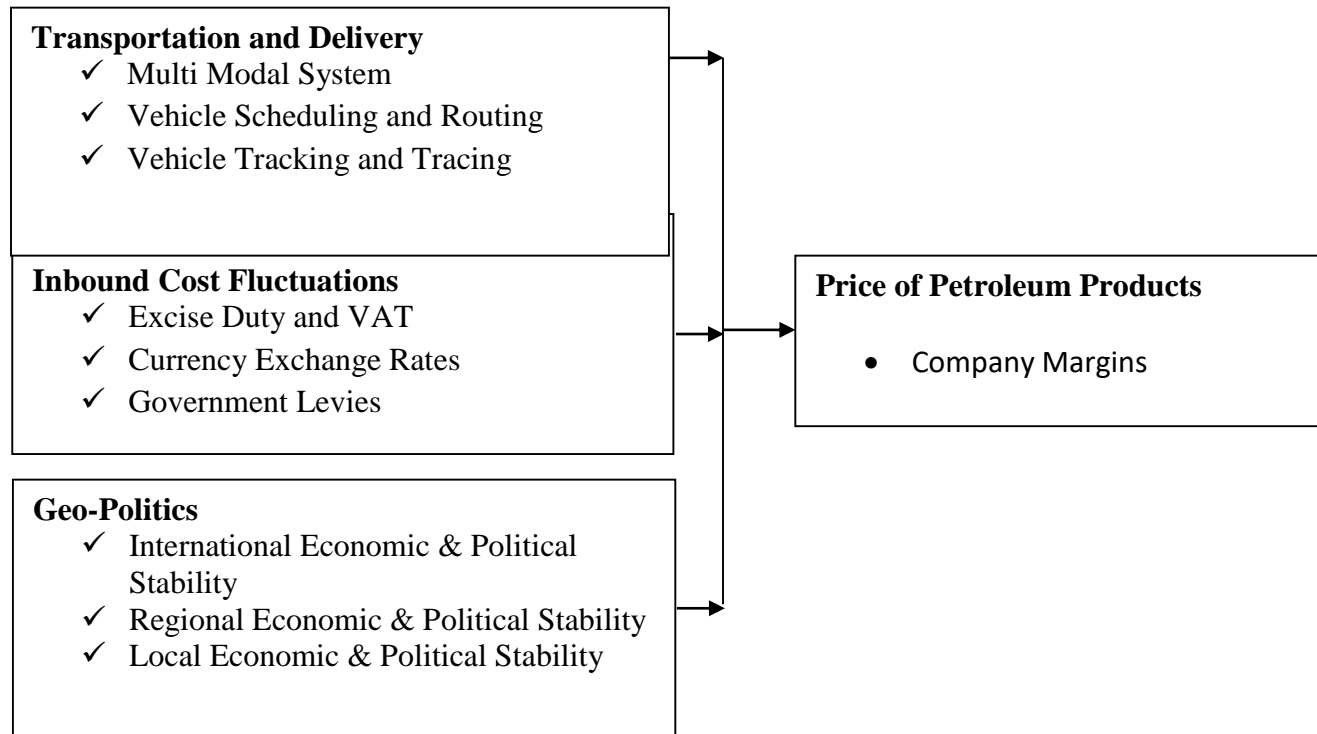
According to Chang (2015) inbound cost fluctuations is a topic that has recently drawn a lot interest in the academia. Emphasis is put on an adequate and accelerated integration of supplier requirements in order to optimise and strategically align market demand with operation capacity within the supply chain. Absence of precise information exchanges along the supply chain lead to the bullwhip phenomena; consequently, inefficient customer service, poor stock rotation, increased inbound cost fluctuations, and high obsolescence rate aggravated by the wide diversity of products.

Having carried out empirical research, Aitken (2012) outlined the need of further research on inbound cost fluctuations; his findings showed that the lack of alignment between demand and supply was a costly problem; that many supply chains incurred huge losses due to wastage, shortage or surplus inventory and lower profit margins. Aside from placing emphasis on marketing and supply chain management collaboration in order generate value, companies can draw substantial benefits from inbound cost fluctuation management which focuses on customers (Axsater, 2015)

2.1.3 Geo-politics and Price of Petroleum Products

Historically, there are about 32 geopolitical events that took place in locations that are sensitive to the petroleum market (Winckler 2014). The two world wars are among these geopolitical events. With the inception of the internal combustion engine during World War 1; ships, airplanes, tanks and cars were propelled by oil for the first time. The war triggered the Russian Revolution of 1917. During the 2nd World War, dependence on oil was even more severe as warring nations sought to fuel their vessels. Shortage of liquid oil was a huge constraint during the Pacific War; Japan's main objective was seize the oil reserves of South East Asia. According to Bregman (2012), the main target for American Submarines was Japanese ships and especially oil tankers. The allied forces

had damaged or sunk about 95% of Japanese total wartime shipping by the time the war ended. In Europe, the Germans attempted to capture the Caucasus oil fields and impeded supply of fuel to Britain by their Americans allies.



