UNIVERSITY OF CAPE COAST

PETROLEUM PRICES AND HOUSEHOLD CONSUMPTION EXPENDITURE IN GHANA: THE ROLE OF REGULATORY QUALITY THRESHOLD

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BY

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DECLARATION

Candidate's Declaration

I hereby declare that this thesis is the result of my own original research and that no part of it has been presented for another degree in this University or elsewhere.

Candidate's Signature..... Date: .....

Name: Anthony Kwaku Yeboah

Supervisors' Declaration

We hereby declare that the preparation and presentation of the thesis were supervised in accordance with the guidelines on supervision of thesis laid down by the University of Cape Coast.

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ABSTRACT

Every household depends heavily on petroleum products; however, its prices are subject to considerable fluctuations and are known to have a major impact on household consumption and welfare. This study examined the role of institutions measured as regulatory quality in the petroleum prices and household consumption expenditure nexus using quarterly time series data from 2000Q1 to 2020Q4. Hansen sample splitting threshold method was used to test the threshold effect of regulatory quality. The study found a threshold effect between petroleum prices and household consumption expenditures nexus.

The study went on to investigate the effect of petroleum prices on household consumption expenditure in both regimes. Increase in prices of Diesel and Liquefied Petroleum Gas lower household consumption expenditure in both regimes. However, the effect on household consumption expenditure is much greater when the regulatory quality score is high than when the regulatory quality score is low. Also, above the threshold level, Kerosene had no significant effect on household consumption spending, but below the threshold value, it had a significant impact. Similarly, petrol was found to have a significant impact on household consumption expenditures.

It is recommended that the government reduces all levies and taxes on petroleum products during price hikes in order to reduce the burden on households. Furthermore, the government should ensure that petroleum products are accessible in the country at all times since these products account for a large portion of household consumption expenditures.

KEY WORDS

Petroleum prices

Household consumption

Threshold regression

Gas oil

Kerosene

LPG

Petrol

Ghana

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DEDICATION

To my wife; Mrs. Dorcas Biamah Darkwa

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LIST OF ACRONYMS

BDCs	Bulk Distribution Companies
CPI	Consumer Price Index
EDRL	Energy Debt Recovery Levy
GDP	Gross Domestic Product
GNPC	Ghana National Petroleum Company
IMF	International Monetary Fund
IPP	Import Parity Pricing
LPG	Liquefied Petroleum Gas
NPA	National Petroleum Authority
NPTB	National Petroleum Tender Board
OLS	Ordinary Least Square
OMCs	Oil Marketing Companies
PSRL	Price Stabilization and Recovery Levies
RFL	Road Fund Levy
SPT	Special Petroleum Tax
TOR	Tema Oil Refinery
UPPF	Unified Petroleum Price Fund
WDI	World Development Indicators

CHAPTER ONE

INTRODUCTION

This chapter provides background information on petroleum prices. It also presents the statement of the problem which highlights the motivation and any knowledge gaps, research objectives, the research hypotheses, the significance of the study, scope and organisation of the study.

Background to the Study

The importance of petroleum in promoting economic development and supplying household energy demands cannot be overemphasised. Various types of petroleum products are required to meet demand for lighting, cooking and electricity generation. For its petroleum products demands, the Ghanaian economy relies heavily on imports. The only refinery in the nation is the Tema Oil Refinery (TOR). However, because of its incapacity to carry out this obligation effectively, some petroleum products have had to be imported from a neighboring nation. Premium Gasoline, Kerosene, Residual Fuel oil, Gas oil, Liquefied Petroleum Gas (LPG) and Premix are among the petroleum products marketed in Ghana (UKEssays, 2018). The use of these petroleum products in the nation and their imports are influenced by a variety of factors. Among these factors are prices of the various products, the consumer's real income and the accessibility of the products.

According to the Energy Commission of Ghana [ECG] (2022), the overall quantity of imported petroleum products into Ghana in the year 2021 was 4,126 kilotonnes (ktoe), a fourfold increase from the number imported in the year 2000.

In addition, final consumption of petroleum products tripled from 2000 to 2021, reaching 4,630 ktoe at an annual growth rate of 5.7%. Transport, Industry, Residential, and Agriculture consumed 3,577Ktoe, 615Ktoe, 252Ktoe, and 160Ktoe of petroleum products, respectively. The largest consumer of petroleum products is the transportation industry, with average annual growth rate of 5.6%.

Petroleum is recognised as a significant energy resource component, which plays a crucial part in the production of all goods and services necessary to support economic growth and, by extension welfare. Unavoidable price variations in the petroleum products have been known to considerably contribute price variations in commodities and services that are essential to household consumption and wellbeing. Given that fluctuations in the pricing of imported petroleum products have a major effect on the prices of goods and services, the presence of significant changes in the petroleum prices has a substantial impact on household consumption expenditures (Wang, 2013).

Pricing of petroleum products has dominated public discourse and policy discordance for years. The divergence in opinions has centered the elimination of subsidies, deregulation and appropriate pricing. At the core of each of these is the pricing of petroleum products to consumers. Due to the high proportion of household budgets devoted to the purchase of energy-intensive goods, the price of petroleum products may have a major effect on the real incomes of households (Cooke et al., 2016).

In Ghana pricing of petroleum products has experienced abnormal hikes recently. The average ex-pump prices of petroleum products specifically gasoline, diesel, kerosene and LPG increased from Ghp13.69/litre, Ghp12.78/litre, Ghp 12.78/litre and Ghp 18.24/kg respectively in 2000 to Ghp 475/litre, Ghp 476.2/litre, Ghp 425.1/litre and Ghp 517.8/kg respectively by the end of 2020 (ECG, 2021).

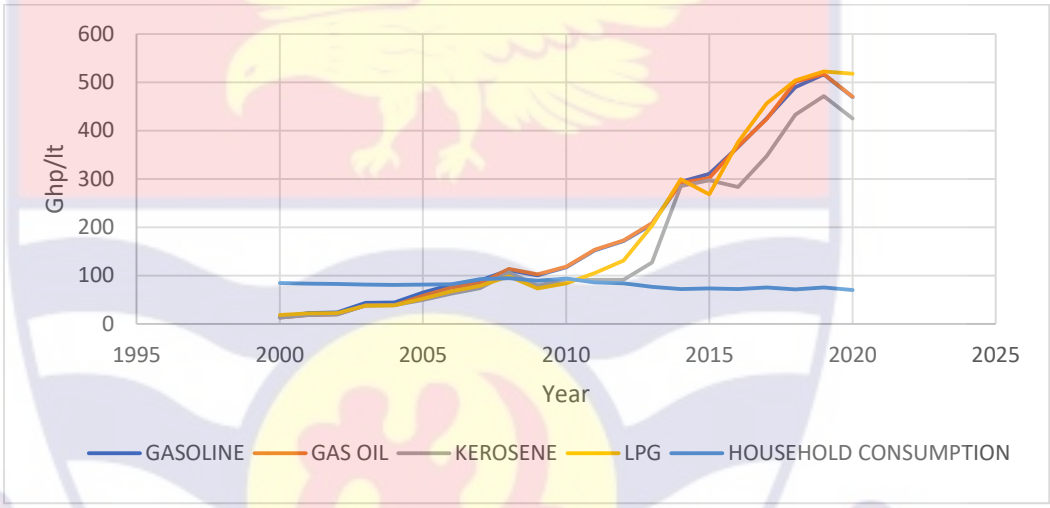

Figure 1: *Trend in Yearly Average Petroleum Prices and Household Consumption*
Source: Author's Computation, 2022

Reforms of petroleum pricing have been ongoing for two decades, employing strategies such as automatic adjustment formula and product cross-subsidization. The most recent regulatory reforms (since July 2015) have seen the removal of government influence over the pricing of petroleum products. This has brought competition between the nation's oil marketing companies (Acheampong & Ackah, 2015).

