



Implications of Price Regulation on Market Structure of Oil Marketing Firms in Kenya

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Abstract

Despite a substantial growth in the sub-Saharan African region, a trend of divestment by multinational oil marketing companies has been witnessed in Kenya in the recent past. These companies have often cited stringent operating markets and pricing laws in the country which bites on their profits. The implications of price regulation whether economic or social could depend on a variety of factors, thus an empirical study was carried out to estimate the relationship between price regulation, market concentration, product differentiation and number of firms entering and exiting the industry within the study period. This explored the implications of price regulation on market structure of oil marketing firms in Kenya. An analytic study approach was used and secondary data was obtained from Petroleum Institute of East Africa for 63 companies registered as at December 2014. Data was analyzed using an entry and price competition model to analyze data using OLS estimates for a period spanning from 2004 to 2014. The obtained results were used to make inferences and conclusions. The findings of this study showed that opportunity costs for price regulation is significant, price regulation significantly affected the market concentration by of these companies an indicator of reduced competition in the industry after the implementation of the policy. The number of firms entering and exiting the market also intensified. Therefore, as long as the policy is still in place, the regulator should always be aware of hidden costs of price regulation and should put in place structures and mechanisms to ensure that competitive markets are natured to attract investors into the country.

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1. Introduction

1.1 Background

Regulation consists of all mechanisms of social control or influence affecting all aspects of behavior from whatever source whether they are intentional or not [3]. Well-regulated, competitive markets can maximize consumer welfare leading to economic growth.

The Energy Act enacted in 2006 laid the foundations of regulations of petroleum sector in Kenya by putting together all laws relating to energy policies under one regulatory body known as Energy Regulatory Commission (ERC). Its functions include regulation of the economic and technical aspects of electricity, renewable energy and petroleum subsectors [61]. Petroleum industry in Kenya covers transportation, refining and marketing of oil products. Since their operations and investment impact on the whole economy directly and indirectly, the government saw the need to have a controlling hand in the sector [29] data shows that Kenya's oil industry contributes over 20% of the Gross National Product. With the transport sector being the largest consumer of petroleum products of approximately 60% of the total volume followed by manufacturing 16%, commercial establishment 11%, households' use 9% and agriculture 4% [29]. However, according to [14] latest data, the total consumption of petroleum products reduced by 5.7 % from 3,857.90 thousand in 2012 to 3,638.00 thousand in 2013. At the same time, annual average oil prices of crude oil increased from \$110.60 per barrel in 2011 to \$112.97 in 2012, a slowing trend in the sector.

Kenya heavily depends on imported petroleum products to meet its energy needs and is therefore viewed as an important source of energy [60]. Since 2005, petroleum pump prices have been surging at a relatively higher rate than crude oil, implying a cartel-like pricing approach by the major oil companies. In a study conducted from July 2003 and May 2004, the Monopolies Prices Commission investigated the pricing of some petroleum products and found no explicit coordination among oil companies [21]. Given that the market structure of the petroleum industry could facilitate cartelization, we assume the oil companies behave like a cartel [32] spurring enactment of Price regulation in December 2010 to control the petroleum sector.

Price controls expose weaknesses in less diversified players. Smaller players, particularly independents, have also found it difficult to operate in the Kenyan market under price controls due to thinner margins in the retail end compared to wholesale. Both listed downstream oil marketers are relatively well diversified with segments such as Fuel Oil, LPG, Aviation and Commercial businesses hence increasingly accounting for a higher share of profits [28].

The pricing mechanism in the industry has been contested by various industry players arguing that it does not favor new investments and entrants of new players. Oilibya's Managing Director Ridah Elamir said "the basis of profit margins is unknown and it will have ramification on the industry". The industry players warned that controlled fuel prices could see exit of multinationals firms; citing regulations to negatively impact on the business climate in the country which so far has been witnessed.

1.1.1 Price Regulation and its Legislative Framework in Kenya

Kenya's energy sector is governed by the Energy Act No. 12 of 2006 which is a comprehensive legislation covering petroleum sector, natural gas, renewable energy and electricity sectors. Energy Act 2007 was formed basically for the purpose of regulation of importation, exportation, transportation, refining, storage and sale of petroleum products. Its role involves protection of consumers and investors and other stakeholders' interests as well as create a fair competitive business environment in the sector.

1.1.2 A Market Structure

Market Structure is the manner in which a market is organized, based largely on the number of firms in the industry [69]. The four basic market structure models are: perfect competition, monopoly, monopolistic competition, and oligopoly [69].

It is the selling environment in which a firm produces and sells its product characterized by the number of firms in the market, ease of entry and exit of firms and the degree of product differentiation. Most industries are characterized by having multiple firms often drastically varying sizes with some having or all having market power that is the ability to raise price above their competition and still have a positive demand [35]. Government can affect markets either through direct participation or through indirect participation in private markets. [35]

Market concentration is a concept derived to arrive at a single number that accounts for not only the number of firms but also how sales are distributed among firms in the market. If one counts the number of firms in an industry even after the exit of a large number, the market may still appear competitive [35]. Therefore, market concentration refers to the extent to which a small number of firms or enterprises account for a large proportion of economic activity such as total sales, assets or employment [27].

1.1.3 Petroleum Sector in Kenya

Petroleum sector in Kenya is composed of the following key players: the regulatory authority, the transporter (Kenya Pipeline Corporation), oil marketers and the refinery. Petroleum is the most important source of commercial energy and in Kenya; it is imported in two forms: crude for processing at the refinery and as finished products. So far, the sector has undergone changes from 1994 with the deregulation of retail prices and the importation of crude and refined products. Government requires all oil marketers to process their crude oil at the refinery KPRL, which is 50% owned by the government and 50% Essar, an Indian company. Importation of the product is done through an open tender system where one winner gets to import on behalf of the whole industry then shared among the OMC according to market share volumes [30].

