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Impact of Petroleum Consumption on Economic Growth in Kenya

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Abstract

Purpose: The main objective of the study was to find the relationship between petroleum consumption and economic growth in Kenya.

Methodology: A modified Cobb-Douglas production function was used to analyse the relationship between energy consumption and economic growth. In this study, secondary annual time series data covering the period 1980-2009 was used. All variables were expressed in natural logarithms. The data on GDP, population, labor force and private capital and petroleum consumption were collected from the various issues of the annual Kenya Economic surveys and statistical abstracts (1980-2008). Relevant data on petroleum consumption was also obtained from the ministry of Energy.

Results: The estimation results of the long-run relationship revealed that the relationship between petroleum consumption and GDP, and private capital and GDP was positive and statistically significant. Estimation of Error-correction model showed that in short run there was a positive and statistically insignificant relationship between GDP and lagged petroleum consumption. Finally, Granger causality tests imply a unidirectional Granger causality running from petroleum consumption to GDP.

Unique contribution to theory, practice and policy: Given the long-term positive effects on the economy, the study recommended that an energy growth policy in the petroleum consumption should be adopted in such a way that it stimulates growth in the economy. To encourage petroleum consumption, both supply side and demand side dynamics should be addressed. For instance, the domestic price of petroleum should be reduced to a level that stimulates both household and industry demand. Structural problems such as the lack of proper storage facility that could stabilize prices during petroleum stocks were indeed necessary

Keywords: *petroleum consumption, economic growth, short and long run relationship, Granger causality*

1.0 INTRODUCTION

Energy is one of the infrastructural enablers of the three pillars of the Kenya vision 2030. The level and intensity of commercial energy usage is a key indicator of socio-economic development in a

country. Kenya is expected to use more energy on the road towards realization of vision 2030 goals. This is because as incomes increase and urbanization intensifies, household demand for energy is bound to rise.

Today, in the globalizing world, rapidly increasing demand for energy and dependency of countries on energy indicate that energy will be one of the biggest problems in the world in the next few decades. In this process, the search for alternative and renewable energy resources has become important for countries. Macroeconomic growth theories focus on labor and capital; they do not attach necessary importance to the role of energy, which is important for economic growth and production (Stern & Cleveland, 2004:7). However, today, energy is an indispensable production input for continuation of production process and indeed, there are a number of studies that have explicitly included energy in the production function.

Even though it is very well known that there is a strong correlation between growth and energy use, the issue of "causality" That is, whether economic growth leads to energy consumption or whether energy consumption is the engine of economic growth remains still to be answered (Konya, 2004; Masih & Masih, 1996).This question has faced renewed interest given the increasing debate about the world climate changes as a consequence of greenhouse gas emissions. The motivation for examining the relations between income and energy consumption first arose in the 1970s when developed countries first proposed significant energy conservation programs. The underlying question then was to determine whether energy consumption caused economic activity (as measured by income) or vice versa.

The direction of causality, in fact, can assist the policy makers to take the most suitable decisions in climatic matters: for instance, evidence of unidirectional causality running from income to energy consumption could suppose the full compatibility between energy conservation policies and economic growth policies since the firsts can be pursued without limiting the seconds. On the opposite, the finding of unidirectional causality running from energy consumption to income may assume a particular significance with regard to the current debate about whether developing countries should be allowed to pollute more than the industrialized world, arguing that energy consumption could represent a stimulus for economic growth (Guttormsen, 2004).

Kenya is among the sub-Saharan African countries that are ranked lowest in per capita energy consumption levels in the world (United Nations Economic Commission of Africa, 2004). In the year 2001, Kenya was ranked number 169 out of 198 in per capita energy consumption worldwide. Energy is a necessity for survival and critical factor affecting economic development in Kenya (NEMA, 2005). Petroleum fuels are the major source used by commercial and industrial establishments. Electricity is the third source of energy in Kenya after wood and petroleum products, but is second to petroleum fuel as a source of commercial energy. About 80 per cent of Kenya's population relies heavily on traditional energy sources such as biomass, agricultural residues, and other primitive energy sources, which exacerbate environmental degradation and air pollution related health impacts. The United Nations Economic Commission for Africa (UNECA, 2004) has cited the inadequate provision of modern energy services as a limiting factor in Economic growth and poverty alleviation. At the national level, wood fuel and other biomass account for about 76% of the total primary energy consumption, followed by petroleum at 21%and electricity at 3%.