Historically, the National Petroleum Tender Board was in charge of pricing of petroleum products until 2005 when an Act of Parliament established the National Petroleum Authority (NPA), an independent regulatory organisation

(Act 691). Although, the NPA previously set prices for petroleum products, this function is currently performed by the Oil Marketing Companies (OMCs). In addition to establishing a Unified Petroleum Price Fund (UPPF), the NPA's mission is to regulate, supervise and monitor operations in the petroleum downstream. The NPA has operated numerous pricing regimes ranging from partial subsidies to cross-subsidies (Nyarko, 2016). The process of deregulating petroleum product pricing continued to develop until July 2015, when it was completed and administered by OMCs and Bulk Distributing Companies (BDCs) under NPA oversight. The subsidy system was discontinued during this stage of deregulation.

Despite the evidence that numerous types of petroleum pricing reforms have harmed the economy, regulatory authorities often find it challenging to eliminate certain reforms, such as subsidies, particularly in developing nations (Kojima, 2016). Ghana is no different, the decision to change pump prices has frequently been left to the discretion of the regulatory institutions and in many cases has undermined earlier reform initiatives. It is widely known that some past reforms have benefited the wealthy individuals significantly than the poor. Regulatory authorities have tried several strategies, including a total elimination of subsidies, redirection into other petroleum commodities and nonpetroleum sectors, and more recently, a complete deregulation of prices. These regulatory reform efforts have yielded mixed results.

The NPA regulates petroleum products imported into Ghana by BDCs in order to guarantee full cost recovery, government revenue creation and pricing uniformity through the UPPF (Acheampong & Ackah, 2015).

The Import Parity Price (IPP) benchmark forms the basis for total cost recovery within the value chain. The benchmark used by IPP is the 'landed cost' of refined petroleum in Ghana, which comprises the global price of refined petroleum, freight costs, currency rates, customs and port levies, insurance, and losses. It reflects the price that BDCs pay at the various Ghanaian ports in the event of real goods importation. The objective of the IPP benchmark is to have a good correlation with the real costs of petroleum imported into the country, taking global trends into consideration. (Acheampong & Ackah, 2015).

The two-week average of the Free on Board (FOB) prices of the products is computed by NPA utilising a pricing reference like Platts during a two-week inventory window (1st–16th of the month). The equation is then updated with the historical average cedi to dollar exchange rate over the preceding two weeks. The Ex-refinery pricing, which is estimated in Ghana pesewas per liter, is then reached by adding ancillary charges like port duties (Adusah-Karikari, 2015). The final Ex-pump price, which is the price the general public pays for fuel at the various filling stations, is then calculated by adding the approved taxes and levies along with various OMC margins. Taxes and margins make up about 35–40% of ex-pump fuel prices**.** (Acheampong & Ackah, 2015).

One of the key ways in which regulatory quality affects household consumption is through its influence on fuel prices. Regulations related to

taxation and subsidies can directly impact the cost of petroleum products, such as gasoline and diesel (Cooke et al, 2016). Also, regulatory quality in the petroleum sector can influence household consumption indirectly by ensuring a reliable supply of petroleum products and minimizing price volatility to households (Osoro et al, 2015).

Therefore, it is important to assess the effect of petroleum prices and the quality of regulatory policies on household consumption expenditure in Ghana. An understanding of the impact of petroleum prices and quality of regulatory policies will assist determine the best policies to inform decision-makers and help control the negative effects of these variables on the well-being of the people in Ghana.

Statement of the Problem

The reliance of Ghanaian households on petroleum products is increasing daily. Coupled with shocks on the international energy market, the growth of demand for petroleum products by the household sector is likely to have major impact on petroleum pricing in developing nations. Consequently, governments of developing countries are concerned about the detrimental effects of such price rises on households and vulnerable businesses. Increasing petroleum cost diminishes real wealth and consumer expenditure. That is, growing prices of petroleum goods such as kerosene and LPG are detrimental to the well-being of consumers because they consume a substantial portion of household budgets (Acheampong & Ackah, 2015).

In accordance with the new petroleum downstream pricing regime that went into effect on June 16, 2015, the government of Ghana permitted the BDCs and the OMCs to set prices instead of the regulatory authority; the NPA. This was expected to result in effective competition in the petroleum sector, thereby enhancing consumer welfare by lowering the prices of petroleum products (CUTS international, 2015). However, pump prices have been high. Petroleum products, notably gasoline, diesel, kerosene, and LPG, saw a rise in their average ex-pump costs from Ghp13.69/litre, Ghp12.78/litre, Ghp 12.78/litre and Ghp 18.24/kg respectively in 2000 to Ghp 475/litre, Ghp 476.2/litre, Ghp 425.1/litre and Ghp 517.8/kg respectively as at the end of 2020 (ECG, 2021). This will have possible effect on low-income households.

Also, the annual growth rate of households' final consumption expenditures decreased from 19.82% in 2013 to 1.29% in 2020 (World Bank, 2022). A situation that could have negative welfare implications for households and impede the country's progress in terms of national growth and poverty reduction.

According to Crompton (2020), prices rise as a result of significant increases in regulatory margins and regressive taxes and levies. Although Sam and Ganiyu (2021), acknowledge the recent increase in prices of petroleum products is due to increase in prices on the international energy market. However, they believe the severity of the situation on households in Ghana is due to the deficiencies in the current regulatory regime which led to introduction of 17% Special Petroleum Tax (SPT), the upward adjustment in the Road Fund Levy

(RFL), the Energy Debt Recovery Levy (EDRL) and the Price Stabilization and Recovery Levy (PSRL) in 2019, as well as the 100% upward adjustment of the Bulk Oil Storage and Transportation Company Limited (BOST) Margin.

Previous research in Ghana has focused extensively on the impact of crude oil prices on economic growth (Anon, 2014; Awunyo et al, 2018; Ayisi 2021; Cantah and Asmah, 2015; Dogah, K. E, 2015; K. Kamasa, 2020). However, empirical studies on the relationship between fuel prices, regulatory quality and household consumption expenditure is limited. This implies that households in Ghana may not have a comprehensive understanding on how changes in petroleum prices and regulatory quality can directly affect their day-to-day spending decisions and overall economic well-being.

The challenge with the existing work of Ackah and Acheampong (2015) was based on theoretical supposition and did not include time series data for empirical testing. In addition, the study by Cooke et al. (2016) employed simulations that is not necessarily derived from the nature of the economy. It is against this backdrop coupled with regulatory deficiencies as stated by Sam and Ganiyu (2021) that this study sought to empirically examine the impact of petroleum prices as well as the role of regulatory quality on household consumption expenditure.

The Hansen sample splitting model is employed to analyse the quarterly time series data from 2000Q1 to 2020Q4 in this study, which aims to concentrate on the threshold effect of regulatory quality in the petroleum prices and household consumption expenditure nexus in Ghana.

Purpose of the Study

This study aims to examine the role of institution as measured as regulatory quality in the petroleum prices and household consumption expenditure nexus.

Research Objectives

Specifically, the following objective were set:

1. To test the threshold effect of regulatory quality on household consumption expenditure.
2. Investigate the effects of petroleum (Petrol, diesel, LPG and Kerosene) prices on household consumption expenditure.

Research Hypotheses

The following hypothesis were tested.

1. H_0: There is no threshold effect of regulatory quality on household consumption expenditure.

   H_a: There is threshold effect of regulatory quality on household consumption expenditure.
2. H_0: There is no relationship between petroleum (Petrol, diesel, LPG and Kerosene) prices and household consumption expenditure.

   H_a: There is a relationship between petroleum (Petrol, diesel, LPG and Kerosene) prices and household consumption expenditure.

