

# Role of Government Economic Regulations on Petroleum Supply Chain Management

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**Abstract:** The study sought to assess the role of government economic regulations on petroleum supply chain management by surveying oil marketing companies in Kenya. The researchers used mixed research design. A field survey was carried out while purposive sampling was used to select 180 respondents from thirty six (36) oil marketing companies located in Nairobi city involved in importation and marketing of oil products in Kenya. Primary data was collected through a questionnaire. Data was quantitatively analyzed using statistical package for social scientists (SPSS) for descriptive statistics and inferential while Analysis of Moment Structure Software (AMOS) was used for structural equation modeling. The study findings indicate that there was a positive relationship (regression weight = 0.47) between government economic regulations and Petroleum Supply Chain Management. The researchers therefore recommend implementation of government economic regulations by OMCs and ERC to be proactive to ensure fully compliance. There is also need for participation of all stakeholders in the development of policies that will ensure sustainable petroleum supply chain management. It is expected that the study will be of great importance to the management of oil marketing companies, policy makers, suppliers, consumers and the government. These are major stakeholders in the petroleum downstream sector.

**Keywords:** Economic Regulations, Petroleum Supply Chain Management, Oligopolistic Market

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## 1. Introduction

Petroleum is the world's major source of energy and is a key pillar of the continued development of the world economies. As of 2014 petroleum accounted for about 22% of the total primary energy consumed in Kenya, while coal provided about 1% of energy consumed, mainly by cement manufacturers<sup>5</sup>. Globally, a whopping 30 billion barrels of oil is consumed per year. The United States Energy Information Administration (EIA) in its 2011 international energy outlook projects that the world's energy consumption will increase by 53% by the year 2035 [11]. In Europe and Asia, oil accounts for 32% of energy consumption, whilst in the Middle East, 53%. For South and Central America the figure is 44% whereas in North America it is 40%. The total energy consumption in Africa is 41%.

Energy markets have a number of features that have prompted government intervention, low short-run price

elasticity of demand and supply, oil is a commodity, which makes it more difficult for producers to enjoy a steady income than producers of brand-name products since different brands of oil, for example are equivalent, consumers will desert an existing supplier if cheaper sources become available. Unfortunately the energy sector worldwide is characterized by monopolistic and oligopolistic market structures which are an impediment to the economic efficiency that is associated with a competitive market. The role of regulation is therefore to deal with this market failure and administratively promote; efficiency, competition, investment and private sector participation and protect consumer interests in terms of affordability, quality of service and service sustainability [10]. It may be argued that regulation is an unpleasant word which represents the heavy hand of authoritarian governments and the creeping body of rules that constrain human or national liberties. The concept of regulation is a part of a superstructure that serves the

interest of the dominant class and power relations in seemingly civilized forms. For example in the USA; for democrats, it is argued that regulation is public good, a tool to control profit-hungry capitalists and to govern social and ecological risks [14]. In this study, the researcher takes regulation to mean the employment of legal instruments for the implementation of social-economic policy objectives more so in petroleum supply chain management in Kenya.

Adoption of supply chain management concept by organizations has been one of the ways through which they are seeking to serve the customer efficiently and effectively. As an effective business philosophy, supply chain management has gained tremendous amount of attention from both the academics and practitioners in the recent years<sup>4</sup>. It has been argued that measuring supply chain performance can facilitate a greater understanding of the supply chain, and improve its overall performance [16]. The petroleum supply chain comprises of upstream, middle stream and downstream sectors. The upstream is concerned with exploration and production, the midstream deals with storage, marketing and transportation of commodities like crude oil, natural gas, natural gas liquids (NGLs, mainly ethane, propane and butane) and sulphur. The downstream sector involves oil refineries, petrochemical plants, petroleum products distributors, retail outlets and natural gas distribution companies. Midstream operations are considered as part of the downstream sector, the subject of this study. The importance of the sector in fulfilling the majority of transportation needs, providing power and serving as a foundation for petrochemical business underpins the survival of other essential industries [3]. This study concentrated on the downstream sector since the Kenyan petroleum upstream sector is at its nascent stages in Kenya.