The industry structure of processing and delivery entails processing of crude oil to petroleum products by KPRL in Mombasa which is then piped by KPC to various storage facilities including Mombasa, Nairobi, Nakuru, Eldoret and Kisumu. Final redistribution to most parts of the roads is mostly by road transport. The OMCs do the final dispensing of petroleum and other products. Even though the industry is open to all players, foreign companies are by far the largest players [46], this is despite the liberalization of the sector.

1.2: Statement of the Problem

Reference [14] stated that a good investment climate is pivotal to achieving the goals of Kenya's Vision 2030 and thus, an enabling environment is key in addressing regional disparities in resource endowments, development and access to other socio-economic services.

Despite a substantial and well publicized growth in oil demand across Africa, a trend of divestment in downstream operations by oil companies has been experienced over the last three to five years in Kenya [30]. The same report states that there is an increase in non-traditional and mid-size players to take up markets left and governments as well, taking leading roles in the industry. Reference [71] stated that Kenyan government needs to improve the market environment for private sector by investing in infrastructure, increasing domestic energy production and removing bottlenecks of doing business.

With a weakened global economy, volatile oil prices and globally reducing margins in downstream business, multinationals are reconsolidating their balance sheets to maintain shareholder value by shedding assets that are marginal and where costs and operating risks are high [30]. Reference [72] report shows that regional growth reflected an increase in demand of 4.9% for West and Central Africa and 4.4% for East and Southern Africa. For Sub-Saharan Africa as a whole, the growth rate comes out at 4.6% per year compared with an overall global growth rate of around 1% per year [71]. The prospects look good but why would oil multinationals exit the market? And what are the implications of their exit on the market structure?

The outgoing companies have previously cited stringent pricing laws which bite bitterly on their profit margins subject to high operational costs and interest in the industry. Reference [62] indicated that reduced profits, increased competition and official price caps are forcing big oil firms out of Kenya. Shell recently exited Kenya by selling their shareholding to Vivo Energy.

Despite most multinationals leaving the sector, it is still dominated by foreign companies since local firms cannot raise capital for acquisition and this only strengthens those already in the market and controlling a bigger market share [62]. There are more than 50 licensed oil marketing companies but just six of them control 86% of the market [49].

This study was therefore important to policy makers as it sought to highlight the implications of price regulations on market concentration, entry and exit of firms and product differentiation in a homogeneous Petroleum Products market. When prices are held below natural levels, resources such as talent and investor capital leave an industry to seek a better return, meaning less discovery and innovations are available in the sector [26]. Hence, it is virtually important to remind policy makers of the effects of price controls on innovation and other product improvements.

2. Literature Review

2.1 Introduction

This section provides the reviewed literature in support of the study. Theoretical literature is first presented to explain the need and effects of price regulations in the economy. It also presents the empirical literature review section on the studies that have been done before, followed by a conceptual framework showing relationship of variables and finally the theoretical model adopted for the study.

2.2 Theoretical Literature

Reference [69] gave a distinction of two types of economic regulations: structural and conduct regulations. Structural regulation concerns the regulation of the market structure and it includes entry and exit while Conduct regulation regulates the behavior of producers and consumers in the market and includes control of prices, products, advertising rules and quality standards.

Reference [59] Produced predictions along the lines of Capture Theory and tried to answer the question: why is there regulation of markets? The theory attempts to explain who receives benefits or burdens of regulation, their forms and effects upon allocation of resources. In Reference [59] approach, regulation is acquired by the industry and for its benefit. The basic resource of the state is the power to coerce and any group that can control this power benefits. Self-interested groups will seek to get the state's coercive power to support their interest that is, agents are rational enough in the sense of choosing actions that are maximizing utility. Stigler states that: "We assume that political systems are rationally devised and rationally employed which is to say that, they are appropriate instruments of desire of members of the society".

The efficient structure hypothesis by [35], states that firms earn high profits because they are more efficient than others. There are two distinct approaches within the efficient hypothesis: the X-efficiency and Scale-efficiency hypothesis. In X-Efficiency hypothesis, firms become more profitable because of their lower costs. Such firms tend to gain larger market shares, which may manifest in higher levels of market concentration, but without any causal relationship from concentration to profitability [2]. The Scale-efficiency approach emphasizes economies of scale rather than differences in management. Larger firms through economies of scale acquire profits and lower costs enabling them acquire larger market shares, leading to high concentration and profits.

2.3 Conceptual framework

Reference [3] Cited by [69] identified three broad causation channels of performance in a market; namely Structural-Conduct-Performance Paradigm. The below framework adopts a similar format of [3] to show a causal relationship between Independent variables, Intervening Variables (Price Regulation, Licensing Controls, Product Mix Controls, Distribution Controls, Public sector influences, Capacity utilization, role of foreign trade) and dependent variables (Market concentration, Entry and Exit, Product differentiation) of the oil marketing companies in Kenya.