In Table 1, it is shown that the Kenyan economy has been subject to a 3.38 per cent annual real income growth rate for the 1980-2008 periods. However, there exist some fluctuations in the growth rates in some periods. The 1980s had an average of about 3 per cent or higher annual average growth rate, while the 1990s witnessed a substantial drop to the 1.36 per cent in the growth rates. There seems to be a revival in the real income growth rates for the post 2000 period. It's evident that the 1980s and early 1990s had the largest growth rates in electricity and petroleum consumption and these average growth rates even exceeded real GDP growth rates indicating the pace of industrialization. Nevertheless, substantial drops in energy use growth rates occurred in mid and late 1990s. The post 2000 period saw both the energy consumption and real GDP grow gradually.

Table 1: Electricity Consumption, Petroleum Consumption and Real GDP Growth (%)

	1980-2008	80-84	85-89	90-94	95-99	00-04	05-08
Electricity	4.68	8.46	3.54	4.74	0.90	6.08	5.23
Petroleum	2.40	-2.98	4.18	6.69	-0.86	0.69	6.40
Real GDP growth	3.38	3.09	5.50	1.37	2.85	2.61	5.18

Source: *Republic of Kenya (Economic Surveys 1980-2008)*

1.2 Problem Statement

In order to become a newly industrialized, middle income country providing high quality of life to all citizens by year 2030, Kenya aims to achieve an average GDP growth rate of 10% per annum beginning the year 2012 (GOK,2007). However the current GDP growth rate of 5.6% is far from the desired growth rate of 10 percent by 2012. Due to its prominent position in Kenya's industrial and commercial structure, petroleum is a major driver in the bid to increase GDP. This is because the country spends up to about 4% of the GDP in the importation of petroleum products yearly (IEA 2000).

Ensuring increased provision of adequate, quality, reliable and affordable energy (petroleum) is bound to stimulate and support high economic growth. However the country is not secure in the supply of petroleum products since it depends on imported crude oil and refined products whose prices are erratic. The current policy objectives emphasize the need for the availability of energy, accessibility at cost effective prices and the supply to support sustainable socio-economic development while protecting and conserving the environment. Other strategies include increasing competition in the Petroleum sub-sector as well as encouraging and promoting alternative energy technologies to supplement the traditional source. In the implementation of the foresaid strategies there is need for policy makers to clearly understand what proportion of GDP is attributable to petroleum consumption. The aim of this study was therefore to provide empirical evidence on the role petroleum consumption plays in Kenya's economic growth.

1.3 Research Objectives

i. To determine the short and long run relationship between petroleum consumption and economic growth.

ii. Examine Granger causality between consumption economic growth and petroleum consumption.
iii. To derive policy implications from the results regarding petroleum consumption and economic growth

2.0 LITERATURE REVIEW

2.1 Theoretical Review

The relationship between energy consumption and economic growth and corresponding policy implications have been set forth in a number of testable hypotheses by researchers. The first hypothesis is that energy consumption is a prerequisite for economic growth given that energy is a direct input in the production process and an indirect input that complements labor and capital inputs (Ebbon, 1996; Toman & Jamelkova, 2003). In this case a unidirectional Granger causality running from energy consumption to GDP means that the country's economy is energy dependent, and that policies promoting energy consumption should be adopted to stimulate economic growth because inadequate provision of energy may limit economic growth.