Independent Variables

Figure 1: Conceptual Framework

Dependent Variable

3.0 METHODOLOGY

This research study adopted both descriptive and inferential statistics where data collected from 159 respondents using questionnaires is analysed and fitted into multiple regression model. The qualitative data generated was analysed by use of Statistical Package of Social Sciences (SPSS) version 22. Structured and semi structured questionnaires were used to collect data. Data gathered from the questionnaires administered was analyzed by the help of Ms Excel and SPSS version 22, while output was presented inform of frequency tables and charts. Patron (2012) defined a population as the sum of all items that share a specific attribute. It is the whole set of elements that have a particular characteristic of interest and is usually denoted with N. The target population is the set all of elements of interest targeted by the researcher (Kothari, 2014). A target population of 53 licensed oil marketing companies in Kenya that are in three tiers will be used for this study as registered by Petroleum Institute of East Africa (2019) directory. The unit of analysis was the individual 53 oil marketing companies and the unit of observation will be the total of 159 respondents, comprising of head of procurement, head of finance and head of marketing

department from all the registered oil marketing companies. study will study will not adopt any sampling technique nut will instead use the whole target population i.e. census, which is the total number of items in a population (Kombo and Tromp (2013

The research used a multiple regression model.

$$Y = \beta_0 + \beta_1 X_1 + \beta_2 X_2 + \beta_3 X_3 + \varepsilon$$

Where:

Y = Price of Petroleum Products

β_0 = Constant

$\beta_1, \beta_2, \beta_3, \beta_4$ = Beta Coefficients

X1 = Transportation and Delivery

X2 = Inbound Cost Fluctuations

X3 = Geo-Politics

ε = Error Term Management

ε = Random Error Term

4.0 RESULTS FINDINGS

4.1 Introduction

The current study intended to determine the influence of supply chain risk factors on the price of petroleum products among oil marketing companies in Kenya.

4.2 Response Rate

159 respondents were interviewed using questionnaires that allowed the researcher to drop the questionnaire to the respondents and then collect them at a later date when they had filled the questionnaires. A total of 159 questionnaires were issued to employees of oil marketing companies. Out of the 159 respondents, 119 were responsive representing a response rate of 75%. According to Mugenda & Mugenda (2012) a response rate that is above the halfway mark (50%) sufficient and acceptable in descriptive statistics

Table 1: Response Rate of Respondents

Response	Frequency	Percentage
Actual Response	119	75
Non - Response	40	25
Total	159	100%

4.3 Pilot Study

The cronbach's alpha was used to compute the average inter-correlations among a set of survey items. It is a common measure of reliability and internal consistency; the reliability of a particular measurement is the extent to which it is a consistent measure of a concept, and it measures the strength of that consistency. Reliability increases as Cronbach's alpha (α) tends towards one i.e. $\alpha \rightarrow 1$, (Serekan, 2013). A value of at equal to or greater than 0.7 is recommended i.e. $\alpha \geq 0.7$. Consistency indicated how well the items measuring the concepts hang together as a set. Cronbach's alpha was used to measure reliability. This was done on the four objectives of the study.

Table 2 :Reliability Results

Variable	No of Items	Respondents	α =Alpha	Comment
Transportation and Delivery	9	16	0.893	Reliable
Inbound Cost Fluctuations	9	16	0.987	Reliable
Geo-Politics	9	16	0.974	Reliable

4.4 Demographic Information

The aim of the study was to determine the demographic attributes of the respondents as they are categorical factors from which a few fundamental knowledge around the respondents can be inferred. The characteristics that were factored in include age, sex, highest level education and level of work experience.

4.4.1 Distribution of Respondents by Gender

Gender Distribution was also determined and the findings summarised in figure 1. where majority of the respondents were males at 57%, while the females were 43% of the respondents. The statistics may raise the issue of gender parity in oil marketing companies in Kenya, although that is outside the scope of this study. According to William (2010) in a study carried out in North America, found that the ability to perform tasks does not differ between men and women but rather a differing perspectives to supply chain risk factors.