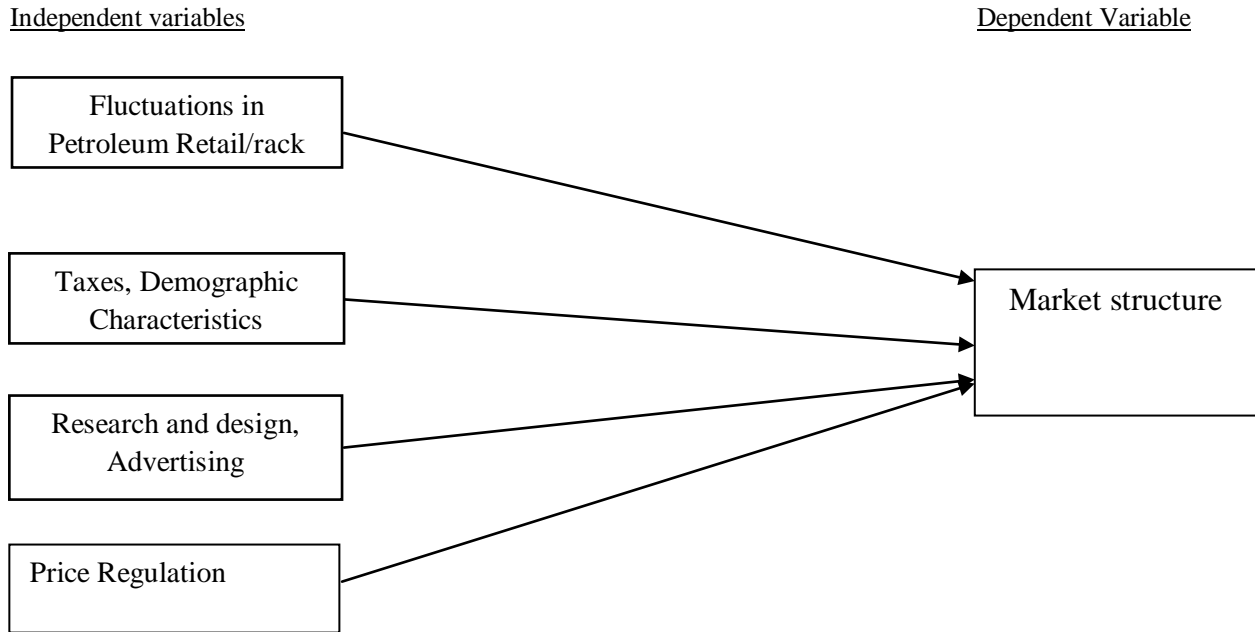


Figure 1: Conceptual framework

2.4 Theoretical Model

To describe the mechanism that drives the long-run impact of the price regulation on market structure of oil marketing firms in Kenya the study adopted an entry and price competition model. The study thus adopts [8] regression model to show the relationship of independent and dependent variables. This helped analyze the effect of the policy on market structure as the industry evolves from a liberal market to a controlled market.

Reference [8] Considered two types of long-run distortions affecting the equilibrium market structure. First, the floor binds in all oligopoly markets and induces excessive crowding, relative to the unconstrained situation. In the second case, the price floor distorts the market by blocking the entry of the most efficient firm. This model applied well in this study because it considered the effects of price regulation, a ceiling control mechanism but with the same expected distortions.

Reference [8] estimated the below linear regression model:

$$Y_{j,t} = \beta Policy_{j,t} + Z_{j,t} \gamma + \mu_{marketj} + \mu_{yeart} + \epsilon_{j,t}$$

Where $Y_{j,t}$ is the variable of interest and labels measures of competition, spatial differentiation, station capacity. This was given by four outcomes (number of pumps, number of islands, large convenience-store indicator, and self-service indicator).

The term $Policy_{j,t}$ is a policy indicator, a binary equals to one when regulation occurs and Zero when it doesn't. $\mu_{year t}$ and $\mu_{marketm}$ are year and market fixed effects. $Z_{j,t}$ are control variables that measured: (i) FSA-level demographic characteristics (average income, population size and unemployment rate), (ii) characteristics of the regional upstream markets (rack prices and number of companies at nearest terminal) and (iii) provincial taxes

on gasoline and $\epsilon_{j,t}$, is the error term.

The objective of this empirical analysis is to test the predictions of traditional oligopoly theories and reviewed literature; by studying the impact of Kenya's price regulatory policy on long-run market structure of oil marketing firms. Market structure at time t may depend on pricing behavior of firms in a market over a number of periods [75]. As the literature reviewed revealed that price regulation in the form of price ceilings, is likely to influence market structure of an industry, the effect of price controls on Kenyan oil marketing industry was thus estimated and examined.

2.5 Empirical Literature

Price caps were introduced to protect the consumer but evidence has also shown that this may lower the profits of the supplier. When pricing as a marketing strategy is controlled, firms have to look for other competitive strategies [46]. In such an environment, industry attractiveness and margins are reduced and it is important to understand the level of competition by firms. Policymakers need to be mindful of the fact that intervention to prevent or reduce the negative consequences could also reduce or eliminate the beneficial impacts [6].

2.3.1 Effects of regulation on Market concentration

Reference [11] formulated an alternative explanation on market structure-performance relationship and proposes the X-Efficiency Hypothesis. Applied to the Petroleum sector, this hypothesis stipulates that a firm which operates more efficiently than its competitors, gains higher profits resulting from low operational costs. Since efficiency determines market structure and performance, the positive relationship between these two seems superficial.

In his study Reference [42], found out that price regulation have attracted previous resistance from oil marketers who opt for markets controlled by forces of demand and supply. In the last 4-5 years, most multinationals have restructured and relocate their business to regions with the highest market growth, high returns on investment and low political and business risks.

Reference [13] present a one time-period model of Cournot competition with uncertain demand. They show that price cap regulation in the presence of uncertainty might fail to increase production and therefore fail to increase consumer welfare. These models solve the optimal entry problem of firms under uncertainty using real options type of arguments. Reference [12] studied the impact of price control in a perfectly competitive market and concluded that such regulatory interventions are detrimental as they introduce a disincentive for competition.

A recent study by [55] found that prices tend to fall after the adoption of sales-below-cost laws in US gasoline markets. By use of a monthly panel of state-level prices for thirty states, over a twenty year period they argue informally that such regulations could affect competition of stations.

Reference [36] also illustrated this relation by using the example of financial analysts that communicate their opinion to the market and thus influence the strategy process of firms. The focus on the strategy formation

process in the banking industry and second the role of the regulator in moderating this process both on an industry level as well as on a club or sub-population level.