Significance of the Study

Petroleum prices are a major determinant of the cost of living for households. Changes in petroleum prices can have a significant impact on

households' budgets, especially those with lower incomes that spend a larger percentage of their income on energy-related expenses. Regulatory quality, on the other hand, can affect the efficiency and effectiveness of the market mechanism that determine petroleum prices. It is therefore essential to consider the strategy that the country should implement to protect the purchasing power of its population without endangering its economic achievements. Thus, this study's main objective is to examine the role of regulatory quality in the petroleum prices and household consumption expenditure nexus in Ghana. The study will recommend regulatory measures that the country can take to mitigate the negative effects of the fluctuation in petroleum prices on the living standards of the Ghanaian populations.

Scope of the Study

The research examined the impact of petroleum prices on household consumption expenditure by considering the role of regulatory quality in Ghana. For the purpose of establishing the relationship between the dependent and explanatory variables, quarterly time series data are employed from 2000Q1 to 2020Q4. The study was limited to these time periods due to availability of data for all variables. The study employed the Hansen sample splitting model to analyze the quarterly time series data to achieve the stated objective. Data for all variables were acquired from the World Bank, Bank of Ghana and National Petroleum Authority.

Limitations of the Study

The main limitation of the study is the non-availability of quarterly data on key variables such as petroleum prices, regulatory quality and household consumption expenditure. The data on regulatory quality and household consumption expenditure were annual data and the data on petroleum prices were biweekly. The quarterly series were generated through the Chow and Lin (1971) approach in STATA version 14.2 for estimation. The use of this approach does not pose risk to the reliability of the results because it can disaggregate and aggregate data to any sub-period and period without being restricted.

Second, some of the products are subsidized by government, which makes it difficult to estimate the actual impact of hike in price on household consumption expenditure. For instance, kerosene.

Organisation of the Study

There are five chapters in the study. The study's background, problem statement, purpose, research hypotheses, significance, scope, limitations, and study organization are all covered in Chapter One. The downward petroleum regulatory structure is outlined in Chapter Two, together with a theoretical review and framework and a critical analysis of the relevant empirical research. The methodological concerns and procedures used in conducting the study are presented in Chapter Three. The results and discussion of petroleum prices and household consumption spending with respect to literature are the main focuses of Chapter Four. Chapter Five summarizes the study's findings and offers conclusions and recommendations based on the results.

CHAPTER TWO

LITERATURE REVIEW

Introduction

The effect of petroleum prices has gained significant attention in several studies, particularly at the academia and the industry level. Numerous theories have been utilised to evaluate the effects of petroleum price fluctuations on a variety of macroeconomic variables, including economic growth, inflation, exchange rate, labour supply, consumption expenditure, energy usage and household income. This study aims to provide additional light on the petroleum prices and household consumption expenditure nexus, with a particular focus on the role as well as the threshold effect of regulatory quality.

This chapter examines the relevant theoretical and empirical literature on petroleum prices and household consumption expenditure. This was intended to synthesise, critique and identify knowledge gaps.

Theoretical Review

Absolute Income Hypothesis

The absolute income hypothesis of consumption was put forth by British economist John Maynard Keynes (1883–1946). Keynes proposed that consumption is a function of income and that the marginal propensity to consume (MPC) from current income is positive. Mathematically, Keynes's theory is represented as follows:

$$C_t = a + \varphi Y_t$$

Where:

C_t = Consumption expenditure

a = Autonomous consumption

φ = Marginal propensity to consume

Y_t = Income level

This shows that the level of consumption is made up of an autonomous part (a), and a constant fraction of income (φY_t). Keynes's theory assumed that the autonomous part would always be positive and the multiple of income would range from zero and one, depending on the size of the economy.

In his relative income hypothesis, Duesenberry (1948) refuted the underlying assumption of Keynes' consumption theory. Duesenberry (1948) argued that consumer behaviour is not independent but interdependent on every individual's behaviour. In a similar vein, Ahuja (2013) demonstrated that people's contentment with consumption is influenced by both their own consumption and how it compares with others.

Permanent Income Hypothesis.

Milton Friedman's permanent income theory from 1957, argues that a consumer's spending patterns during a given period depend both on that period's income and also on the stream of income they anticipate receiving in the future. To achieve these individuals forecast their long-term income prospects and modify their consumption to match their current income. The idea seeks to clarify why consumption is smoother than income. As a result, the systematic relationship between consumption and income that we should be looking for is the relationship between permanent income and permanent consumption. Friedman divided consumption and income into two parts: permanent and transitory. He

went on to say that permanent income has a considerably greater impact on consumer behavior than transitory income (Ekong & Effiong, 2020).

Life-Cycle Income Hypothesis

This theory was established by Franco Modigliani (1954) and Brumberg (1980) to explain the discrepancy between cross-sectional and time-series analysis results. The impact of liquid assets on consumption was also something the model was supposed to take into account. Unlike the Keynesian consumption theory, which is entirely based on the individuals' current income, the Life-Cycle Hypothesis makes the assumption that people consume a consistent percentage of the present value of their lifetime income. According to the life-cycle theory, individuals or families want to get the most satisfaction out of all the things they consume. Because of this, consumption must be constant even while income varies throughout life, and saving is mostly done to pay consumption during retirement (Kankaanranta, 2006).

Consumption pattern of individuals under this theory is heavily influenced by savings and asset building over the course of a person's lifetime (Balami, 2006). The concept highlighted how savings could be utilised to move purchasing power from one stage of life to another. In early life, labour income is typically lower relative to later years of work. Income often rises in the final years of employment, then declines as one approaches retirement. Borrowing during the early years of low income, repaying those debts, and accumulating wealth during the years of high income, followed by spending off the accumulated savings

throughout retirement, is the preferred strategy for consumers who want to smooth their consumption (Parker, 2017).

General Concepts and Definition of Consumption Expenditure

The definition of consumption differs across the academic community and within it. In general, consumption refers to an individual's use of products and services. In economics, consumption involves, the process of acquiring goods and services from various sources, using them to maintain household well-being and the disposal of their by-products. Thomas (2013) defined consumption as the selection, acquisition and utilisation of goods and services for the fulfilment of wants. Consumption is also strongly correlated with the cost associated with the use of goods and services. As a result, the term "consumption" can also refer to the entire amount of goods and services that individuals in a certain economy may want to buy for immediate consumption use.

By defining consumption as the percentage of income that was not saved, Keynes (1936) was able to distinguish between investments that became assets in the absence of an adequate way to measure the commodities consumed and purchases that directly satisfied demands. Friedman (1972), however, defined consumption as the entire number of products and services people buys and use over the course of a specific period. Additionally, he contended that the theory of income and employment should take into account the concept of consumption.

Schorfheide (2011) also stated that consumption expenditure relates to the amount of money spent by households on the acquisition of goods and services.

His theory highlights that, consuming expenditures are the most crucial of all expenditures that lead to the creation of goods and income.

Overview of the Petroleum Industry in Ghana

The petroleum sector significantly dominates Ghana's energy consumption mix. The sector can be classified into two major categories: upstream and downstream operations. Upstream activities consist mostly of the production, procurement and refining of crude oil, whereas the downstream activities comprise distribution and sale of petroleum products as well as the premixing of petroleum products for industrial uses, including fishing.

Petroleum products are imported, exported, re-exported, shipped, transported, processed, refined, stored, distributed, marketed, and sold as part of the industry's many commercial activities. The sector is one of the most important subsectors and significantly contributes to Ghana's Gross Domestic Product (GDP). It presently has over 5,000 service providers and an annual sales value of roughly GHS22.3 billion (US$ 3.92 billion), or over 6% of the nation's GDP.