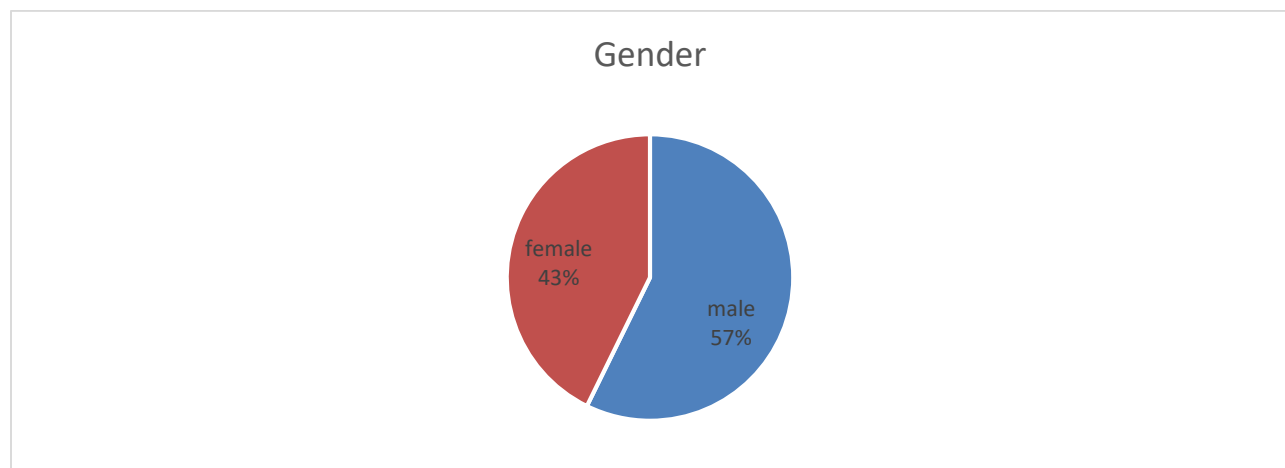


Figure 2: Distribution of Respondents by Gender

4.4.2 Distribution of Respondents by Age

Age distribution of the respondents was also determined and results summarized in tabular form below. The findings indicated that 33.6% of the respondents were between the of 41 and 50 years old, while 26.1% of the respondent's ages ranged between 31 to 40 years. The age group of 18 - 30 years accounted for 19.3%. Above fifty years was shown at 21%. This also shows that the

interviewees are mature adults with the ability to make sound independent judgements and have personal perspectives; the results emanating from them are therefore considered valid. Saunders (2012) also found that there are two natural age peaks of the late 20's to early 40s which correlated to employee performance.

Table 4: Distribution of Respondents by Age

Age	Frequency	Percent
18 - 30 Years	23	19.3
31 - 40 Years	31	26.1
41 - 50 Years	40	33.6
50 Years and above	25	21.1
Total	119	100

4.4.3 Distribution of Respondents by Level of Education

Respondents were required to state their highest education level. The findings were captured in Table 4.4. The results indicated that majority of the respondents 23.5% had a degree certificate, 22.7% percent had acquired a master's degree, and results further showed that 23.5% had a certificate while finally 30.3% were diploma holders. These findings concur those of Rotich (2011) who concluded that majority of the employees who run public procurement are highly educated; evidence has shown that there a link between the level of education and performance in state corporations.

Table 5: Distribution of Respondents by Level of Education

Level of Education	Frequency	Percent
Certificate Level	28	23.5
Diploma Level	36	30.3
Degree Level	28	23.5
Master Level	27	22.7
Total	119	100

4.4.4 Distribution of respondents by Length of Service

The study determined the number of years the respondents had worked among oil marketing companies in Kenya. The findings showed that majority of the respondents had worked at oil marketing companies at 28.6% for 6 to 8 years. 26.9% had worked for zero to two years. 26.9% had been in active service for 3-5 years. 17.6% and above had worked for 9 and above years. The findings of the study concur with those presented by Patron (2012) who found a link between duration of service and the level of experience helps employees to acquire more knowledge and technical skills that have a positive impact to performance.

Table 6: Distribution of Respondents by Length of Service

Length of Service	Frequency	Percent
0 - 2 Years	32	26.9
5 Years	32	26.9
6 - 8 Years	34	28.6
9 Years and above	21	17.6
Total	119	100

4.5 Descriptive Statistics

4.5.1 Transportation and Delivery

The first objective of the study was to assess the influence of transportation and delivery on the price of petroleum products among OMCs in Kenya. The respondents were inquired to show to what degree transportation and delivery affected the cost of petroleum products among oil marketing companies in Kenya. The findings demonstrated that lion's share of the respondents 33% concurred that it was to an very great degree, 19% said that it was to a great degree, 30% said it was to a moderate degree, whereas little extent was 11% and not all was at 7% respectively.