A key observation is that regulatory agencies are more effective in controlling prices than in establishing the quality of service offered by a regulated firm. Privatization and deregulation of the downstream sector of the petroleum industry in Nigeria has many consequences, more so the suffocating effect of these policies when the public installations have been sold by government to themselves, their associates, friends and relations [8]. A review of gasoline regulation in Nova Scotia, government regulation was identified to introduce a measure of stability and predictability into an otherwise volatile market for petroleum products [9]. Governments across the globe have heavily regulated the energy sector though to some extent the practice of deregulation is gaining ground in line with a free regulating market coupled with government subsidies.

Kenya has effected a number of policies to address energy issues in support of its development challenges. These include formulation of a national energy policy and improvements in the energy planning process amongst others affordable supply of energy to meet development needs, while protecting and conserving the environment. These are contained in the Economic Recovery Strategy (ERS) and Sessional Paper No. 4 of 2004 on Energy. The Energy Act 2006 addresses the current disparities in energy sector

regulations and enforcement of energy sector activities under one body, the Energy Regulatory Commission (ERC) [11]. The national energy policy has a number of broad objectives, including ensuring adequate, quality, cost effective and timely supply. The Energy Act is a comprehensive legislation that encompasses the petroleum and natural gas, electrical energy and renewable energy sectors. ERC is a single sector regulatory agency with responsibility for economic and technical regulation of electric power, renewable energy and downstream petroleum sub-sectors including tariff setting and review; licensing; enforcement of compliance; dispute settlement and approval of power purchase and network service contracts [16]. The ERC was established in 2007 and is in its nascent stages [14].

As at December 2014 there were 71 OMCs licensed to import petroleum products and 176 companies licensed to market petroleum products in Kenya, and more are expected to join although there are only 36 active ones [15]. The main marketers in the petroleum industry are Total, Shell and Kenol Kobil who control a total of 68 per cent of the petroleum market in Kenya and have been setting the pace for petroleum pricing however Oil Libya, the fourth largest player, and National Oil have been closing the gap with steady growth of market share. There are also independent dealers such as Hass Petroleum, Hashi Gulf Energy and Gapco Oil [7]. The licensing criterion has been simplified to facilitate the entry of indigenous traders in the oil business. However, the market is still largely oligopolistic with over 55% being controlled by the three main OMCs.

The quality, price, and schedule availability of products and systems improve significantly with the increasing relevance and effectiveness of government activities in that sector, of particular significance are the existence, effectiveness, institutionalization, and continuous improvement of these activities which include measures to ensure adequate supply of petroleum products [6]. Despite the government interventions in the sector supply inefficiencies in quality, availability and pricing of petroleum products are still visible [21]. The challenge therefore, for many countries is the establishment of effective regulatory infrastructures capable of playing complementary roles in fostering success in supply and safeguarding consumer welfare [20]. Thus the study therefore sought to establish the role of Government economic regulations on petroleum supply chain management in Kenya.

## 2. Literature Review

### *Economic Theories of Regulation*

The study is anchored on economic theory of regulation. Economic regulation is an important instrument in market economies. It does not mean the total governance of the economy as a whole, but the exercise of some influence on an activity that is different from total control. As direct state ownerships decline, the economics of regulation becomes very important both in academic and policy areas [22]. Economic theory is based on two simple but important

insights. The first is that since the coercive power of government can be used to give valuable benefits to particular individuals or groups, economic regulations the expression of that power in the economic sphere can be viewed as a product whose allocation is governed by laws of supply and demand. The second insight is that the theory of cartels may help us locate the demand and supply curves. Economic regulation consists of two types of regulations: structural regulation and conduct regulation. Structural regulation is used for regulating market structure while conduct regulation is used for regulating behavior in the market. Examples are price control, rules against advertising and minimum quality standards. Economic regulation is mainly exercised on natural monopolies and market structures with limited or excessive competition. This study sought to establish the effect of both regulations on the petroleum supply chain management. These theories are highly applicable in the Kenyan petroleum sector context due to its oligopolistic nature which necessitates price controls as well as quality management to minimize cartel like behaviors.