The second hypothesis known as the "Conservation" hypothesis asserts that energy conservation policies such as reduction in greenhouse emissions, efficiency improvement measures, and demand management policies, designed to reduce energy consumption and waste may not adversely affect real GDP (Mehra, 2006). The "conservation" hypothesis is supported if an increase in GDP Granger-causes an increase in energy consumption. However, it is possible that a growing economy constrained by political, infrastructural, or mismanagement of resources could generate inefficiencies and the reduction in the demand for goods and services, including energy consumption. If such is the case, an increase in GDP may have a negative impact on energy consumption.

The third, "neutrality" hypothesis views energy consumption as a small component of real GDP and therefore energy consumption should not have a significant impact on economic growth (Asafu-Adaye, 2000; Jumbe, 2004). In this instance, energy conservation policies may not adversely impact real GDP. Support for the "neutrality" hypothesis is provided by the absence of Granger-causality between energy consumption and real GDP.

The fourth hypothesis assumes a bidirectional relationship between energy consumption and economic growth. This feedback hypothesis suggests that energy consumption and real GDP are interdependent and may serve as complements to one another. In this case, increases (decreases) in energy consumption result in increases (decreases) in real GDP, and likewise, increases (decreases) in real GDP result in increases (decreases) in energy consumption. In this case, the "feedback" hypothesis is supported by evidence of bi-directional granger-causality between energy consumption and real GDP.

2.2 Empirical Review

The relationship between energy consumption and economic growth has been widely discussed by many researchers around the world. Unfortunately, the empirical findings are inconsistent across countries including the methodology used. Kraft and Kraft (1978) found a strong causality running uni-directionally from Gross National Product to energy consumption using annual data for United States of America for the period 1947 to 1974. They therefore argued that, while the level of

economic activities may influence energy consumption, the level of gross energy consumption has no causal influence on economic activities. Akarca and Long (1980) using the Sims' technique for energy and Gross National Product contested Kraft and Kraft (1978) result; they used data for the United States for the period 1950-1968 and 1970 and found no causal relationship between Gross National Product and energy consumption.

Yu and Hwang (1984) confirmed the absence of any causality between energy consumption and Gross National Product over the sample period 1947 to 1979 for the United States. The same procedure revealed unidirectional causality running from Gross National Product to energy consumption over the sample period. Yu and Choi (1985) found different results for different economies. They found no causality between Gross National Product and energy consumption for the USA, UK and Poland. On the other hand, they found unidirectional causality from Gross National Product to energy consumption for South Korea and from energy consumption to Gross National Product in the Philippines.

Nachane et al. (1988) using the Engle--Granger co-integration methodology, found long run relationship between energy consumption and economic growth for eleven developing countries and five developed countries. Using similar methodology, Glasure and Lee (1997) for South Korea and Singapore found bidirectional causality while Cheng and Lai (1997) found no long run relationship for Taiwan. Abosedra and Baghstain (1989) used direct Granger test and concluded that for all the periods 1947 to 1972, 1947 to 1974, 1947 to 1979 and 1947 to 1987, there was unidirectional causality between Gross National Product and economic growth.

Yu and Jin (1992) used employment data as a third variable in explaining the link between energy consumption and Gross National Product. They used monthly data over the period 1990- 1994 for the United States and they did not find any evidence of co-integration. With this analysis, they concluded that energy restrictions do not harm economic growth in the United States and that energy conservation has no clear impact on employment.

There are not many studies which investigate oil consumption and GNP interaction. Zou and Chau (2005) found no cointegration between oil consumption and GDP, in China for the period of 1953-2002. Due to liberalization of China’s economy in 1984, they separate these periods into 1953-1984 and 1985-2002. They found cointegration relationship between oil consumption and GDP. In 1953-1984 periods, they found no causality between oil consumption and GDP in the short run; conversely, they found bidirectional causality in the long run. In 1985-2002 period; in short run they found unidirectional causality from oil consumption to GDP; however, in the long run there was bidirectional causality as in 1953-1984 period.