History of Petroleum Pricing Reforms

Before 2001, when an automatic adjustment formula was established for petroleum product prices, TOR set prices based on production costs or import costs. Following the determination of the cost basis, final prices were set with significant subsidies for most petroleum products to ensure affordable fuel and promote economic growth. Subsidies were relatively manageable at that time, but a combination of higher volumes and a weaker cedi led to enormous subsidy deficits on TOR's books. Based on a building of prices at import parity from

nations in northwest Europe, the petroleum products Pressure Build Up (PBU) schedule, an automatic price adjustment method, was established in June 2001. This was done to avoid absorbing TOR inefficiencies as costs in petroleum product pricing and to ensure that petroleum product prices reflected full cost recovery at import parity (Coady & Newhouse, 2006). A social policy goal to lessen the impact of petroleum product prices on the poorer households was another important component of the formula, which led to the establishment of cross-product subsidization.

For instance, in the same year, the price of gasoline was raised by around 61 percent in order to raise the funds required to control the price increases of fuels (kerosene, diesel, and LPG), which are essential to low-income households. This plan was based on the Ghana Living Standards Survey IV (GLSS IV), which revealed that kerosene was a product used by low-income households while gasoline use accounted for a larger share of expenditures in high-income households (GSS, 2018). Although the poor did not use diesel directly, they were significantly impacted by it indirectly because it was the primary fuel for commercial transportation of people, products, and food from the hinterlands.

In order to promote the use of LPG in place of wood fuels for cooking and heating in the poorest households, cross-subsidization of LPG was taken into consideration. For years, there was a cross-subsidy fee of 5 pesewas per liter of gasoline, with negative charges for all other fuels. After intensive lobbying by the NPA, Parliament approved the Energy Levies Act (Act 899) in December 2015,

which among other things abolished the cross-subsidy charge from the petroleum products PBU schedule.

The TOR Debt Recovery Levy, a petroleum debt service fee, was included to the petroleum price formula in March 2002 to manage the TOR debt. Since 1996, the country's largest supplier of petroleum products; TOR, has accrued debt from previously unpaid subsidies. By 2002, the debt had grown to such an extent that it challenged TOR's ability to continue operating. Due to subsidies as well as the company's failure to fulfill its financial commitments to its lenders and crude oil suppliers in the late 2000s, the TOR debt was diversified. The amount owed by TOR as of December 2015 was around US$580 million (Coady & Newhouse, 2006).

The government's decision that the existing subsidy was unsustainable led to revisions of petroleum subsidies in 2004. This provided the framework for later subsidy reforms. The government started a Poverty and Social Impact Analysis (PSIA) for petroleum goods in 2004 due to the unsustainable nature of the subsidy system (Coady & Newhouse 2006). The PSIA demonstrated that households with more wealth benefited from fuel subsidies. In order to liberalize pricing after the assessment, prices were raised by 50 percent in February 2005. As a follow-up to the 2001 changes, the NPA was founded in the same year and started setting ceiling prices at import parity benchmarking. A UPPF was also established in 2005 as an extension of both the 2001 and 2004 reforms in order to harmonize transport fees and equalize petroleum product prices across the nation. Each petroleum product was subject to a UPPF charge. The last quarter of 2006 saw the

introduction of the ex-refinery differential, which functioned as a price stabilization fund to compensate fuel marketers for under recovery of cost for selling kerosene, LPG, and premix.

To reflect international costs, price reviews were increased from once a month to twice a month in October 2007. However, owing to the high cost of food and petroleum that year, further price hikes were halted between May and November of that year. Large price rises have occasionally been followed by infrequent price revisions. To cut back on subsidies, prices for all petroleum products were raised by 30 percent starting in June 2009. In 2010, there were no price adjustments.

Although the seeds for effective subsidy reform were laid in 2004, Ghana did not start an unreversed process to reduce fuel subsidies until December 2011. Several of these changes tended to be substantial. For instance, in January 2011, prices jumped by 25–30 percent except for kerosene and premix, whose prices were unchanged because fishing and rural populations were the intended recipients of the subsidies.

On January 1, 2012, fuel costs rose by around 20 percent. In order to avoid irregular, unwarranted rises in transportation costs, the government and the local commercial vehicle transport union negotiated a trigger point around the same time as the 2012 price adjustment. Except for fuel oil and LPG, whose prices increased by 16 percent, most fuel prices increased by 22 to 27 percent in July 2014. As a means of raising money for the government, the Special Petroleum Tax (a value added tax of 17.5 percent of the ex-depot price of petroleum

products) was enacted in the PBU schedule in November 2014. The price of gas at the pump marginally increased by 3 percent as a result of this tax. 2015 saw the elimination of all subsidies for all goods, apart from premix fuel, whose subsidy (close to 40 percent) was maintained (Coady & Newhouse, 2006).

As mandated by the Energy Levies Act of 2015, the government adjusted the PBU on January 1, 2016. To aid in the recovery of the TOR debt, lessen the BDCs' foreign exchange loss, and boost infrastructure assistance for the power sector, a new Energy Debt Recovery Levy was implemented. Due to the removal of the change in consumption volumes, the cross-subsidy levy, a tax on fuel and a subsidy on all other goods was no longer necessary. A tax on exploration that was supposed to finance Ghana National Petroleum Corporation (GNPC) operations was also eliminated. At the same time, the Road Fund Levy, which helps to maintain and upgrade road infrastructure, was raised from 7 to 40 pesewas per liter. The Energy Fund Levy, which helps to fund the work of the Energy Commission, was raised from 0.05 to 1 pesewa per liter. In order to pay for the premix fuel subsidy, a price stabilization and recovery margin fee of 12 pesewas per liter was introduced. Domestic petroleum prices increased by 28–30 percent as a result of the price deregulation.

The International Monetary Fund (IMF) fiscal consolidation program requirements stipulate that all subsidies must either be budgeted for or eliminated. The most comprehensive petroleum subsidy reform Ghana has ever undertaken resulted in the deregulation of petroleum product pricing on July 1, 2015. This

implies that the full cost of petroleum products would be borne by consumers. Only premix used in the fishing sector were cross-subsidized.

The NPA stated on October 13, 2021, that for a period of two months, the PSRL on gasoline, diesel, and LPG will be eliminated. The choice was made at a time when the cost of crude oil and refined petroleum products has drastically increased on the international market. To ease the strain on consumer income, the ban was further prolonged to the end of January 2022. On February 1, 2022, the NPA declared that the PSRL on gasoline, diesel, and LPG will be reinstated. Also, on November 1, 2022, the government declared through the NPA that the subsidy on residual fuel will be suspended indefinitely.

The petroleum Pricing Formula

National Petroleum Authority uses two different formulae to determine the prices of products.

1. Ex-pump Price = Ex-refinery Price + Taxes/Levies + Margins
2. Ex-refinery Price = Cost, Insurance and Freight (CIF) + Related Charges

Where related charges include Off-loading Cost, In-transit Losses, Inspection, Letter of Credit Cost, Financial Cost, Storage Cost, Rack Loading Cost and Operating Margin.

Table 1: *A Breakdown of Taxes, Levies and Margins Imposed on Ex-Pump Prices and Intended Purpose*

Levy	**Intended Purpose**
Energy Debt Recovery Levy	To aid in the debt repayment of the Tema Oil Refinery, the downstream petroleum industry, under-recoveries in the foreign exchange market, and electricity generation and infrastructural assistance.
Road fund	To support recurring maintenance and restoration of the public highways.
Energy fund	To assist the works of the Energy Commission.
Price Stabilization and Recovery Fund	To maintain consumer price stability and cover premix fuel and residual fuel oil subsidies.
UPPF	To ensure that petroleum products are efficiently delivered to consumers across the country in a way that is easy to administer, efficient, and affordable.
Marketers margin	It represents the gross profit that an OMC is due for each litre of sold fuel.
Fuel marking margin	To cover the cost of labeling petroleum goods in order to stop smuggling, adulteration, and the loss of tax income
Bost margin	To pay for the maintenance and running of petroleum product depots as well as executing expansion projects at depots.
Dealers margin	It is the gross profit owed to a petroleum retailer running an OMC
Primary distribution margin	Targeted at guaranteeing uniform petroleum product pricing across the country. It is utilized to distribute petroleum products throughout the nation's depots.
Special petroleum tax	As part of Value Added Tax (VAT) reform
Sanitation and pollution	To raise funds for investment in sanitation sector infrastructure

Source: Energy Sector Levies Act 2015 and NPA Regulations, 2012 (L.I. 2186)

Regulatory Agencies in the Petroleum Sector

They are institutions whose deeds and inactions have an impact on how much petroleum products cost in Ghana. These institutions are known as regulators. Cahn (2013), divides regulators or actors into state and non-state. In contrast to non-state regulators, state actors operate under the guidance of official institutions. State actors in the petroleum downstream include the Ministry of Energy (MoE) and the NPA, whereas OMCs and BDCs are examples of non-state actors.