#### *Public Interest Theory*

According to public interest theory, government regulation is the instrument for overcoming the disadvantages of imperfect competition, unbalanced market operation, missing markets and undesirable market results. Public interest theory explains regulation from viewpoints not restricted to imperfect competition and unbalanced market operation. In the first place, missing markets can be accounted for by hidden information or an asymmetric distribution of information with respect to prices, quantities or quality of goods. Public theory was used in the study to cater for the imperfect competition, unbalanced market operation and undesirable market results since the government through regulating the petroleum supply chain seeks to promote local suppliers as well as ensure quality, competitively priced and adequate supply of petroleum products.

#### *Free Market Economic Model*

With the massive reduction in government intervention in economic activities, the superiority of the free market model has been clearly demonstrated as the other two economic models are now being abandoned. The economic case for deregulation of markets rests on the well know proposition that, given certain conditions, free market equilibrium entails the maximization of efficiency in the pareto optimal sense. This proposition originated from Adam Smith's doctrine of Laissez fair rested in the 'Nonintervention by government in businesses' part of his work in 'An Inquiry into the Nature and Causes of the Wealth of Nations, 1776.

Government should not interfere in economic process and should follow a policy of laissez faire. The syllogism is that in a free market, people acting to further their own self-interest will be led by an invisible hand to promote efficiently and the interest of the society as a whole. Thus, with competitive markets, and an absence of government regulation, the resulting market prices bring about an optimum allocation of resources, in that consumers receive

the goods they want at the lowest possible cost. However, due to market failure and the inadequacies of the pricing mechanism for the allocation of resources, the free market model has been faulted in several respects. Thus, in many circumstances, the invisible hand of the market mechanism has been subjected to the control of the guiding in most third world economies stepped in to address the issue of market failure by assuming increased control over aggregate economic activity through the use of macroeconomic and sectorial policies as well as increased participation in economic activities in the form of nationalized industries, public enterprises and public investment programs. The researchers postulate that such a theory is not applicable in the Kenya Petroleum sector since its oligopolistic in nature and often operates in a cartel like manner.

#### *Government Economic Regulations*

Economic regulations are enforced in form of taxes and levies which are enforced by Kenya Revenue Authority (KRA) or ERC. This are in form of charges for various licenses; trading license, operating license, environment license, storage charges, training levy, transportation levy etc. Key costs that impact on petroleum pump prices include taxes and levies on petroleum products. However, these do not vary with the cost of products and have remained unchanged for the last several years. Table 1 shows the taxation rates for petroleum products as at January, 2015. Hence we hypothesize that;

H0<sub>1</sub>: Government economic regulations does not significantly influence petroleum supply chain Management in Kenya

**Table 1.** Taxation Regime for the Petroleum Sector as at January, 2015.

	Super	Kerosene	Diesel
Excise Tax	19.895	0.000	8.244
Road Maintenance Levy	9.000	-	9.000
Petroleum Development Levy	0.400	0.400	0.400
Petroleum Regulation Levy	0.120	0.050	0.120
Total: Taxes & Levies	29.415	0.450	17.764

Source: ERC, 2015

#### *Petroleum Supply Chain Management*

Petroleum supply chain management has received a lot of interest in Kenya owing to the critical role attached to energy in the realization of vision 2030. The increase in consumption of petroleum products has obvious implications for the operations of the petroleum industry in the country (both upstream and downstream), including the risks posed to the natural environment and human safety. Supply Chain Management aims to link all the supply chain agents to jointly cooperate within the firm as a way to maximize productivity in the supply chain and deliver the most benefits to all related parties. Adoption of Supply chain management practices in industries has steadily increased since the 1980s. The government controls a majority stake in every level of the petroleum supply chain i.e., it controls the importation process, the petroleum refining process, the pipeline transportation mode and the retail distribution channel [15].

The government does so through enactment of various regulations; economic, environmental, operational, health and safety regulations all of which affect the petroleum supply chain management.