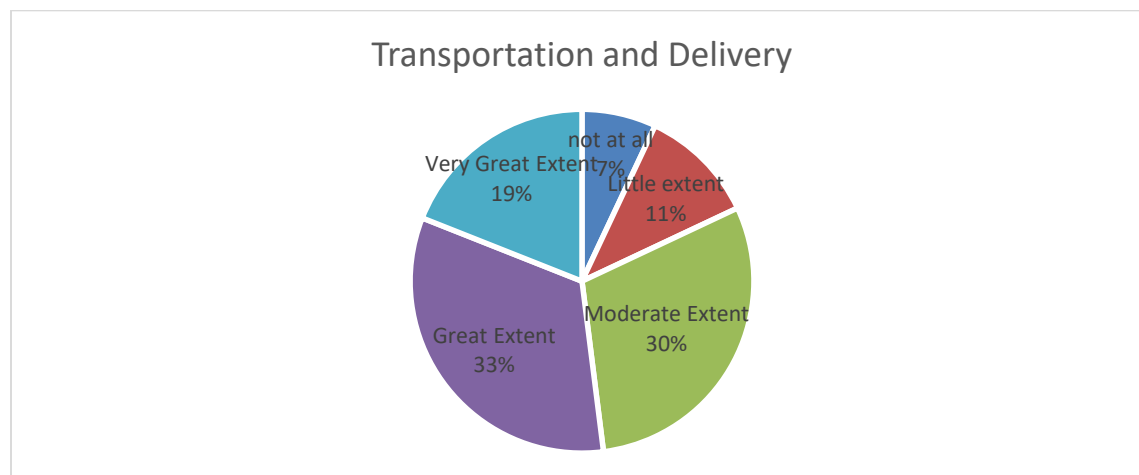


Figure 3: Transportation and Delivery

The respondents were moreover inquired to comment on statements with respect to transportation and delivery impact on the price of petroleum products among oil marketing companies. The reactions were appraised on a likert scale and the displayed in table 4.6 underneath and was rated on a 5 point Likert scale ranging from; 1 = “strongly” disagree to 5 = “strongly agree”. The scores of “strongly disagree” and “disagree” have been taken to represent a statement not agreed upon, proportionate to mean score of to 2.5. The score of ‘neutral’ has been taken to represent a statement concurred with, proportionate to a mean score of 2.6 to 3.4. The score of “agree” and “strongly

agree” have been taken to represent a statement highly agreed with equivalent to a mean score of 3.5 to 5.

Results showed that larger part of the respondents as implied by a mean of 4.2 concurred with the statement that multi modal system has a significant impact on prices of petroleum products. The variations within the responses were indicated by a standard deviation of 1.0. Results showed that majority of the respondents as demonstrated by a mean of 3.6 concurred on the statement that vehicle scheduling and routing has a significant impact in prices of petroleum products. The variations in the responses was evidenced by a standard deviation of 1.3 Results showed that larger part of the respondents as demonstrated by a mean of 3.6 concurred with the statement that vehicle tracking and tracing plays has significant a influence in prices of petroleum products. The variations in the responses was shown by a standard deviation of 1.3.

Results indicated that larger part of the respondents as demonstrated by a mean of 3.3 concurred on the statement that multi modal system plays a significant influence in reducing storage and distribution expenses. The variations in the responses were illustrated by a standard deviation (s.d) = 1.3. Results indicated that a large part of the respondents as shown by an average of 4.2 concurred with the statement that vehicle scheduling and routing play a significant influence in reducing storage and distribution expenses. The variations in the responses was demonstrated by a standard deviation of 0.9. Results indicated that a large part of the respondents also showed by a mean of 3.8 agreed on the statement that vehicle tracking and tracing plays a significant influence in reducing storage and distribution expenses. The variations in the responses as demonstrated standard deviation of 0.6. Findings indicated that a large part of the respondents as demonstrated by an average of 4.1 concurred with the statement that multi modal system has a significant influence in prices of petroleum products. The variations in the responses were shown by a standard deviation of 0.6. Results indicated that a larger part of the respondents as shown by a mean of 3.9 concurred with the statement that vehicle tracking and tracing plays a significant influence in prices of petroleum products. The variations in the responses was also demonstrated by a standard deviation of 0.6. The average result for statements on transportation and delivery was 3.8 while the standard deviation was 1.4. The findings agree with Odundo (2012) that transportation and delivery when sourcing can be expensive and time consuming which means it requires a clear strategy.

Table 7: Transportation and delivery

Statements	N	Mean	Std. Deviation
Multi modal system has a significant influence in prices of petroleum products	119	4.2	1.0
Vehicle scheduling and routing has a significant influence in prices of petroleum products	119	3.6	1.3
Vehicle tracking and tracing has a significant influence in prices of petroleum products	119	3.8	1.3
Multi modal system has a significant influence in prices of petroleum products	119	3.3	1.4
Vehicle scheduling and routing has a significant influence in prices of petroleum products	119	4.2	0.9
Vehicle tracking and tracing has a significant influence in prices of petroleum products	119	3.8	0.6
Multi modal system has a significant influence in prices of petroleum products	119	3.6	1.3
Vehicle scheduling and routing has a significant influence in prices of petroleum products	119	4.1	3.9
Vehicle tracking and tracing has a significant influence in prices of petroleum products	119	3.9	1.1
Average	119	3.8	1.4

4.5.2 Inbound Cost Fluctuations

The second objective was to examine the impact inbound cost fluctuations on the cost of petroleum products among OMCs in Kenya. The respondents were required to demonstrate to what degree inbound cost fluctuations impacted the price of petroleum products among oil marketing companies in Kenya. The findings demonstrated that larger part of the respondents 37% concurred that it was to a “very great extent”, 33% said that it was to a “great extent”, 19% said it was “moderate”, whereas “small extent” and not all tied were at 4 and 7% respectively.