Ighodaro and Ovenseri-Ogbomo (2008) for Nigeria used data for 1970 to 2003 on a co integration and bivariate Granger causality technique. They found unidirectional causality between energy consumption (electricity demand) and economic growth with causality running from energy consumption to economic growth. They concluded that a well-designed energy conservation policy can be an effective tool in managing the energy sector in Nigeria. Contrary to the result, Omotor (2008) also for Nigeria found a bidirectional relationship between coal production and economic growth as well as between economic growth and electricity use while Olusegun (2008) used a bound testing cointegration approach and found no causality between electricity consumption and economic growth. In a related, though, different study, Celik and Ozerkek (2009)

examined the relationship between consumer confidence, personal consumption and other relevant economic and financial variables for nine European Union countries. Using panel data analysis, they found the existence of a long run relationship and concluded that consumers are able to detect early signals about future rates of economic growth as they contribute through the consumption channel.

3.0 RESEARCH METHODOLOGY

A modified Cobb-Douglas production function was used to analyse the relationship between energy consumption and economic growth. In this study, secondary annual time series data covering the period 1980-2009 was used. All variables were expressed in natural logarithms. The data on GDP, population, labor force and private capital and petroleum consumption were collected from the various issues of the annual Kenya Economic surveys and statistical abstracts (1980-2008). Relevant data on petroleum consumption was also obtained from the ministry of Energy.

4.0 RESULTS AND DISCUSSIONS

4.1 Descriptive Statistics

Results in Table 2 indicate that all variables were normally distributed as their skewness coefficients ranged from -2 to +2. On the other hand, the tests show that all variables except the Per Capita Gross Domestic Product (GDP) exhibited kurtosis value of less than 3. Therefore, results using skewness imply that all variables were normally distributed. However, the Jarque-Bera Test statistic results indicate that the variables were normally distributed except for Per Capita Gross Domestic Product.

Table 2: Summary Statistics

	Per capita Gross Domestic Product(GDP)	Labor Force (LF)	Per capita Private Capital(KPC)	Per capita Petroleum consumption(PC)
Mean	20159.14	444.5522	0.985790	2087.505
Median	12499.78	450.3301	0.962400	2009.000
Maximum	55255.00	498.8712	1.232900	3133.100
Minimum	8369.180	398.8623	0.734300	1373.000
Std. Dev.	13277.33	33.41765	0.127864	502.1769
Skewness	1.210602	-0.212566	-0.006456	0.589148
Kurtosis	3.426062	1.692126	2.287911	2.472008
Jarque-Bera	7.302872	2.285285	0.612911	2.014479
Probability	0.025954	0.318975	0.736051	0.365226
Observations	29	29	29	29

4.2 Unit Root Tests

As a first step to testing for causality and co-integration, the study sought to verify whether the series had a stationary trend, and, if non-stationary, to establish orders of integration. The study used both Augmented Dickey-Fuller (ADF) and the Phillips-Perron (PP) tests to test for stationarity on all the variables. The test results of the ADF and PP tests are presented in Table 3

and 4. The results clearly indicate that all the series have a unit root but on first differencing the series become stationary. The first step for conducting the other tests is therefore satisfied.

Table 3: Tests for Stationarity: Levels

Variable name	ADF test	PP test	1% Level	5% Level	10% Level	Comment
LN Per capita Gross Domestic Product	3.811 (0.001)	3.811 (0.001)	-2.648	-1.953	-1.622	Non Stationary
LN Labor Force	1.119(0.272)	1.119(0.272)	-2.648	-1.953	-1.622	Non Stationary
LN Per capita Private capital	0.014(0.989)	0.014(0.989)	-2.648	-1.953	-1.622	Non Stationary
LN Per capita Petroleum Consumption	1.757(0.090)	1.757(0.090)	-2.648	-1.953	-1.622	Non Stationary