Governments have a number of policy responses to combat asymmetric retail petroleum product pricing and to reduce excessive margins. One option is to ensure that more information be made available to the public on the range of prices paid. This can include better price displays at retail stations and the official collection and publication of data from stations in major population centers, as is now done in a number of countries. Another approach is to remove barriers to entry, especially for firms that would be large enough to have an effect on industrial concentration. An important example of this approach is legislation to ensure that all retail companies and wholesale companies have equal access to sources of supply (storage, pipelines, and refineries) that may be controlled by just one or a few companies that themselves are active in the downstream markets.

Although rarely exercised in practice in downstream petroleum markets, a number of governments also have antitrust legislation, intended to constrain the behavior of existing companies where there is strong evidence of excessive prices and implicit collusion. The possibility of the imposition of fines and orders to divest some market share provides strong disincentives for companies to collude and provoke the use of such legislation.

Relationship between crude oil prices and retail petroleum product prices appears to exhibit an asymmetric, “rockets and feathers” pattern. That is, in countries where retail prices are not controlled by the government, when crude prices rise, retail prices follow quickly (like a rocket); in contrast, when crude oil prices fall, retail prices go down more slowly (like a feather). This tendency has been taken to imply that there has been implicit collusion between companies to increase profits, at least temporarily, by delaying the full price cut warranted by the fall in costs.

Although research has generally been documented, few studies have been undertaken in Kenya on the role of government regulations on petroleum supply chain management. However, in Nigeria much of the attention in the research on oil pollution and safety in the petroleum industry and its regulation have been on the upstream sector. This leaves out the role of government regulations on the oil downstream sector. The Kenyan upstream petroleum sector is at its nascent stages hence such research may be not appropriate. [15] sought to unravel the challenges facing Supply Chain Management in Kenya Petroleum Industry where he found out that Kenya’s petroleum industry faces supply chain challenges such as lack of strategic stocks, relatively high petroleum prices compared to other East African countries, frequent fuel shortages, sub-standard products and diversion of products destined for export back into the country. This study was only limited to NOCK and identified challenges facing implementation of effective supply chain management practices. Despite the study finding out that government controls a majority stake in

every level of the supply chain i.e., it controls the importation process, the petroleum refining process, the pipeline transportation mode and the retail distribution channel. The research did not deal with the effects of the government control and causes of the challenges. Hence the research shortcomings form part of the basis for this study.

[21] on a study titled regulatory and competition– Related Reforms in Kenya’s Power and Petroleum Sectors found out that the energy sector in Kenya continues to face huge challenges which includes weaknesses in institutional and legal frameworks, limited and uncoordinated enforcements, inadequate technical capacities and external economic conditions despite reforms in the petroleum sub-sector which allowed greater participation of the private sector, particularly in the importation, distribution and supply services. The researcher recommended strengthening of the regulatory system in the energy sector to ensure sustainability, competitiveness and security of energy supply in Kenya. <sup>4</sup>assessed the implication of full scale deregulation of the downstream oil sector on the Nigerian economy using the neoliberalism approach. The researcher asserts that deregulation of the downstream oil sector of Nigeria will bring an end to the problems of oil and lead to development of the economy. Most of the studies focus on upstream supply chain yet the customer faces the bad effects of poor managed downstream supply chain. It is therefore critical to assess the role the government plays in the petroleum supply chain management more so the downstream sector so as to protect the customer from the aforementioned effects of accidents, health and safety issues, environmental degradation as well as non-competitive prices.

### 3. Research Methodology

The study adopted a descriptive survey design with both qualitative and quantitative approaches. Descriptive research design elicits data from a target population through either questionnaire or interview and subjecting each data to statistical analysis for the purpose of drawing conclusions which will be used. A survey provides the third component of a research concept, thereby allowing a triangulation of accounts; from a review of documentation, to an analysis of what actually happens, to how this is viewed by those involved or associated with the process. Furthermore surveys have been the most popular method in SCM research.