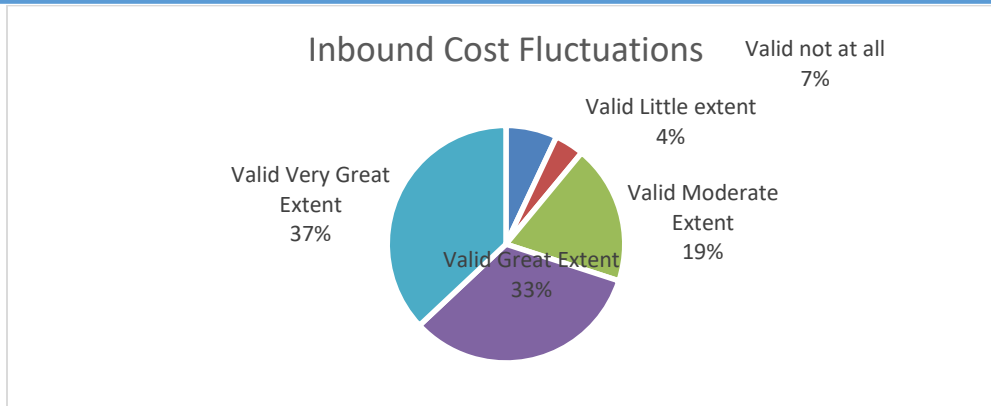


Figure 4: Inbound Cost Fluctuations

The respondents were also inquired to comment on statements regarding the influence of inbound cost fluctuations on the price of petroleum products among OMCs in Kenya. Results indicated that a larger of the respondents shown by a mean of 3.8 concurred with statements that excise duty and VAT play a significant influence in prices of petroleum products. The variation was 1.2. As demonstrated by a mean of 3.5, a larger part of the respondents concurred with the statement that currency exchange rates play a significant influence in prices of petroleum products. The variation was 1.1. Also demonstrated by the mean of 3.7, a larger part of the respondents concurred with the statement that government levies play a significant influence in prices of petroleum products. The variation was 1.

Results demonstrated that larger part of the respondents as shown by a mean of 3.5 concurred on the statement that excise duty and VAT plays a critical role in reducing storage and distribution costs. The variation was 1. Results demonstrated that larger part of the respondents as shown by a mean of 3.6 concurred on the statement that currency exchange rates has a critical role in reducing storage and distribution costs. The variation was 1.2. The findings indicated that larger part of the respondents demonstrated by a mean of 3.5 concurred on the statement that government levies has a significant influence in reducing storage and distribution costs. The variation was 1.3. Results show that a larger of the respondents as illustrated by a mean of 3.5 agreed on the statement that excise duty and VAT plays a significant influence in prices of petroleum products. The variation was 1.3. Results show that a larger of the respondents as illustrated by a mean of 3.4 concurred with the statement that currency exchange rates play a significant influence in prices of petroleum products. The variation was 1.4. Results show that a larger of the respondents as illustrated by a mean of 3.4 concurred with the statement that government levies have a significant influence in prices of petroleum products. The variation was 0.5. The average of the statements on inbound cost fluctuations was 3.6 while the variations in the responses were given at 1.1. These findings agree with Nyariki (2013) that organizations must look toward inbound cost management for improvements. The opportunities for cost savings can be enormous as the influence on margins and bottom line is considerable.

Table 8: Inbound Cost Fluctuations

Statements	N	Mean	Std. Deviation
Excise duty and VAT have a significant influence in prices of petroleum products	119	3.8	1.2
Currency exchange rates have a significant influence in prices of petroleum products	119	3.5	1.1
Government levies have a significant influence in prices of petroleum products	119	3.7	1.0
Excise duty and VAT have a significant influence in prices of petroleum products	119	3.5	1.1
Currency exchange rate have a significant influence in prices of petroleum products	119	3.6	1.2
Government levies have a significant influence in prices of petroleum products	119	3.5	1.3
Excise duty and VAT have a significant influence in prices of petroleum products	119	3.5	1.3
Currency exchange rates have a significant influence in prices of petroleum products	119	3.4	1.4
Government levies have a significant influence in prices of petroleum products	119	3.6	0.5
Average	119	3.6	1.1

4.5.3 Geo-politics

There was also need to establish how geo-politics influenced the price of petroleum products among OMCs in Kenya as the third objective. The respondents were inquired to comment on extent of geo-politics influence the price of petroleum products among OMCs in Kenya. The findings illustrated that a larger part of the respondents 48% concurred that it was to a very great extent whereas 45% stated that it was to a great extent, moderate was at 2%; to small degree and not all at 2% and 3%.