Source: Own Computation

Table 4: Tests for Stationarity: First Difference

Variable name	ADF test	PP test	1% Level	5% Level	10% Level	Comment
LN Per capita Gross Domestic Product	-3.297 (0.003)	-4.114 (0.002)	-2.648	-1.953	-1.622	Stationary
LN Labor Force	-4.907(0.000)	-4.907(0.000)	-2.648	-1.953	-1.622	Stationary
LN Per private capital	-6.178(0.000)	-6.178(0.000)	-2.648	-1.953	-1.622	Stationary
LN Per capita Petroleum Consumption	-3.653(0.001)	-3.653(0.001)	-2.648	-1.953	-1.622	Stationary

Source: Own Computation

4.3. Co-Integration Tests

After ascertaining the stationarity properties of the series, cointegration tests were conducted. The study carried out Johansen Test to test for cointegration. The test in Table 5 compared the log likelihood ratios with the t statistics at 5% critical values.

Table 5: Cointegration Test Results

Eigenvalue	Likelihood Ratio	5 Percent Critical Value	1 Percent Critical Value	Hypothesized No. of CE(s)
0.563534	49.47062	47.21	54.46	None *
0.485429	26.25734	29.68	35.65	At most 1
0.226402	7.653552	15.41	20.04	At most 2
0.016500	0.465854	3.76	6.65	At most 3
*(**) denotes rejection of the hypothesis at 5%(1%) significance level L.R. test indicates 1 cointegrating equation(s) at 5% significance level				

Source: Own Computation

From the results the null hypothesis of no-cointegration is rejected at 5% level of significance whereas the null hypothesis of at most one cointegrating equations cannot be rejected. This implies that in the long run, all the variables (GDP per capita, labour force per Capita, private capital per Capita and petroleum consumption) converge to equilibrium.

4.4 Regression Results

After establishing that the variables are stationary at different levels and that they are cointegrated, regression analysis was conducted to establish the relationship between the variables in the long run. Results were presented in Table 6.

Table 6: Results of the Regression Model

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	-69834.67	21922.42	-3.185536	0.0038
LNLABOUR FORCE	68.47283	53.90166	1.270329	0.2157
LNPER CAPITA PRIVATE CAPITAL	23921.73	9861.195	2.425845	0.0228
LNPER CAPITA PETROLEUM CONSUMPTION	17.23219	3.974293	4.335913	0.0002
R-squared	0.840058	Mean dependent variable		20159.14
Adjusted R-squared	0.820865	S.D. dependent variable		13277.33
S.E. of regression	5619.538	Akaike info criterion		20.23333
Sum squared residual	7.89E+08	Schwarz criterion		20.42192
Log likelihood	-289.3833	F-statistic		43.76900
Durbin-Watson statistic	0.535145	Prob(F-statistic)		0.000000

Source: Own Computation

It follows that;

LNGROSS DOMESTIC PRODUCT = -69834.67 + 68.472 LNLABOUR FORCE + 23921.73 LNPER CAPITA PRIVATE CAPITAL + 17.232 LNPER CAPITA PETROLEUM CONSUMPTION

Study findings reveal that the overall goodness of fit of the model is satisfactory as reflected by R-squared of 0.84. This indicates that 84 percent of the variations in Gross Domestic Product are explained by the variables included in the model (labour force, per capita private capital and petroleum consumption). Results obtained in Table 6 attempts to satisfy the objectives of the study which sought to determine the long run relationship between petroleum consumption and economic growth. It is evident that petroleum consumption has a positive and statistically significant coefficient at 5% level of significance (as indicated by a coefficient of 17.232 and p

value of 0.0002). These results are in agreement with those of Erol and Yu (1988) who found long run relationship between energy consumption and economic growth for eleven developing countries and five developed countries. Study results were also in line with those of Oh and Lee (2004) who further found evidence of a long run relationship between electricity consumption and economic growth for all GCC countries.

Results further imply that labour force and private capital also have a positive relationship with GDP. The relationship between private capital and GDP is positive and statistically significant as exhibited by a coefficient of 23921.73 and a p value of 0.0228. However, the relationship between labour force and GDP is insignificant as shown by a p value of 0.2157.

4.5 Error Correction Model

Since the variables are co integrated, then we specified an error-correction model to link the short-run and the long-run relationships. The estimates of the error-correction model are presented in Table 7.