The target population was all workers for OMCs especially the ones involved directly in the petroleum supply chain management, which are 36 OMCs with 1780 members of staff<sup>7</sup>. According to [15] there are 36 operational OMCs in Kenya and hence the respondents were drawn from five sections namely; Supplies and Distribution, Human Resources and Production and operations, sales and Marketing and finance departments. Purpose sampling technique was used to select 180 respondents from the 36 OMCs which was more than 10% of target population which was adequate and representative [17].

This study used both secondary and primary data. Primary

data was collected through use of a questionnaire while secondary data was obtained from the internet, Journals, published thesis and books. The questionnaire was divided into subsections based on the constructs with relevant items used to measure them. Government Economic Regulations (GER) construct was measured by five items; Taxes, levies, quality, effectiveness and hedging labeled as GER1, GER2, GER3, GER4 and GER5 while Petroleum Supply Chain Management (PSCM) construct was measured by seven constructs; quality of products, steady supply, adequate supply and responsive chain labeled as PSCM1, PSCM2, PSCM3, PSCM4, PSCM5 and PSCM6 respectively.

Descriptive statistics and inferential analysis of data was done using Statistical Package for Social Sciences (SPSS) a while Analysis of Moment Structures (AMOS) was used to determine the contribution of government regulations on petroleum supply chain management. A multiple linear regression model was used to test the significance of the influence of GER on PSCM.

The multiple linear regression model was,  $Y = \beta_0 + \beta_1 X_1 + e$ , Where;  $Y$  = Petroleum Supply chain Management,  $X_1$  = Government Economic Regulation and  $e$  = error term which is assumed to be normally distributed with mean zero and constant variance. In the model,  $\beta_0$  = the constant term while the coefficient  $\beta_1$  = 1 was used to measure the sensitivity of the dependent variable ( $Y$ ) to unit change in the predictor variables while the error term ( $e$ ) captured the unexplained variations in the model.

Pearson's correlation analysis was used to establish the relationship between the PSCM and the GER. T-test was used to test the significance of GER, at 5% level of significance. AMOS reports the t-value, the significance level, and the standardized regression weight for each causal relationship in the model. The t-value and significance level allow researchers to identify whether the relationship is significant and at what level, while the standardized regression weight, which is called effect size, shows what the coefficient between the independent variable and the dependent variable in a causal relationship.

## 4. Research Findings and Discussions

The study targeted respondents who comprised of 36 Supplies managers, 36 Health & Safety managers, 36 Operations managers, 36 sales and marketing managers and 36 Finance managers who are the heads of their respective departments or their deputies totalling 180 respondents in the 36 OMCs. All the 36 OMCs participated in the survey which could be attributed to the inclusion of a support letter from the university and research permit from National Commission for Science, Technology and Innovation (NACOSTI) permit number 8754. A total of 113 filled questionnaires were returned which represents a 63% response rate as shown in table 2 below. According to [17] a response rate of 50% is adequate, 60% and above good, and above 70% very good, while that of 60% response rate is sufficient especially in the oil industry whose business

information is deemed to be secretive even to what the public may consider to be general data. Therefore in cognizance of the sensitivity of the required data in the study, for managers of OMCs wouldn't like to be seen to be critical of government policies in a very oligopolistic oil market structure, a 63% response rate was deemed to be adequate and sufficient.

### *Job Designation and Experience of Respondents*

Majority (27.3%) of the respondents were supply chain managers which is an indication of their interest in the subject of study hence the study was relevant to their daily operations. Majority (78.7%) of respondents had worked for the current OMCs for a period of 1-10 years as shown in table 2, which is an indication of moderate turnover rate of senior functional managers in the petroleum sector in Kenya. The average number of employees per OMC was 90 with a minimum of one employee in the departments which indicates that OMCs supply chain management ranges from simple to complex structures.