Ministry of Energy

MoE is the government agency in responsibility of extending and making sure that an ongoing supply of energy services is provided to each sector of the Ghanaian economy in a way that is both energy sufficient and ecologically responsible. The Ministry plays a supervisory role in the sector. Its main mandates are policy formulation, planning, implementing, monitoring, and evaluating energy sector policies. It strives to provide energy services in a way that is both widely accessible and environmentally beneficial.

Ghana National Petroleum Corporation (GNPC)

GNPC was founded by the Ghana National Petroleum Corporation Law of 1983 (P.N.D.C.L 64) in order to govern Ghana's upstream petroleum industry. The PNDC Law requires GNPC to conduct crude oil exploration, development, and production. The Law also requires GNPC to make sure Ghana achieves as much as possible from the expansion of its petroleum resources and to facilitate the transfer of relevant technologies pertaining to petroleum operations. The

corporation's goal is to grow into a significant oil and gas company that improves the quality of life for Ghanaians.

Petroleum Commission Ghana

The Act of Parliament 821 (2011) establishes the Petroleum Commission and charges it with regulating and managing the exploitation of petroleum resources and coordinating the upstream petroleum sector's policies. Its medium- to long-term objective is for oil and gas to become the primary economic drivers. Its objective is to become a global regulator that promotes Ghana as a centre for upstream petroleum production.

National Petroleum Authority (NPA)

The NPA was established by a statute passed by the Parliament in 2005, and it was given the power to regulate, control, and monitor petroleum-related activity in the downstream sector. The Authority ensures that the industry is efficient, successful, and fair while also defending consumers' right to a fair bargain through its Unified Petroleum Pricing Fund (UPPF). As a result, the UPPF keeps up a steady flow of petroleum across the nation, sets prices that reflect the anticipated cost of distribution, and employs methods of distribution that are both efficient and effective.

Tema Oil Refinery (TOR)

TOR is Ghana's leading oil refinery, tasked with processing crude oil and marketing petroleum products. Crude oil is imported from Nigeria by TOR and processed into a range of consumable petroleum products. With the Residual Fluid Catalytic Cracking (RFCC) unit being put into operation, TOR has

rearranged the capacity of its refinery, switching from a basic hydro skimming refinery to a state-of-the-art complex refinery. The refinery aims to provide high-quality energy products and services while promoting economic development that is environmentally friendly. Prior to the establishment of the TOR, Ghana used to import petroleum products from foreign refineries.

Bulk Oil Storage and Transportation Company Limited (BOST)

BOST was established as a private limited company in 1993, with the Government of Ghana serving as its sole stakeholder. It has a key mandate to build a nationwide network of pipelines, storage tanks and other bulk transportation infrastructure. BOST is tasked with building up the Natural Gas Infrastructure across the whole of Ghana while preserving strategic reserve stocks for Ghana to satisfy a minimum of six weeks of national demand in the short and medium terms as well as increasing the stock level to twelve weeks in the long terms. As a means of generating internal funds, BOST has been given an additional mandate to rent out part of the storage facilities.

Bulk Distribution Companies and Oil Trading Companies

The NPA has granted licenses to the BDCs and Oil Trading Companies to operate as bulk distributors. These companies use their license to import crude oil and to buy, store, sell, and distribute petroleum products to large groups of customers. Globex Energy, Firm Energy, Battop, Eagle Petroleum, Springfield, PWSL, Oil Trade, Dominion, SA Energy, Juwel, Blue Ocean, and Sage Petroleum are a few of the key BDCs in Ghana.

Oil Marketing Companies

These companies have been granted the license to obtain and market refined petroleum products through retail outlets to large consumers and to the general public. Thus, the license mandates them to operate as wholesalers and retailers of petroleum products in Ghana. Key OMCs in Ghana include Total Energy, Pacific Oil and Frimps oil.

Price Development of Petroleum Products in Ghana

Prior to the 2003 reform, GNPC was the only entity the government used to handle the importation of crude and the refining process. Costs for petroleum products received significant subsidies. Due to pressure from the International Monetary Fund (IMF) as well as the Tema Oil Refinery's approaching bankruptcy, and the enormous debt burden of GNPC, a new pricing structure was devised in 2003. The new pricing mechanism, known as the Price Adaptation Mechanism, uses the cost of crude oil on the global market plus markups for insurance, shipping, suppliers' commission, refining costs, and other expenses to determine the ex-refinery rates. The additional costs range depending on the precise petroleum product involved and include several taxes and levies.

Among these are the Cross-Subsidy levies, Road levies, Social Impact Mitigation Levies, UPPF levies, Exploration Levies, Debt Recovery Levies, Excise Duty and Energy Fund levies. In the Cross-subsidy situation, the tax on gasoline serves as a fund for kerosene subsidy. On the other hand, the UPPF levies raise the funds necessary to stabilize prices throughout the coastal and hinterland regions. After establishing ex-refinery prices and considering all

applicable levies and margins, the NPA determines the maximum indicative ex-pump pricing of various petroleum items for the OMCs and reviews it on a regular basis.

In response to the rising cost of petroleum products, parliament approved an Act in June 2008 to stop additional price increases for petroleum products and to remove some of the taxes that applied to certain goods. Since international prices exceeded the domestic ex-refinery price, an ex-refinery differential fund was established by the NPA in 2009, into which the proceeds of a fee were deposited to guarantee that import-parity prices could be paid to those who import products and the Tema Oil Refinery.

In the past, social and political instability have been associated with increases in petroleum prices. Prior to the early 1980s economic developments, Ghana's petroleum pricing was characterized by large subsidies. Poor pricing prohibited suppliers from making enough money to upgrade their capacity and maintain their infrastructure. The result is inefficient energy consumption. The government adopted an increase in petroleum product pricing to reflect user costs in order to improve energy efficiency in the processes of production, distribution, and consumption.

The increasing modification of fuel prices will send a message to both petroleum product users and suppliers. It informs customers of the true costs of utilising petroleum products, provides the option to move from inefficient to effective methods, and enables the substitution of one energy commodity for

another. Again, it supplies suppliers with the cash flow required to maintain and expand supply networks.

The underlying argument for developing nations' low energy policies, which are pushed for welfare reasons, is the inflationary impact of petroleum costs on consumers. This is frequently used by governments of developing nations as rationale for regulating energy markets, especially for petroleum-based products.

The Governing Board of the NPA was then constituted and inaugurated in 2005. To reflect worldwide crude oil prices, the NPA evaluates petroleum prices at the pump.

Trend in Yearly Average of Ex-pump prices of Petroleum Products

Figure 2 shows the trend of average ex-pump price of petrol in Ghana for the year under review. From Figure 2, the historical trend of the ex-pump price of petrol has been on an upward trajectory over the course of the year. This means that the price of petrol has generally been increasing over time. The few exceptions to this trend were during the period between 2018 and 2019, during which petrol recorded a fall in price. During this time, the price of petrol decreased, but this was not part of the overall trend, as prices have continued to rise both before and after this period. Overall, the long-term trend for the ex-pump price of petrol has been upward, with brief exceptions.