Reference [73] found that, in the short run, asymmetric access price regulation is an effective instrument to make the entrant and consumers better off. Thus, price regulation would stir competition in the short run. [5] Argued that price-cap regulation leads to more efficient capital replacement decisions compared to rate-of-return regulation and showed that finite price cap horizons distort capital replacement.

Price regulation is adopted to protect consumer welfare by putting a maximum price that can be charged which in turn bites on the supplier profits [70] as referenced by [46]. It is with this that the oil marketers have to adjust their operations to fit into the market ensuring that they remain profitable as possible.

Reference [52] in his study concludes that when government adopts a price control, it defines the market price of a product and forces all, or a large percentage of transactions to take place at that price instead of the equilibrium set through supply and demand. As supply and demand shifts constantly in responses to taste and costs, the government's price will change only after a lengthy political process as it is never at an equilibrium, it will either be too high or low resulting in dead weight losses because of failure to rate consumer or producer surplus.

2.4.2 Effects of Price Regulation on Entry and Exit of firms

Reference [8] studied the effects of price regulations on the organization and performance of gasoline market in Quebec and other parts of Canada. The goal of the research was to demonstrate that price regulations can have important unintended consequences on prices and productivity in the longer run by distorting the structure of markets. They argued in particular that price control policies crowded markets hence creating an endogenous barrier to entry for low-cost retailers.

Reference [25] studied the effects of bans on self-service gasoline stations in New Jersey and Oregon on prices and market structure. The study found out that the bans led to higher prices, but did not seem to achieve their objective of protecting smaller stations. Reference [6] analyzed the potential impact of a specific type of minimum gasoline price regulation in California, aimed at smoothing the evolution of gas prices, without addressing the potential effects of the regulation on the entry and exit of gas stations. Reference [10] points out that although price cap regulation appears to be successful in its main aim of establishing incentives within the regulatory period for cost efficiency, there remain questions as regards to its efficiency to induce appropriate entry and exit in a market in the long term.

Entry and exit can be defined as either gross or net of exits [47] as referenced by [4]. They used the net measure of entry and exit which gives a measure of expansion of the industry to measure for competition barriers. This understates entry by the amount of exit.

2.4.2 Effects of Regulation on Product Differentiation

Reference [69] states that if a product is unique, consumers may be willing to buy it even if the price exceeds the prices of competitors, however, in the oil sector where products are rather homogenous, technological opportunities may be relevant.

Reference [17] used a dynamic equilibrium model of Pharmaceutical industry to assess the impact of the introduction or removal of price controls across countries on the introduction of new drugs, consumer welfare and value in different scenarios. Its predictions showed that price controls failed to compensate retail marketers resulting in a significant decrease in the number of new drugs and in large welfare losses at a global scale. However, abandoning price controls especially hurts domestic consumers and this may explain why many countries still use them, despite their inefficiency.

Reference [21] introduced a joint framework of both strands in theory and showed how the co-evolution of transaction costs and capabilities determine the boundaries of the firm thus the market structure. The study depicts that the drivers, nested in transaction cost economics and capability based view triggered the evolution of financial intermediation systems towards vertical disintegration and the emergence of intermediate market between distinct modules of production [4].

Reference [34] did a study on telecommunication competition and found out that imposing price controls in the U.S. reduces firm's value, R&D, the flow of new drugs, and the net present value of consumer welfare and when price controls are removed, there is an increase in firms value, R&D, the flow of new drugs, and consumer welfare globally. Reference [74] highlighted that price controls encourage firms to locate their development activities elsewhere and that the resulting losses of jobs, businesses, and tax revenues make it slightly privately optimal for European Union countries to abandon price controls.

Reference [54] studied the impact of PCR on productivity growth in the US telecommunications industry between 1988 and 1998. The authors identify a "pronounced positive effect of PCR on growth." They find that 24 of the 25 firms in the sample "experienced an increase in mean technological change" and that 23 of the 25 firms "experienced an increase in annual productivity growth following the implementation of regulation". In her study of exchange markets in the US between 1991 and 2002, reference [15] corroborates earlier findings that price cap regulation is associated with higher earnings for regulated suppliers.

2.6 Critique and Gaps in the existing Literature

Most of the literature about price regulation analyzed the post regulation period only, considering that the pre-period lacks details of the long run effects of price regulation. It is also notable that most research works deal with the productivity and strategic movements adopted by industry players these are the results and reactions of industry players but no study has been done to establish the effects of prices on the industry structure.

Thus, this research aims at closing the gap on the effects of price regulations on market structure of oil marketing firms in Kenya.

3. Methodology

3.1 Research Design

An analytical approach was used for this study, since it identifies the different variables involved in a study [41]. This study aimed to establish the effects of price regulations on oil marketing companies' market structure measured by analyzing the effect brought about by the policy changes on the market concentration, entry and exit from the market and product differentiation (technological change). The study analyzed pre and post period implementation of the policy. Therefore two regression models of the same variables at different time periods were adopted and results compared.

The study used entry and price competition model to estimate the effect of the policy on the changes in the structure of markets; this eliminates part of the endogenous selection problem by controlling for time-invariant market structure characteristics that might have led to the regulation [8].

3.2 Population

The petroleum sector has 63 oil importing and marketing companies [49]. The researcher targeted all the 63 of the companies in existence as at December 2014. Data was analyzed for a period of Eleven years starting January 2004 to December 2014.

3.3 Sample and Sampling technique

Since the population is relatively small as indicated by [49] above, the researcher used census as the sampling technique since it is more accurate [33].

3.4 Data Collection Instruments

The study used secondary sources of data. Data for the annual market shares, annual sales was collected from quarterly published journals of Petroleum Institute of East Africa. Other published Data from ERC statistics and Industry reports were assessed as well. The researcher obtained data from various oil markets so as to enrich and compare the above sources as well.

3.5 Data Collection Procedure

Data was collected directly by the researcher from company websites and published journals.