**Table 2.** Job Designation and Experience of Respondents.

Job designation	Frequency	Valid Percent
Sales Executive	24	21.8
Finance officer	7	6.4
Supply Manager	30	27.3
Marketing Manager	6	5.5
Operations Manager	17	15.5
Accountant	16	14.5
IT	6	5.5
Exports officer	4	3.6
Total	110	100.0
Years in current OMCs	Frequency	Valid Percent
1-10	87	78.7
20 and above	23	21.3
Total	110	100.0

### *Awareness of Existence of Government Economic Regulations*

The section sought to ascertain respondent's awareness of existing economic regulations that guide their petroleum supply chain management. Majority (80.5%) percent of the respondents were aware of the existence of these regulations with only 19.5 percent attesting to not being aware. This is an indication that the sampled respondents had the knowledge and exposure to answer questions on economic regulations requirements in their activities.

### *Areas of GER Application in Petroleum Supply Chain Management*

The researcher sought the respondent's identification of economic regulations application in priority areas. Price control as well as levies and taxes were identified as the areas of application of the regulations in order of decreasing priority. Majority (80.3%) of the respondents identified price control as the highest priority area with levies and taxes being the least (19.7%) priority application areas of the government economic regulations in OMCs activities. This is so since the petroleum prices are reviewed on monthly basis by the ERC. According to [14] the intention behind price regulation is the desire to maintain affordability of staple

foods and goods, prevent price gouge during shortages, slow inflation and to ensure a minimum income for providers of certain goods. This may be in form of price controls, taxation, subsidization and franchising. There are two primary forms of price control, a price ceiling, the maximum price that can be charged, and a price floor, the minimum price that can be charged. Price controls are supposed to help consumers toward getting better and cheaper products. As a result, human welfare is maximized.

#### *Measurement of Government Economic Regulations*

In this section the researcher sought the opinions of respondents on the role played by government economic regulations on their petroleum supply chain management as shown in table 3. When asked whether government taxes are fairly implemented, majority (47%) of the respondents agreed to a large extent, 25% moderately agreed, 17% agreed to a very large extent, 9% agreed to a small extent with only 2% of the respondents attesting to GER not being fairly implemented. Majority (47%) of respondents agreed to a large extent that

levies imposed on petroleum products help them in improving their services, 20% moderately agreed, 19% agreed to a very great extent while 11% agreed to a small extent and only 3% agreeing that this did not help in improving their services. When asked whether taxes and levies imposed on petroleum products lead to quality products. Majority (48%) of the respondents agreed to a large extent, 23% to a very large extent, 22% agreeing to a moderate extent while 2% agreed to a small extent and 5% attesting to zero effect of GER on the quality of their products.

When asked whether GER lead to effective petroleum supply chain management. Majority (48%) of the respondents agreed to a large extent, 25% to a moderate extent, 23% to a very large extent while 5% agreed not at all and 2% agreeing to a small extent. Majority (47%) of respondents agreed to a large extent that GER helps to cushion petroleum supply chain in hard economic times, 30 agreed to a very large extent, 17% to a moderate extent while 6% of the respondents agreed to a small extent.

**Table 3.** Measurement of Government Economic regulations.

Government Economic regulations	Not at all (%)	Small extent (%)	Moderate extent (%)	Large extent (%)	Very large extent (%)	Mean	Std. Deviation
Government taxes are fairly implemented.	2	9	25	47	17	3.69	.924
Levies imposed on petroleum products help in improving our services.	3	11	20	47	19	3.67	1.009
Taxes and levies on petroleum products lead to quality products	5	2	22	48	23	3.84	.963
Economic regulations lead to effective petroleum supply chain management.	0	6	25	48	20	3.83	.827
Economic regulations have help cushion petroleum supply chain in hard economic times.	0	6	17	47	30	4.00	.854

#### *Factor Analysis of Government Economic Regulations*

Table 4 indicates that the overall cronbach's value for GER items was 0.845 which is a very good reliability coefficient; each of the items had a factor loading greater than 0.7, accounted for 56.59% of the total construct variance and a

KMO value of 0.837. This was an indication of reliable measures hence all the constructs items as well as sampling adequacy hence were accepted and subjected to further analysis.