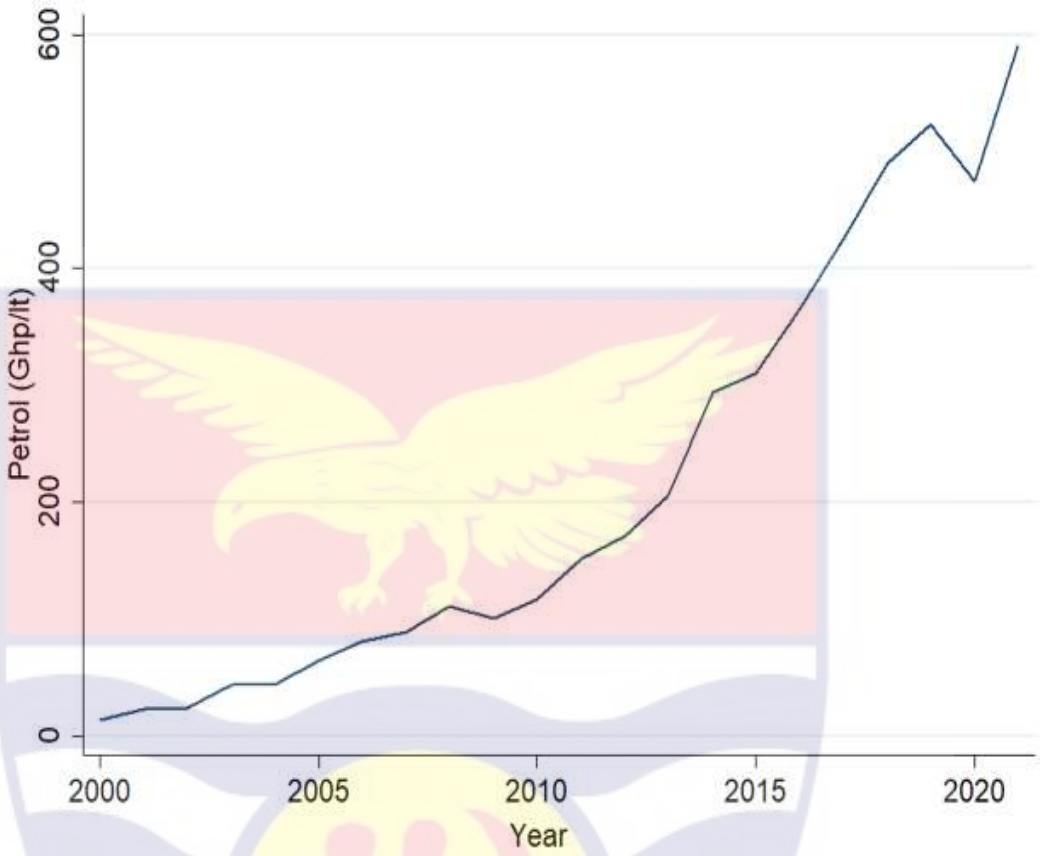

Figure 2: *Trend in Yearly Average prices of Petrol in Ghana*
Source: Author's Computation, 2022

Similarly, the prices of Gas oil followed the same trajectory of Petrol. That is, over the course of the period under study, the ex-pump price of gas oil has been observed to trend upwards with few exceptions. This means that the price of gas oil has been consistently increasing over the year, with occasional fluctuations. As can be seen in the Figure 3 below.

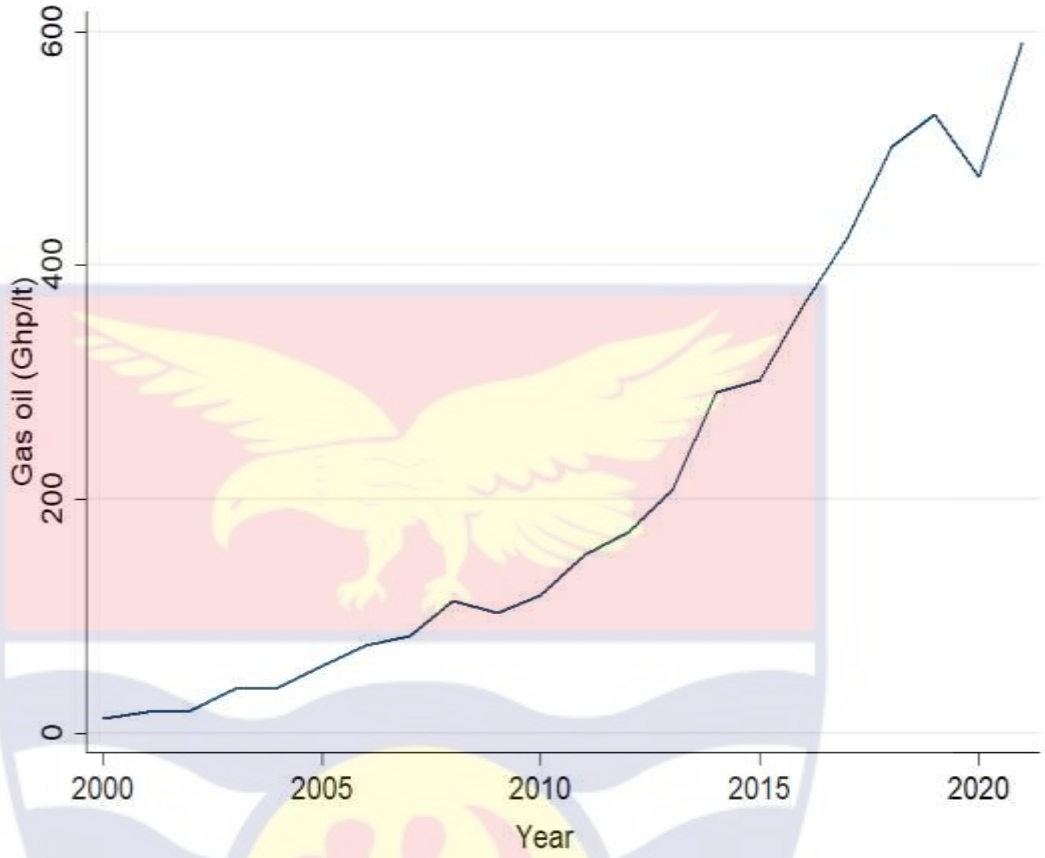

Figure 3: *Trend in Yearly Average prices of Diesel in Ghana*
Source: Author's Computation, 2022

Figure 4 displays the yearly trend of the average ex-pump price of kerosene in Ghana between 2000 and 2022. The data presented in the figure shows that the ex-pump price of kerosene has been on a continuous upward trend over the years under review. This means that the price of kerosene has generally been increasing each year, with occasional minor price fluctuations observed. The upward trend of the ex-pump price of kerosene suggests that it has become progressively more expensive to purchase kerosene over the years in Ghana. Despite the occasional fluctuations, the overall trend highlights the persistent rise in the price of kerosene, which can have significant implications for consumers who rely on this fuel source for various household needs.