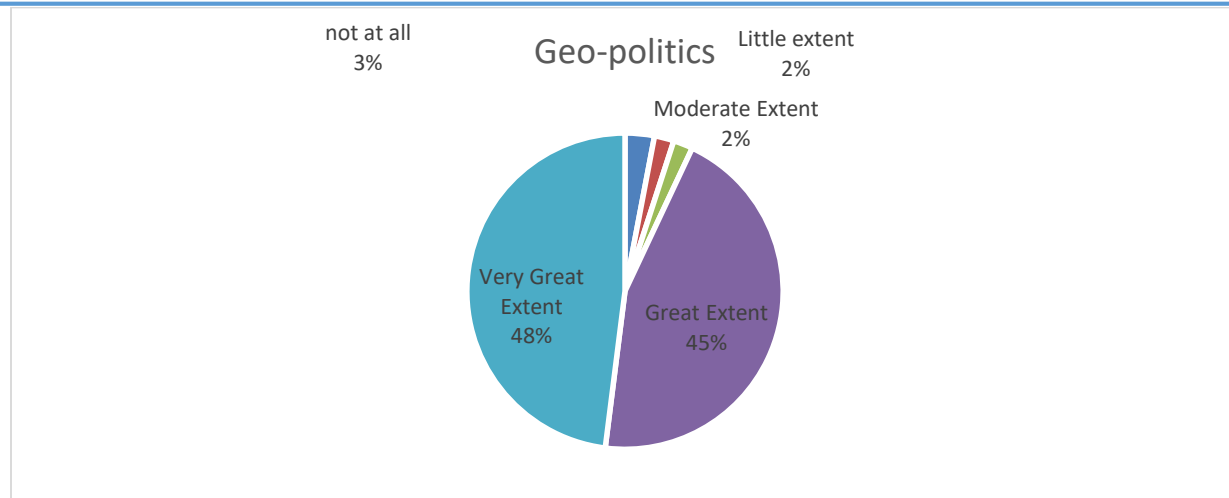


Figure 5: Geo-politics

The respondents were also required to comment on statements with respect to influence of geo-politics on the price of petroleum products among OMCs in Kenya. The findings demonstrated that a larger part of the respondents as illustrated by a mean of 4.0 concurred with statement that international economic and political stability has a significant influence on prices of petroleum products. The standard deviation for the results responses was 1.1. Results showed that a larger part of the respondents as illustrated by a mean of 4.4 concurred on the statement that regional economic and political stability has a significant influence on prices of petroleum products. The standard deviation for the results responses was 1.3. Results demonstrated that a larger part of the respondents as illustrated by a mean of 3.4 concurred on the statement that local financial and political stability plays a significant influence on prices of petroleum products. The standard deviation of the results responses was 0.8. Results indicated that a larger part of the respondents as shown by a mean of 3.4 concurred with the statement that international economic and political stability has a significant influence in reducing storage and distribution expenses. The standard deviation for the results responses was 1.3. Results indicated that a larger part of the respondents as shown by a mean of 3.7 concurred with the statement that regional economic and political stability has a significant influence in reducing storage and distribution expenses. The standard deviation for the results responses was .7. Results indicated that a larger part of the respondents as shown by a mean of 2.8 concurred with the statement that local economic and political stability has a significant influence in reducing storage and distribution expenses. The standard deviation for the results responses was 0.7.

Results indicated that a larger part of the respondents as shown by a mean of 3.2 concurred with the statement that international economic and political stability plays a significant influence in prices of petroleum products. The standard deviation for the results responses was 1.2. Results indicated that a larger part of the respondents as shown by a mean of 3.4 concurred with the statement that regional economic and political stability plays a significant influence in prices of petroleum products. The standard deviation for the results responses was 1.2. Results indicated that a larger part of the respondents as shown by a mean of 3.6 concurred with the statement that local economic and political stability plays a significant influence in prices of petroleum products.

The standard deviation for the results responses was 1.3. The average for all the responses was 3.6 and a standard deviation of 1.2. These findings imply that through geo-politics, companies can improve competitive positioning, gain entry to new dynamic, technology driven markets (Noor, Guyo & Amuhaya, 2013).

Table 9: Geo-politics

Statements	N	Mean	Std. Deviation
International economic and political-stability has a significant influence in prices of petroleum products	119	4.0	1.1
Regional economic and political-stability has a significant influence in prices of petroleum products	119	3.4	1.3
Local economic and political- stability has a significant influence in prices of petroleum products	119	4.1	0.8
International economic and political stability has a significant influence in prices of petroleum products	119	4.1	1.0
Regional economic and political stability has a significant influence in prices of petroleum products	119	3.7	0.7
Local economic and political stability has a significant influence in prices of petroleum products	119	2.8	1.3
International economic and political stability has a significant influence in prices of petroleum products	119	3.2	1.2
Regional economic and political stability has a significant influence in prices of petroleum products	119	3.4	1.2
Local economic and political stability has a significant influence in prices of petroleum products	119	3.6	1.3
Average	119	3.6	1.1

4.4 Correlation Analysis

Determination of the degree of association and level of significance of variables is done using correlations analysis. It is also employed when predicting the level of variation of output variable which is as a result variation of the input variables. The findings of the correlation analysis are outlined in Table 10