**Table 4.** Factor Analysis Results for Government Economic Regulations Items.

GER	Overall Cronbach's Alpha	Corrected Item-Total Correlation	KMO	Factor Loadings	Total Variance Explained
Government taxes implementation	0.851	.544	0.839	.690	62.80%
levies and quality of services		.768		.871	
Taxes & levies and quality of petroleum products		.720		.837	
ER and PSCM effectiveness		.629		.763	
ER and PSCM resilience		.654		.790	

#### *Factor Analysis Results for Petroleum Supply Chain Management Items*

Table 5 indicates that the overall cronbach's value for PSCM items was 0.903 which is a very good reliability coefficient, each of the items had a factor loading greater

than 0.7, accounted for 63.77% of the total construct variance and a KMO value of 0.858. This was an indication of reliable measures hence all the constructs items as well as sampling adequacy hence were accepted and subjected to further analysis.

**Table 5.** Factor Analysis results for Petroleum Supply Chain Management Items.

PSCM	Overall Cronbach Alpha	Corrected Item-Total Correlation	KMO	Factor Loadings	Total Variance Explained
PSCM is efficient	0.903	.801	0.858	.868	63.77%
PSCM is responsive		.746		.824	
PSCM is customer centred		.735		.809	
PSCM is highly regulated		.716		.794	
PSCM embraces innovation		.689		.780	
PSCM is adequately regulated		.641		.735	
PSCM embraces risk management techniques		.689		.773	

### CFA 2<sup>nd</sup> Order Test

This phase involved testing the hypothesized relationships and to fit the structural model involving latent variables structural equation modeling (SEM). The objective of this section was to establish the role of financial regulations on petroleum supply chain management in Kenya. There was a

positive relationship (regression weight = 0.47) between GER and PSCM as indicated in figure 1. The hypothesis to test this objective was;  $H_0$ : Government economic regulations do not significantly influence petroleum supply chain management in Kenya

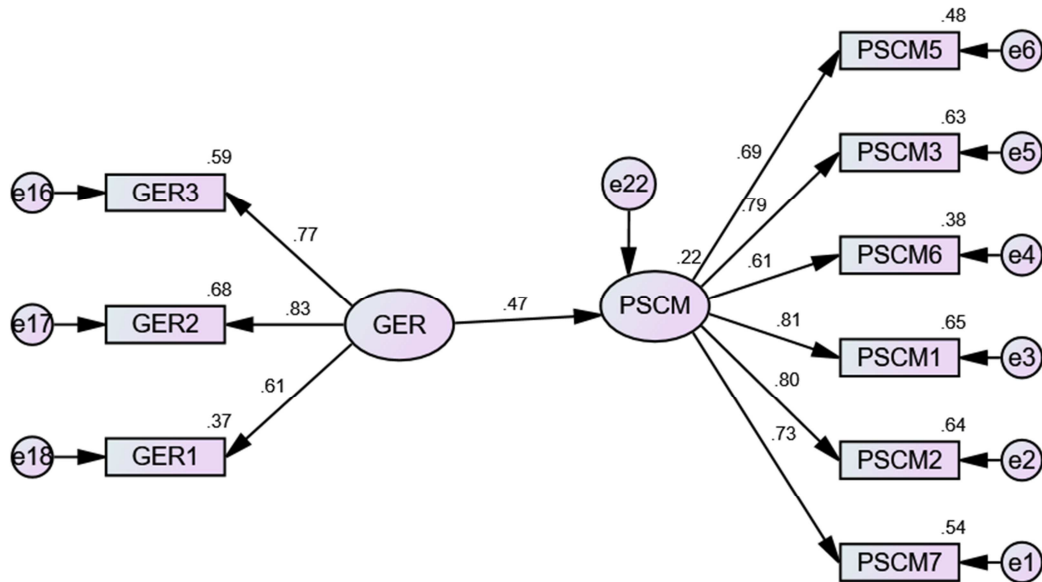


Figure 1. CFA 2<sup>nd</sup> Order Results for GER and PSCM.

The model fit ratios of CFI, GFI and AGFI were 0.947, 0.919 and 0.86 respectively as shown in table 6, an indication of a good model fit. The RMSEA of 0.089 which is greater than 0.05 hence an indication of a perfect model fit.

Table 6. Model Fit Indices.