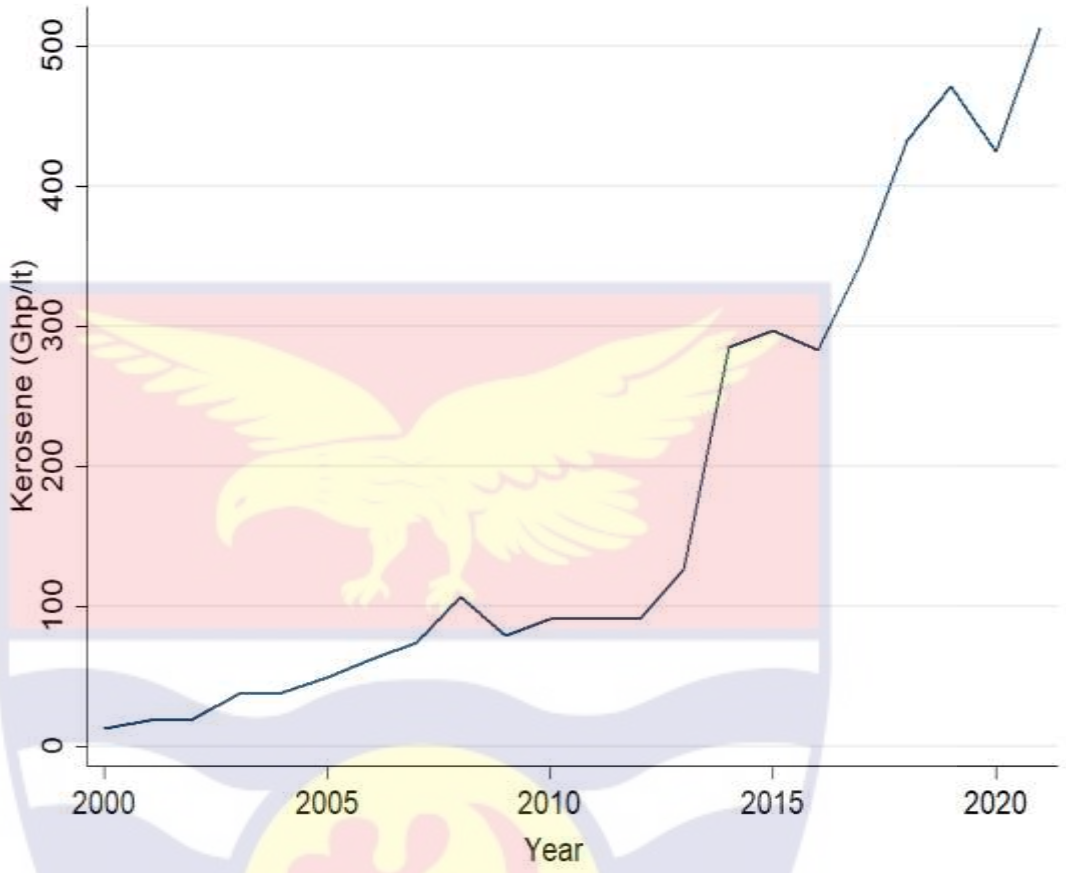

Figure 4: *Trend in Yearly Average prices of Kerosene in Ghana*
Source: Author's Computation, 2022

Figure 5 displays the yearly average ex-pump price trend of LPG over a period ranging from 2000 to 2021. The data presented in the figure shows that the yearly average ex-pump price of LPG started from a relatively low point in the year 2000 and remained relatively stable for the next few years, up until 2005. However, from 2005 onwards, the yearly average ex-pump price of LPG began to rise gradually, indicating that the price of LPG has been increasing over the years. This suggests that it has become progressively more expensive to purchase LPG over time, which can have significant implications for consumers who rely on this fuel source for various household and commercial needs.

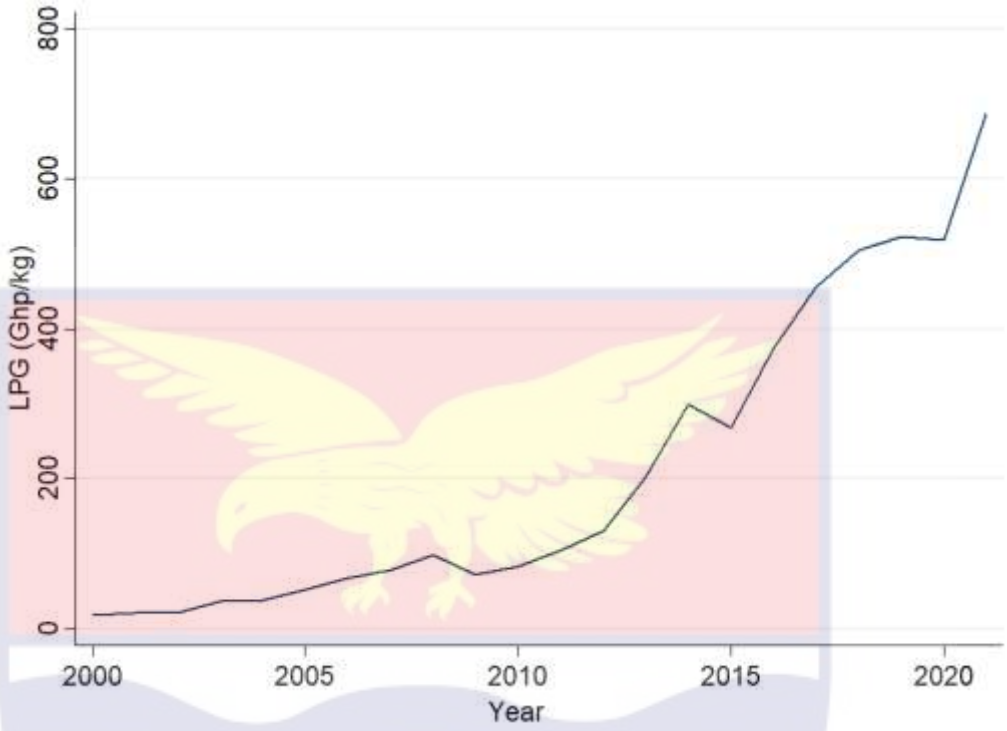

Figure 5: *Trend in Yearly Average prices of LPG in Ghana*
Source: Author's Computation, 2022

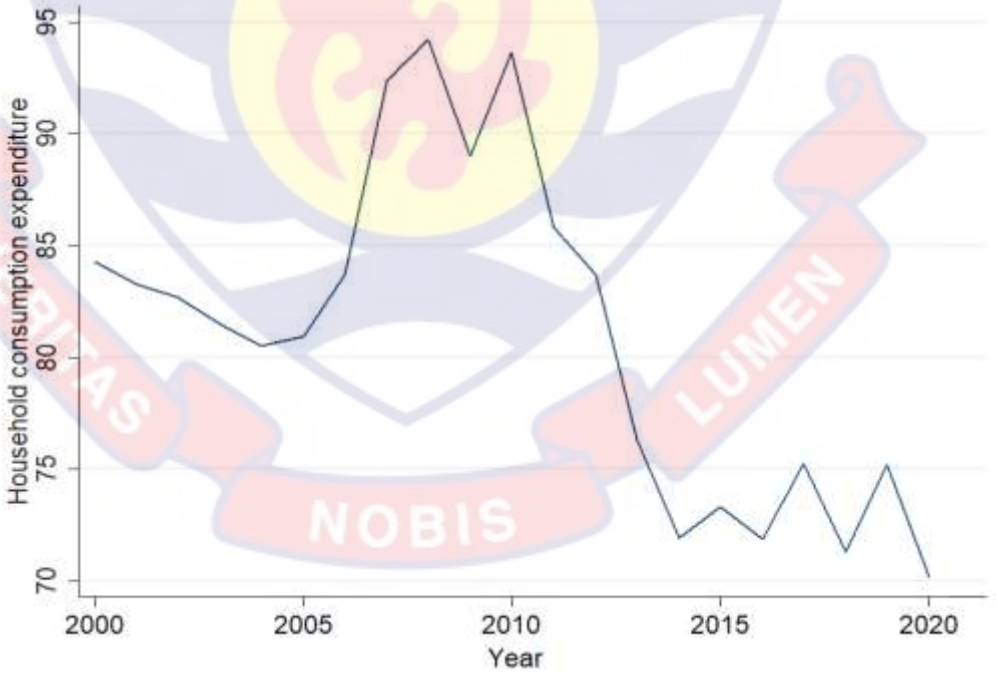

Figure 6: *Trend in Yearly Household Consumption Expenditure in Ghana (2000 – 2020)*
Source: Author's Computation, 2022

Figure 6 presents the trend in yearly household consumption expenditure in Ghana over a period ranging from 2000 to 2020. The data depicted in the figure shows that between the years 2000 and 2005, household consumption expenditure experienced a slight decline in growth rate, meaning that households spent less on consumption during this period. However, in 2007, household consumption expenditure rose to its highest level over the period under review.