Correlations

		Transport and delivery	Inbound cost fluctuations	Geopolitics	Pricing of petroleum products
Transport and delivery	Pearson Correlation	1	.090	.050	.536**
	Sig. (2-Tailed)		.330	.586	.000
	N	119	119	119	119
Inbound cost fluctuations	Pearson Correlation	.090	1	-.232*	.199*
	Sig. (2-Tailed)	.330		.011	.030
	N	119	119	119	119
Geopolitics	Pearson Correlation	.050	-.232*	1	.360**
	Sig. (2-Tailed)	.586	.011		.000
	N	119	119	119	119
Pricing of petroleum product	Pearson Correlation	.536**	.199*	.360**	1
	Sig. (2-Tailed)	.000	.030	.000	
	N	119	119	119	119

** . Correlation Is Significant At The 0.01 Level (2-Tailed).

* . Correlation Is Significant At The 0.05 Level (2-Tailed).

The correlation summary presented in Table 10 demonstrates that the associations between each of the input variable and the output variable were all significant at the 95% confidence level. The correlation analysis to examine the influence of supply chain risk factors on the cost of petroleum items among oil marketing companies in Kenya, Pearson Correlation Coefficient calculated and tested at 5% significance level. The results demonstrated existence positive relationship ($r=0.536$) between transportation and delivery and the price of petroleum products among oil marketing companies in Kenya. Moreover, the relationship was found to be statistically significant at 5% significance level ($p=0.000$, <0.05). The correlation analysis to prove the relationship between transportation and delivery and the price of petroleum products among oil marketing companies in Kenya, Pearson Correlation Coefficient calculated and tested at 5% significance level. The evidence shows that there exists positive relationship ($r=0.199$) between inbound cost fluctuations and the price of petroleum products among oil marketing companies. Moreover, the researcher found the relationship was found to be statistically significant at 5% level ($p=0.000$, <0.05). The correlation analysis to test the relationship between geo-politics and the price of petroleum products among oil marketing companies, Pearson Correlation Coefficient calculated and tested at 5% significance level. The findings reveal that there is a positive relationship ($r=0.360$) value for geo-politics and the price of petroleum products among oil marketing companies. Moreover, the relationship was found to be statistically significant at 5% level ($p=0.000$, <0.05). It is therefore evident that all the factors could explain the changes in the price of petroleum products among oil marketing companies on the basis of the correlation analysis.

4.5 Regression Analysis

Regression analysis was undertaken to evaluate the significance of the relationship between the output variable and all the input variables. Regression analysis was done to determine the proportion within the dependent variable (the cost of petroleum items among oil marketing companies) that can be accounted for from the independent variables (transportation and conveyance, inbound taken a toll changes and geo-politics). Table 11 is a tabular presentation of the regression coefficients (β_n , where $0 \geq n \leq 3$) of risk factors against dependent variable (price of petroleum products). The findings of regression analysis indicated there exists a significant positive relationship between dependent variable (the price of petroleum products among oil marketing companies and the independent variables (transportation and delivery, inbound cost fluctuations and geo-politics). The R-value i.e. coefficient of correlation report was 0.674 which demonstrates that there is a perfect or strong positive (uphill) linear relationship between dependent variable and independent variables. Coefficient of determination (R^2) of 0.455 implies 46% of changes in price of petroleum products can be attributed to the three supply chain risk factors i.e. transportation and delivery, inbound cost fluctuations and geo-politics. At $\beta = 0.309$, $p=0.002 < 0.05$, the regression analysis shows that there exists a significant positive relationship between dependent variable and independent variable.

Table 11: Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.674 ^a	.455	.440	.11947

Predictors: (Constant), Transportation and Delivery, Inbound Cost Fluctuations and Geo-politics
 Dependent Variable: The Price of Petroleum Products among Oil marketing Companies

Table 11: ANOVA

ANOVA^a

Model		Sum of Squares	df	Mean Square	F	Sig.
1	Regression	1.368	3	.456	31.957	.000 ^b
	Residual	1.641	115	.014		
	Total	3.010	118			

a. Dependent Variable: PRICE OF PETROLEUM PRODUCTS

b. Predictors: (Constant), GEOPOLITICS, TRANSPORT AND DELIVERY, INBOUND COST FLUCTUATIONS

The significance value is 0.000 which is less than 0.05 thus the model is statistically significance in predicting how transportation and delivery, inbound cost fluctuations and geo-politics influence

the price of petroleum products among oil marketing companies in Kenya. The F-critical at 95% confidence interval was 26.80. Since F calculated (ANOVA table) of 31.957 is greater F – critical (at $\alpha = 0.05$) = 26.80; this result demonstrates that the overall model was significant. Therefore, the study reveals that; transportation and delivery, inbound cost fluctuations and geo-politics were all important factors influencing the price of petroleum products among oil marketing companies. These results similar to the findings of Asaari and Razak (2010) which also revealed a positive and significant influence of supply chain risk factors on the price of petroleum products among oil marketing companies in South Africa.