Table 7: ECM Estimation Results

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	1537.194	599.7836	2.562914	0.0174
DLNLABOUR FORCE	-97.29525	54.08485	-1.798937	0.0852
DLNPER CAPITA PRIVATE CAPITAL	9899.038	4865.978	2.034337	0.0536
DLNPER CAPITA PETROLEUM CONSUMPTION	3.456958	3.620432	0.954847	0.3496
LAGRES	-0.179695	0.107911	-1.665220	0.1094
R-squared	0.342717	Mean dependent variable		1595.841
Adjusted R-squared	0.228407	S.D. dependent variable		3217.938
S.E. of regression	2826.648	Akaike info criterion		18.89200
Sum squared residual	1.84E+08	Schwarz criterion		19.12990
Log likelihood	-259.4880	F-statistic		2.998140
Durbin-Watson statistic	1.605714	Prob(F-statistic)		0.039627

Source: Own Computation

Results reveal R-squared of 0.342. This implies that 34.2 % of variations in the GDP are explained by the explanatory variables in the model. Consequently, 65.8 % of the variations is unexplained. It is clear that there is a positive and statistically insignificant relationship between GDP and lagged petroleum consumption in the short run (coefficient of 3.456 and p value of 0.3496). The error correction term (Lag Res) measures the speed of adjustment to the long run equilibrium in the dynamic model. The error term is negative (-0.1796) and statistically insignificant at the 5% level of significance .This result implies that there is a gradual adjustment (convergence) to the long run equilibrium. The coefficient of -0.1796 indicates that 1.796 % of the disequilibria in GDP achieved in one period are corrected in the subsequent period.

4.6 Causality Results

Table 8: Granger Causality Test Results

Null Hypothesis:	Observation	F-Statistic	Probability
LNLF does not Granger Cause LNGDP	27	0.49835	0.61423
LNGDP does not Granger Cause LNLF		0.27287	0.76373
LNKPC does not Granger Cause LNGDP	27	0.05466	0.94694
LNGDP does not Granger Cause LNKPC		2.94694	0.07346
LNPC does not Granger Cause LNGDP	27	7.57219	0.00315
LNGDP does not Granger Cause LNPC		1.20862	0.31768
LNKPC does not Granger Cause LNLF	27	0.33198	0.72103
LNLF does not Granger Cause LNKPC		1.18835	0.32354
LNPC does not Granger Cause LNFPC	27	2.49926	0.10517
LNLF does not Granger Cause LNPC		3.77307	0.03901
LNPC does not Granger Cause LNKPC	27	6.02953	0.00817
LNKPC does not Granger Cause LNPC		0.75228	0.48303

Source: Own Computation

Source: Own Computation

After testing for stationarity, establishing the order of integration and establishing that the variables are co-integrated, we proceeded to determine whether there was Granger causality between variables used in the model with a view to determining whether GDP had causality with petroleum consumption as well with other study variables. Results are presented in Table 8.

Granger causality tests indicate that the null hypothesis “LNPC does not granger cause LNGDP” may be rejected as reflected by a p value of 0.003. Therefore, LNPC granger causes LNGDP. However, there was no evidence of reverse causality between LNPC and LNGDP. These findings are consistent with those of Sica (2007) who investigated the possibility of "energy demand-led growth" and "growth-driven energy demand" hypothesis and found evidence of unidirectional causality running from energy to gross domestic product. Study results were also in line with those of Ighodaro and Ovenseri-Ogbomo (2008) for Nigeria who using co integration and bivariate Granger causality technique found unidirectional causality between energy consumption (electricity demand) and economic growth with causality running from energy consumption to economic growth.

Study findings also revealed a unidirectional causality between labour force and petroleum consumption. The null hypothesis that labor force (LNLF) do not granger cause petroleum consumption (LNPC) was rejected on the evidence of p value of 0.039. However, there was no evidence of reverse causality between labour force and petroleum consumption. On the other hand, the null hypothesis “LNPC does not granger cause LNKPC” may be rejected on the evidence of a p value of 0.008. These results imply that there is a very low probability that the null hypothesis is true. Therefore, petroleum consumption (LNPC) granger causes Private capital (LNPC).