Model	CFI	GFI	AGFI	RMSEA
Default model	.947	.919	.860	.089
Saturated model	1.000	1.000		
Independence model	.000	.399	.249	.329

The path coefficients between GHSR items and PSCM ranged from 0.105 to 0.161 which are less than 2 an indication of acceptance of the positive relationships between the items and factors. T-values ranged from 3.96 to 8.229 which are greater than 1.96 t-static values which is an indication of the significance relationship between GER and PSCM. The  $R^2 = 0.221$  an indication that 22.1% of the variance in PSCM can be explained by GER and the rest percentage variance by other factors as indicated in table 7.

Table 7. Regression Weights.

			Unstandardized Estimate	Standardized Estimate	S. E.	C. R.	P
PSCM	<---	GER	0.418	0.469	0.105	3.96	***
PSCM7	<---	PSCM	1	0.733			
PSCM2	<---	PSCM	0.99	0.797	0.122	8.114	***
PSCM1	<---	PSCM	1.259	0.809	0.153	8.229	***
PSCM6	<---	PSCM	0.85	0.614	0.137	6.22	***
PSCM3	<---	PSCM	1.01	0.792	0.125	8.058	***
PSCM5	<---	PSCM	0.943	0.69	0.135	7.004	***
GER3	<---	GER	1	0.769			
GER2	<---	GER	1.073	0.826	0.161	6.662	***
GER1	<---	GER	0.729	0.61	0.126	5.797	***

Since there exists a positive and significant relationship between GER and PSCM the null hypothesis ( $H_{01}$ ) that Government economic regulations does not significantly influence petroleum supply chain management in Kenya is rejected.

### Analysis of Variance (ANOVA)

The total variance (39.031) as indicated in table 8 was the

difference in variance that can be explained by the independent variable (Model) and the variance that cannot be explained by the independent variable (error). The study established that there existed good ness of fit between variables as F- test ( $F = 19.375$ ,  $P = 0.00 < 0.001$ ) as indicated in table 8.

Table 8. ANOVA.

Model	Sum of Squares	df	Mean Square	F	Sig.
Regression	33.988	4	8.497	19.375	.000 <sup>b</sup>
Residual	39.031	89	.439		
Total	73.019	93			

a. Dependent Variable: PSCM

b. Predictor: (Constant), GER

*Coefficients Estimate of Variance*

The coefficients estimate of variables is shown in table 9.

Table 9. Coefficients of Variations.

Model	Unstandardized Coefficients		Standardized Coefficients	t	Sig.
	B	Std. Error	Beta		
(Constant)	.157	.069		2.278	.025
GER	.258	.075	.308	3.423	.001

a. Dependent Variable: PSCM

From the regression analysis shown in table 9 it was found that petroleum supply chain management would be at 0.157 (constant) when GER is at zero (0). This could be because of other factors that could not be explained by the model. The study also found at there existed a positive and significant relationship between PSCM and GER since  $r = 0.258$ ,  $t = 3.423$  and  $P = 0.001 < 0.005$ . The findings were similar to [5] that soaring prices have led to calls on governments across the world to take action, ranging from providing greater safety nets and releasing oil from strategic reserves, reducing taxes, and granting outright price subsidies.

Therefore the linear relationship of the overall model is:  $PSCM = 0.157 + 0.258 \text{ GER}$ . This indicates that for every change of one unity by PSCM, a change of 0.258 takes place at GER respectively and an error term of 0.157. The large value for the error term (0.157) is an indication that there are other factors affecting PSCM other than government economic regulations.

## 5. Conclusions

The study concludes that the role of government economic regulations on petroleum supply chain management in Kenya is very important since the intention behind the regulation is the desire to maintain affordability of goods, prevent price gouge during shortages, slow inflation and to ensure a minimum income for providers of certain goods [14]. The Kenyan consumer has enjoyed relatively fair priced, quality and adequate supply of petroleum products since the levies and taxies imposed on petroleum industry are fairly implemented. However there is need for a more proactive development of regulations that factor in geopolitical environment so as to ensure an immediate low price trickle effect once the global prices fall.

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