3.6 Data Analysis and Presentation

After collecting data, the researcher analyzed the relationship between price regulation and market structure of oil marketing firms in Kenya using an empirical model discussed in 3.10. A linear regression of OLS because of its BLUE estimates. Data was tested to ensure it fits in the assumptions of OLS.

The study used two main econometric specifications the full panel from 2004 to 2014, long difference between 2010 and 2014. This was to measure differential evolution of markets after the implementation of the policy in 2010. These two periods approximate the pre and post implementation of the policy. The output was tested and evaluated on economic, statistical and economic criterion. Statistical test include estimation of coefficients, t-ratios, R2 and F-Statistics. Economic criterion evaluated includes test for Stationarity, Heteroskedasticity and autocorrelation. Tables and Figures presentations were appropriately used to present the data that was analyzed using Eviews as a statistical software.

3.7 Empirical model

The study adopted [8] linear regression model of entry and price competition to estimate the effect of the policy in the structure of markets. The study period covers an eleven year period, between 2004 and 2014 and during this period, the market underwent major changes that satisfy the two conditions required for the policy to possibly distort markets. However, it remains an empirical question whether or not these changes were important enough and the price control policy implemented affected market concentration, entry/exit and product differentiation decisions.

Thus the study considered two main econometric specifications. The short panel to cover the period before regulation i.e. 2004 to 2010 and the long panel to measure the (potentially) differential evolution of markets in Kenya after the implementation of the policy in 2010 i.e. 2011 to 2014. These two periods approximated the pre-policy and post-policy industry specifications.

In this specification, the study controlled for trends in other relevant variables before and around the time of the implementation of the policy, which could be confounded with the policy implementation.

The study adopted the below regression model

$$Y_{j,t} = \beta_s Policy_{j,t} + Z_{j,t} + \epsilon_{j,t}, \dots \dots \dots (i)$$

$$Y_{j,t} = \beta_l Policy_{j,t} + Z_{j,t} + \epsilon_{j,t}, \dots \dots \dots (ii)$$

$Y_{j,t}$ is the variable of interest

Where j indexes a market

$Z_{j,t}$ Control variables include, licensing controls, quality controls, rack prices, subsidies and taxes, import duties geographical coverage and time dummies

The term $Policy_{j,t}$ is a policy indicator whereby the impact of regulation is measured by creating dummy variables which take the value of 1 when the regulatory measure takes place and 0 when otherwise.

β_s and β_l in equation (i) and (ii) for the short and long panel specifications respectively. $\epsilon_{j,t}$, is the error term

The analysis focused on measures of market concentration, measure of Product differentiation and measure of entry and exit of firms. The outcome variables in this study differ based on the unit of analysis: (i) HHI as measures of concentration (Herfindahl-Hirschman Index), (ii) No of firms as a measure of entry and exit of firms, Entry and exit can be defined as either gross or net of exits [4]. (iii) Investment on R&D as measure of product differentiation. Market concentration was measured by Herfindahl-Hirschman Index given by the below formula

$$H = \sum_{i=1}^N S_i^2 \dots\dots\dots(iii)$$

Where H is the sum of the squares of the market shares of firms. It is ranked from 0 to 1.0, 1 being an indication of a highly concentrated market and, S_i is the market share of firm i in the market, and N is the number of firms.

The purpose of the model was to investigate whether price regulation can lead to a market structure in which the technological progress is present, there is free entry and exit and competition is enhanced and according to reviewed theory and literature theory, price regulation policy can distort the post reorganization equilibrium structure of retail markets in the following ways: concentrated markets, blockaded entry and slow differentiation of products. This in summary gives the below testable implications.

- H1. The concentration of markets subjected to price regulation is low
- H2. The number of competitors is higher in markets subjected to price regulation.
- H3. The fraction of firms with the newer technology is smaller in markets subjected to price regulation

The study only incorporated market concentration and number of firms. Product differentiation was not considered because of lack of data. The predictions of the model was tested in the following section of the paper.

4. Research Findings and Discussion

4.1 Introduction

This chapter presented the empirical findings, interpretations and discussion of the analyzed data. The study sought to answer the following research questions.

- How has price regulation affected the level of market concentration of oil firms in Kenya?
- Does Price regulation affect entry and exit of firms in the sector? This is given by the net number of firms at a certain period of time as per the reviewed literature. Before data was analyzed the following test were carried out; First diagnostic tests were conducted to test if the data fit into OLS assumptions this include

Stationarity and Heteroskedasticity tests. Stationarity determined whether estimates have unit roots. Statistical evaluations criteria were evaluated to statistically test the reliability of the estimates using measurers like correlation coefficients. The last criteria was the economic criteria which reviewed whether our parameters satisfy economic theory as far as size and magnitude are concerned. As indicated in chapter 3, the econometric analysis was based on two different specifications, first period from 2004 to 2010 and 2011 to 2014 corresponding to the time prior to regulation and the regulation period.

4.2 Descriptive Statistics

This section presents summary statistic for the two time periods and discussions. From the table 4.1 below mean variable of price z can be observed to have marginally increased from 89.04 before price regulation to 111.49 after price regulation showing a relative increase in prices, mean variable of number of firms increased from 49 to 59 and mean HHI increased from 1297.68 to 1652.03 an indicator of higher concentration in the market. At 10 % significance level the difference of means are statistically significant see table 4.2. The rise in prices is reinforced by a lower standard deviation after regulation. This can be argued that retail oil prices after oil price regulation and control regime have been high compared to period under no price control, under the relevant sample size and space.