Table 12: Coefficients of Determination

Coefficients^a

Model		Unstandardized Coefficients		Standardized Coefficients		Sig.	Collinearity Statistics	
		B	Std. Error	Beta	t		Tolerance	VIF
1	(Constant)	2.396	.119		20.217	.000		
	Transport Delivery	.120	.017	.494	7.119	.000	.987	1.014
	Inbound Cost Fluctuations	.057	.017	.246	3.453	.001	.936	1.069
	Geopolitics	.106	.019	.392	5.528	.000	.941	1.063

Predictors: (Constant), Transportation and Delivery, Inbound Cost Fluctuations and Geo-politics

Dependent Variable: The Price of Petroleum Products among Oil marketing Companies

The following multilinear regression model was employed:

$$Y = \beta_0 + \beta_1 X_1 + \beta_2 X_2 + \beta_3 X_3 + \epsilon$$

Where:

Y = The price of Petroleum Products among Oil marketing Companies

β_0 = Constant

β_i = Regression coefficients, ($i = 1, 2, 3$)

X_1 = Transportation and Delivery

X_2 = Inbound Cost Fluctuations

X_3 = Geo-politics

ϵ = Error at 95% confidence interval or $\alpha = 0.05$

The multiple regression equation is;

$$Y = 2.396 + 0.120 X_1 + 0.057 X_2 + 0.106 X_3$$

Above regression equation was formulated by including all supply chain risk factors i.e. transportation and delivery (X_1), inbound cost fluctuations (X_2) and geo-politics (X_3) and constant the price of petroleum products among oil marketing companies, $\beta_0 = 2.396$. The findings also demonstrate that assuming a unit increase in transportation and delivery will lead to a 0.120 increase in the price of petroleum products among oil marketing companies. The P-value = 0.00 < ($\alpha = 0.05$), the relationship is therefore statistically significant. The results also reveal that one unit

increase in inbound cost fluctuations will lead to a 0.057 increase in the price of petroleum products among oil marketing companies. The P-value = $0.03 < (\alpha = 0.05)$. Moreover, one unit increase in geo-politics factor will lead to a 0.106 increase in the price of petroleum products among oil marketing companies. The P-value = $0.00 < (\alpha = 0.05)$, the relationship is therefore statistically significant. The findings of the study, evidently demonstrate that transportation and delivery accounts most changes in price of petroleum products among oil marketing companies in Kenya.

5.0 Summary, Conclusion And Recommendations

5.1 Summary of Findings

The aim of the study was to determine the influence of supply chain risk factors on the price of petroleum products among OMCs in Kenya. The study targeted staff of companies in the oil industry, specifically procurement. A count of 119 employees filled the questionnaires i.e. responded. The findings demonstrated the significance supply chain risk factors to the price of petroleum products among oil marketing companies to include; transportation and delivery, inbound cost fluctuations and geo-politics; and the extent to which they influence pricing. The coefficient of determination (R^2) equals to meaning only 46% for the variation in price can be predicted using the modelled supply chain risk factors. The remaining 40% is a definitely future study area i.e. determine other factors that have not examined but have a positive significance on prices such as weather conditions.

5.2 Conclusion

In Conclusion, the price of petroleum products among oil marketing companies can be influenced by transportation and delivery, inbound cost fluctuations and geo-politics; a development robust and sophisticated supply chain risk management system would help oil companies to mitigate unforeseen shocks and disruption in the market and minimise the level of supply chain exposure. The coefficient of regression for transportation and delivery risk factor is $\beta_1 = 0.120$ which indicates it has a significant influence on the price of petroleum products among OMCs; this implies that increasing levels of transportation and delivery risks by one unit results in a corresponding increase of petroleum products by 0.120 therefore transportation and delivery has a positive effect on the price of petroleum products among oil marketing companies.

With regard to geo-political risks, the corresponding regression coefficient $\beta_3 = 0.106$ which indicates it that a significant influence on the price of petroleum products among OMCs; i.e. one unit increase geo - political risks results in a corresponding increase of petroleum products by 0.106 therefore geo-politics has a positive effect on the price of petroleum products among oil marketing companies. Lastly, With regard to inbound cost fluctuation risk, the corresponding regression coefficient $\beta_2 = 0.057$ which indicates it that a significant influence on the price of petroleum products among OMCs; that is to say that one unit increase inbound cost fluctuations results in a corresponding increase of petroleum products by 0.057 therefore inbound cost fluctuation positively affects the price of petroleum products among oil marketing companies. Although its influence is much lower than that of transportation and delivery risk factor and geo-politics.

5.3 Recommendations and further research

Scholarly recommends that there is need for future research to delve into undertaking research in other industries or sectors in Kenya and Africa in order determine if the investigated supply chain factors can be generalised to affect performance or prices in other sectors.

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