5.0 DISCUSSION CONCLUSIONS AND RECOMMENDATIONS

5.1 Findings

This paper sought to find out the relationship between petroleum consumption and economic growth in Kenya. Specifically, it determined the short and long run relationship between petroleum

consumption and economic growth and also examined granger causality between consumption, economic growth and petroleum consumption. It adapted a growth model with real GDP per capita as the dependent variable and labour, private capital and petroleum as the independent variables to be estimated.

First, the study determined the stationarity of the variables. It was found that all the variables were non-stationary in levels but stationary at first-difference. Second, the Johansen test was then employed to test for cointegration. Cointegration tests indicated that the null hypothesis of no-cointegration was rejected at 5% level of significance. The estimation results of the long-run relationship revealed that the relationship between petroleum consumption and GDP, and private capital and GDP was positive and statistically significant.

Estimation of Error-correction model showed that in short run there was a positive and statistically insignificant relationship between GDP and lagged petroleum consumption. The results also indicated a negative error-correction term of negative 0.1796. A deviation from long- run real GDP in a given year is corrected by about 17.9 % in the next year as suggested by an estimated coefficient of -0.1796. Finally, Granger causality tests imply a unidirectional Granger causality running from petroleum consumption to GDP.

5.2 Conclusions

Study results indicate that there is short and long-run relationship between petroleum consumption and growth in GDP. The results also indicate a unidirectional relationship running from petroleum consumption to GDP.

5.3 Recommendations

Given the long-term positive effects on the economy, the results suggest that an energy growth policy in the petroleum consumption should be adopted in such a way that it stimulates growth in the economy. Such growth would contribute to realization of vision 2030. Therefore, energy policy regarding petroleum consumption may be implemented in such a way that it further boosts economic growth as well as create investment opportunities in Kenya. On the other hand, the uni-directional causality between petroleum consumption and GDP implies that increase in petroleum consumption stimulate economic growth. Therefore, petroleum consumption may be encouraged as it is beneficial to the economy of the country.

To encourage petroleum consumption, both supply side and demand side dynamics should be addressed. For instance, the domestic price of petroleum should be reduced to a level that stimulates both household and industry demand. Fiscal policies such as tax reduction will go a long way into reducing the current high prices of petroleum. For instance, Analysts say that Sh55 of the Sh110 charged per litre of petrol goes to the government as tax. Therefore, a drop in tax by KShs 15 would lead to a proportional drop in petrol prices by KShs 10. The Keynesian consumption function stipulates that as income increases, consumption of a normal good also increases. It will therefore be in the interest of the current government to address problems such as a runaway inflation, a declining exchange rate so as to enhance the disposable income and the purchasing power of petroleum consumers. This way households and firms will have more money to spend on petroleum as well as other goods.

Structural problems such as the lack of proper storage facility that can stabilize prices during petroleum stocks are indeed necessary. Te upgrade of the Kenya pipeline is overdue as it was conducted during the pre-colonial era making it unable to handle the required capacity, increasing its vulnerability to fuel siphoning. The old pipeline also doesn't have inbuilt and automated pressure gauges that can warn management of fuel leakages. Measures aimed at improving the service delivery of the Kenya Pipeline Co would also ago along way into enhancing the pricing of petroleum and its subsequent consumption.

5.4 Suggestions for Further Studies

Whereas this study focused on the relationship between petroleum consumption and GDP, other potential areas that might require further investigations include; the impact of energy prices on economic growth, the relationship between gas consumption and economic growth, impact of biomass on economic growth and the impact of energy consumption on total factor productivity. Furthermore, a relationship between petroleum consumption and the disaggregated form of GDP should be tested so as to test the distributional effects of any policy geared towards petroleum consumption. This way, the Government will know which sector yields the highest impact due to petroleum consumption.

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