Table 4.1: Descriptive statistics before price regulation

	H	N	Z
Mean	1297.676	49.00000	89.04429
Median	1467.420	45.00000	94.03000
Maximum	1537.240	67.00000	97.17000
Minimum	808.6300	39.00000	75.83000
Std. Dev.	335.4387	10.31181	8.861247
Skewness	-0.921987	0.934836	-0.708366
Kurtosis	1.888738	2.270885	1.763284
Jarque-Bera	1.351918	1.174624	1.031508
Probability	0.508668	0.555819	0.597050
Observations	7	7	7

Table 4.2: Descriptive Statistic after price regulation

	H	N	Z
Mean	1652.030	59.75000	111.4875
Median	1224.675	60.00000	111.2650
Maximum	1620.370	63.00000	116.6200
Minimum	1098.400	56.00000	106.8000
Std. Dev.	233.1909	3.774917	4.028874
Skewness	0.781802	-0.034882	0.188322
Kurtosis	2.005972	1.046373	1.985208
Jarque-Bera	0.572158	0.636921	0.195277
Probability	0.751203	0.727268	0.906977
Observations	4	4	4

4.3 Diagnostic Tests

4.3.1 Stationarity Tests

Data was analyzed to test for unit roots (i.e.) stochastic trends using standard Philips-Peron (1988). This eliminated issues of autocorrelation as well. The results presented in table 1 (a),(b) and (c) showed that the null hypothesis of a unit root test was rejected at 5% level of significance for no of firms and market concentration. Null hypothesis was rejected at 5% level of significance for prices.

Table 4.3: Unit root tests HHI

PP Test Statistic	-4.888477	1% Critical Value*	-8.6833
		5% Critical Value	-4.7037
		10% Critical Value	-3.5442

*MacKinnon critical values for rejection of hypothesis of a unit root.

Lag truncation for Bartlett kernel: 1	(Newey-West suggests: 1)
Residual variance with no correction	2576.051
Residual variance with correction	897.2618

Phillips-Perron Test Equation

Dependent Variable: D(H)

Method: Least Squares

Date: 10/24/15 Time: 14:59

Sample(adjusted): 2004 2014

Included observations: 11 after adjusting endpoints

Variable	Coefficient	Std. Error	t-Statistic	Prob.
H(-1)	-0.710705	0.235491	-3.017974	0.0037
C	795.9278	318.8096	2.496562	0.0025
R-squared	0.901070	Mean dependent var		-153.9600
Adjusted R-squared	0.802140	S.D. dependent var		197.6328
S.E. of regression	87.90991	Akaike info criterion		12.02522
Sum squared resid	7728.152	Schwarz criterion		11.42430
Log likelihood	-16.03783	F-statistic		9.108167
Durbin-Watson stat	2.955073	Prob(F-statistic)		0.203695

Table 4.4: Unit Root Test for net entry and exit of firms

PP Test Statistic	-5.383681	1% Critical Value*	-8.6833
		5% Critical Value	-4.7037
		10% Critical Value	-3.5442

*MacKinnon critical values for rejection of hypothesis of a unit root.

Lag truncation for Bartlett kernel: 1 (Newey-West suggests: 1)

Residual variance with no correction	5.023256
Residual variance with correction	2.161168

Phillips-Perron Test Equation

Dependent Variable: D(N)

Method: Least Squares

Date: 10/24/15 Time: 15:01

Sample(adjusted): 2004 2014

Included observations: 11 after adjusting endpoints

Variable	Coefficient	Std. Error	t-Statistic	Prob.
N(-1)	-0.441860	0.725045	-0.609425	0.0516
C	28.25581	42.59495	0.663361	0.0271

R-squared	0.270818	Mean dependent var	2.333333
Adjusted R-squared	-0.458365	S.D. dependent var	3.214550
S.E. of regression	3.881980	Akaike info criterion	5.785289
Sum squared resid	15.06977	Schwarz criterion	5.184364
Log likelihood	-6.677933	F-statistic	0.371399
Durbin-Watson stat	2.709302	Prob(F-statistic)	0.651565

Table 4.5: Unit root test on prices

PP Test Statistic	-4.364774	1% Critical Value*	-4.3347
		5% Critical Value	-2.0720
		10% Critical Value	-1.6759

*MacKinnon critical values for rejection of hypothesis of a unit root.

Lag truncation for Bartlett kernel: 1	(Newey-West suggests: 1)
Residual variance with no correction	3.168339
Residual variance with correction	1.132676

Phillips-Perron Test Equation

Dependent Variable: D(Z)

Method: Least Squares

Date: 10/24/15 Time: 15:04

Sample(adjusted): 2004 2014

Included observations: 11 after adjusting endpoints

Variable	Coefficient	Std. Error	t-Statistic	Prob.
Z(-1)	-0.029146	0.011131	-2.618508	0.0001
R-squared	0.044421	Mean dependent var	-3.273333	
Adjusted R-squared	0.044421	S.D. dependent var	2.230120	
S.E. of regression	2.180025	Akaike info criterion	4.657751	
Sum squared resid	9.505017	Schwarz criterion	4.357289	
Log likelihood	-5.986627	Durbin-Watson stat	2.944564	

4.4 Heteroskedasticity

To ensure that there is constant variance the researcher tested for Heteroskedasticity using White test and the results were as shown below.

Table 4.6: Heteroskedasticity test of HHI

White Heteroskedasticity Test:

F-statistic	0.075426	Probability	0.002159
Obs*R-squared	0.524316	Probability	0.009389

Test Equation:

Dependent Variable: RESID^2

Method: Least Squares

Date: 10/24/15 Time: 15:46

Sample: 2011 2014

Included observations: 4

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	-26.10987	9861585.	-0.264763	0.0052
Z	47.67127	176501.9	0.270089	0.0021
Z^2	-216.4677	789.1603	-0.274301	0.0096
R-squared	0.131079	Mean dependent var		10550.61
Adjusted R-squared	-1.606763	S.D. dependent var		11597.81
S.E. of regression	18725.22	Akaike info criterion		22.62684
Sum squared resid	3.51E+08	Schwarz criterion		22.16656
Log likelihood	-42.25367	F-statistic		0.075426
Durbin-Watson stat	3.141930	Prob(F-statistic)		0.932159

Table 4.7: Heteroskedasticity test of entry and exit

White Heteroskedasticity Test:

F-statistic	45.56918	Probability	0.004179
Obs*R-squared	3.956587	Probability	0.038305

Test Equation:

Dependent Variable: RESID^2

Method: Least Squares

Date: 10/24/15 Time: 15:47

Sample: 2011 2014

Included observations: 4

Variable	Coefficient	Std. Error	t-Statistic	Prob.
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C	-3828.494	403.7536	-9.482253	0.0469
Z	68.69295	7.226354	9.505894	0.0467
Z ²	-0.307531	0.032310	-9.518191	0.0466
R-squared	0.989147	Mean dependent var		3.718835
Adjusted R-squared	0.967440	S.D. dependent var		4.248701
S.E. of regression	0.766649	Akaike info criterion		2.420130
Sum squared resid	0.587751	Schwarz criterion		1.959851
Log likelihood	-1.840261	F-statistic		45.56918
Durbin-Watson stat	3.141930	Prob(F-statistic)		0.104179

We reject the null hypothesis in both tests since p-value is less than 0.05:

4.5 Regression Results

Table 4.7 presents the regression results for the variables at the two time periods .From the results, research questions will be answered and the general and specific objectives achieved.

This section presents an econometric analysis of the change in market structure before and after the implementation of the policy, controlling for observed and unobserved variables that might be correlated with it. This section directly tests predictions H1 and H2.

Table 4.8(a): Regression results on effect of price regulation on no of firms before regulation, from equation (i)

Dependent Variable: N

Method: Least Squares

Date: 10/24/15 Time: 15:56

Sample: 2004 2010

Included observations: 7

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	71.66127	45.41029	1.578085	0.0004
Z	-0.254494	0.507823	-0.501147	0.0075
R-squared	0.047827	Mean dependent var		49.00000
Adjusted R-squared	0.142607	S.D. dependent var		10.31181
S.E. of regression	11.02258	Akaike info criterion		7.872725
Sum squared resid	607.4861	Schwarz criterion		7.857271
Log likelihood	-25.55454	F-statistic		0.251149
Durbin-Watson stat	2.192354	Prob(F-statistic)		0.037547

Table 4.8(b): Regression results on effect of price regulation on no of firms after regulation, from equation (ii)

Dependent Variable: N

Method: Least Squares

Date: 10/24/15 Time: 15:54

Sample: 2011 2014

Included observations: 4

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	144.1003	43.59261	3.305613	0.0006
Z	-0.756590	0.390818	-1.935915	0.0025
R-squared	0.652039	Mean dependent var		59.75000
Adjusted R-squared	0.478058	S.D. dependent var		3.774917
S.E. of regression	2.727209	Akaike info criterion		5.151288
Sum squared resid	14.87534	Schwarz criterion		4.844435
Log likelihood	-8.302575	F-statistic		3.747768
Durbin-Watson stat	2.142727	Prob(F-statistic)		0.002511

Table 4.9(a): Regression results on effect of price regulation on HHI before regulation, equation (i)

Dependent Variable: H

Method: Least Squares

Date: 10/24/15 Time: 15:57

Sample: 2004 2010

Included observations: 7

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	2973.062	13.13586	2.263318	0.0030
Z	-18.81520	1.468984	-0.1280831	0.0064
R-squared	0.247048	Mean dependent var		1297.676
Adjusted R-squared	0.096458	S.D. dependent var		335.4387
S.E. of regression	318.8507	Akaike info criterion		14.60228
Sum squared resid	508328.9	Schwarz criterion		14.58683
Log likelihood	-49.10798	F-statistic		1.640529
Durbin-Watson stat	1.633527	Prob(F-statistic)		0.006444

Table 4.9(b): Regression results on effect of price regulation on HHI after regulation, equation (ii)

Dependent Variable: H

Method: Least Squares

Date: 10/24/15 Time: 15:58

Sample: 2011 2014

Included observations: 4

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	-4263.836	2.321925	-0.183633	0.0007
Z	49.83398	2.081659	0.239395	0.0090
R-squared	0.741302	Mean dependent var		1292.030
Adjusted R-squared	0.611953	S.D. dependent var		233.1909
S.E. of regression	145.2626	Akaike info criterion		13.10182
Sum squared resid	42202.45	Schwarz criterion		12.79496
Log likelihood	-24.20363	F-statistic		0.731022
Durbin-Watson stat	2.377016	Prob(F-statistic)		0.009011

4.5 Discussions

The analysis was focused on measures of competition and entry and exit of firms. The outcome of the variables differed based on the unit of analysis: (i) Entry and exit (net number of firms) and (ii) measures of concentration (HHI-index).

The results presented in table 4.8(a) and 4.8(b) showed that test statistics were satisfactory. P values of less than 0.05 means we do reject the null hypothesis Prices is an important determinant of entry and exit of firms hence a reliable test. The goodness-of-fit variable (R2) show that the exogenous variables account for 7.4 % in the short panel and accounts for 65% of the variations in the long panel. Coefficient was in the short panel and negative in the long panel but the size increased after introduction of the policy, meaning there is an indirect relationship between independent and dependent variable. Price Regulation has an indirect relationship with market entry and exit of firms in a market. The DW statistic is approximately 2.0 and larger than R2, implying that the regression is not spurious.

Comparing the intercepts in the two periods it could be argued that perception of market by entrants is more pessimistic in period 2 than 1, meaning confidence by the firms in the market has eroded as skepticism is increased. This answers objective two and three of the study.

The results presented in table 4.9(a) and 4.9(b). The test statistics are satisfactory. P value of less than 0.05 means we do reject the null hypothesis at 5% level of significance, thus price is an important determinant of market concentration giving a reliable test. The goodness-of-fit variable (R2) show that the exogenous variables

accounted for 24.7% before regulation and increased to 74.1% after regulation of the variations in HHI are explained by prices a good fit. The Coefficient sign had a negative sign before regulation an inverse relationship which changed after introduction of regulation to positive meaning there is a direct relationship between independent and dependent variable. From this results it's an indication that Regulation has a direct relationship on market concentration. The DW statistic is approximately 2.0 and larger than R2, implying that the regression is not spurious. Comparing the coefficients in the two periods of -18.81520 and 49.83398 which measures the rate of competition in the market shows that HHI had gone up in period two. A unit increase in price positively changes market concentration by 49 units. This indicated that the market has been characterized by low completion after the introduction of price regulation. This is an indication that price regulation has reduced competition and majority of the companies are exiting the oil businesses to more profitable ventures or they could have resorted to other products. The estimates support the theory predictions that regulated markets became relatively less competitive and more crowded after 2010. Therefore above relationship answered objective one of the study.

Due to lack of data it was not able to measure the impact of price regulation on product differentiation in the market. The estimates support the theory predictions that regulated markets became relatively less competitive and more crowded after 2010.

5. Summary, Conclusion and Recommendations

5.1 Introduction

This chapter summarizes the findings for chapter five, conclusions, recommendations and suggestion for further studies based on the objectives of the study. The results were based on the objective of the study where the researcher intended to establish the implications of price regulation on market structure of oil marketing firms in Kenya.

5.2: Summary of the findings

This study was undertaken with the main objective of determining whether there is any effect of price regulation in the market structure of Oil Marketing Companies in Kenya. Oil is an important variable that drives the economies of all countries in the world .Its price fluctuations and instability often affects the efficiency of the propelling economy.

The analysis here revealed that for the period under study the magnitude of price changes were higher than before the policy change .However the variables mainly moved in the same direction year to year. Regression analysis revealed that 60.6% of variation in market concentration is explained by price regulation and 65.2% of variation in entry and exit of firms is explained by price regulation. This finding conforms to [8] study, who studied the effect of price regulations on the organization and performance of gasoline market in Quebec and other parts of Canada. The goal of the research was to demonstrate that price regulations can have important unintended consequences on prices and productivity in the longer run by distorting the structure of markets. They argued in particular that price control policies crowded markets hence creating an endogenous barrier to

entry for low-cost retailers.

The evidence here indicates that the independent variables have a statistically significant impact on market concentration of the Oil marketing industry and number of firms. It is evident that price regulation has a negative impact on the performance of the industry which conforms to findings in other countries that import oil. This is in conformity with previous findings by George Stigler who demonstrated that economic regulation often advances private interest such as increasing the profits of the industry being regulated. The implication is that regulation promotes industry profit rather than social welfare. The imposition of a binding price ceiling reduces social welfare by decreasing the amount exchanged in the market. The results reveal that limiting sales growth through price regulation will have a negative effect on the growth of industry firms.

The positive impact of price regulation on market concentration and growth of firms is consistent with some prior research and inconsistent with other research that found that price regulation, by itself, may result in efficiency losses and only when coupled with an independent regulator does it improve performance. In this study, price regulation was found to reduce competition irrespective of whether it was coupled with an independent regulator.

Competition is strongly related with growth of firms. This study found significant impacts of competition; these findings reject the existence of strong competition in the Oil Marketing Industry in Kenya. Since competition seems to be having a positive impact on sector performance and from a policy perspective, it is correct for policymakers to continue to open these markets to competition.

5.3 Conclusion

This paper applied a dynamic entry and price competition model applied to empirically examine the impact of price regulation on the Kenya Oil Marketing Industry during the 2004-2014 time period. Consistent with prior findings, the study found that the existence of an independent regulator is associated with challenges. The existence of an independent regulator does not necessarily imply a tightening or a loosening of regulation imposed on carriers. Rather, the existence of an independent regulator can be interpreted as reducing discretionary actions on the part of regulators, which reduces uncertainty which in turn, increases obstacles to sector investment.

Price Regulation is found to be positively and significantly associated with market concentration and negatively associated with number of firms. This is consistent with some prior research which found that privatization by itself, may lead to decreases in sector performance. This study found that price cap regulation is associated with high market concentration.

5.4: Recommendations

The aim of this study was to look into the implications of price regulation on market structure of oil marketing firms in Kenya. The study therefore made the following recommendations, The Ministry of Energy controls key sector players in the supply chain of Kenya and regulatory institutions, as such, ERC and OMCs should consult

further to improve suitability and applicability of ERC formula in order to protect the profitability of the sector. The formula has been criticized as not capturing all elements of supply chain such as financing costs for imports, depot costs and demurrage.

Oil marketing firms should focus more on innovation, quality of products, as well as superior customer service in order to compete in the market. A marketing strategy that focuses on building better customer relationships would provide a better avenue for oil firms to compete. The study showed that oil marketers should move to reduce operational costs so as to increase their operating profits. The companies should strive to operate efficiently by minimizing their operating expenditures so as to increase their profitability.

The companies should use derivatives to cushion themselves against rising international oil prices as this constitutes a large proportion of their direct costs. Other firms which are at the risk of being regulated in terms of price caps should take lessons from the oil marketing firms and focus on other marketing strategies that can enhance their competitiveness in the market and not just focus on pricing.

Market research will indicate the demand for added services. Firms should conduct more research in their business areas. This will act as a two way benefit as site specific demands will be gathered and the awareness and support of their businesses will become more noticeable in their direct areas. This will also help to come with new products that will help them diversify and have more earnings

5.5 Opportunity for further research

In the process of understanding more on this factor impediments further research needs to be done on the implications of price controls on innovation in the industry.

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