Subsequently, from 2010 onwards, the growth rate in household consumption expenditure began to decline sharply, reaching its lowest point over the period. This means that households spent less on consumption during this period compared to other years. However, after the decline, the household consumption expenditure started to fluctuate over the remaining period under review. The decline in household consumption expenditure between 2010 and its lowest point could indicate a period of economic downturn, which may have impacted household incomes and purchasing power. The subsequent fluctuations in household consumption expenditure may suggest that households have been adjusting their spending patterns in response to changing economic conditions.

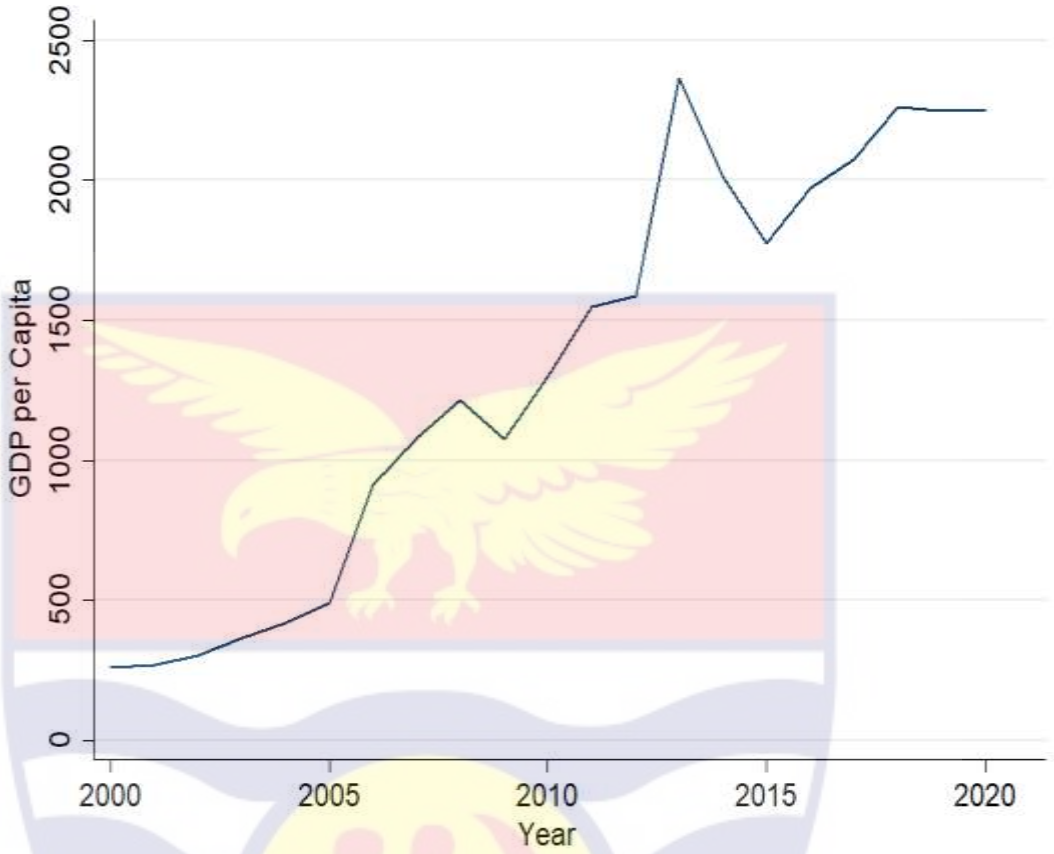

Figure 7: *Trend in Yearly GDP per Capita in Ghana (2000 – 2020)*
Source: Author's Computation, 2022

Figure 7 shows the trend of yearly GDP per Capita in Ghana over a 20-year period, from 2000 to 2020. The data presented in the figure indicates that the GDP per Capita in Ghana has been on a continuous upward trend over the entire period under review. The upward trend of the GDP per Capita implies an increase in the average income per person in the country, which is expected to improve access to basic needs, such as food, shelter, education and healthcare. Overall, the data presented in Figure 7 highlights the positive trend in Ghana's economic growth over the years, as indicated by the rising GDP per Capita. This growth can be attributed to various factors, including policy reforms, investments in infrastructure, and efforts to attract foreign direct investment, among others.

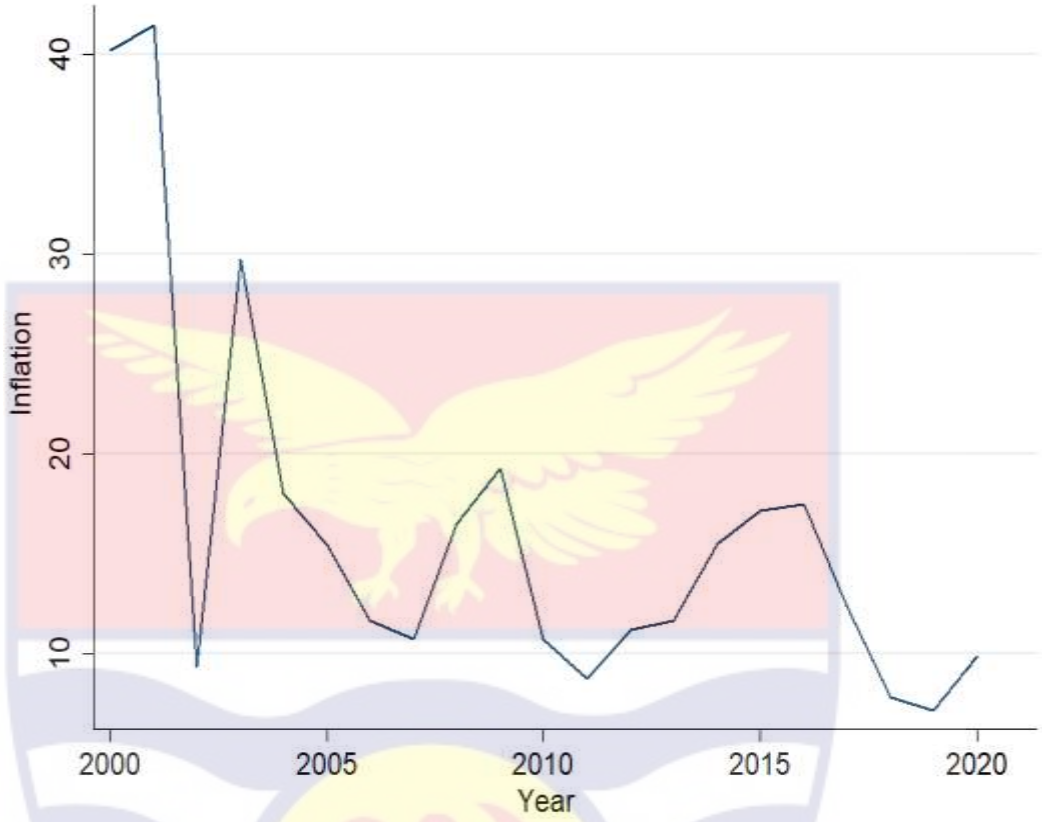

Figure 8: *Trend in Yearly Average of Inflation in Ghana (2000 – 2020)*
Source: Author's Computation, 2022

Figure 8 depicts the trend in yearly average inflation in Ghana over a period of 20 years, ranging from 2000 to 2020. The data presented in the figure indicates that Ghana experienced a significant increase in inflation in 2001, with a yearly average of 41.5 percent. However, in the following year, there was a sharp decline in inflation. Ghana experienced a general downward fluctuation in inflation over the period under review, although there were occasional increases in inflation. This indicates, Ghana has been able to maintain relatively stable prices over the years.

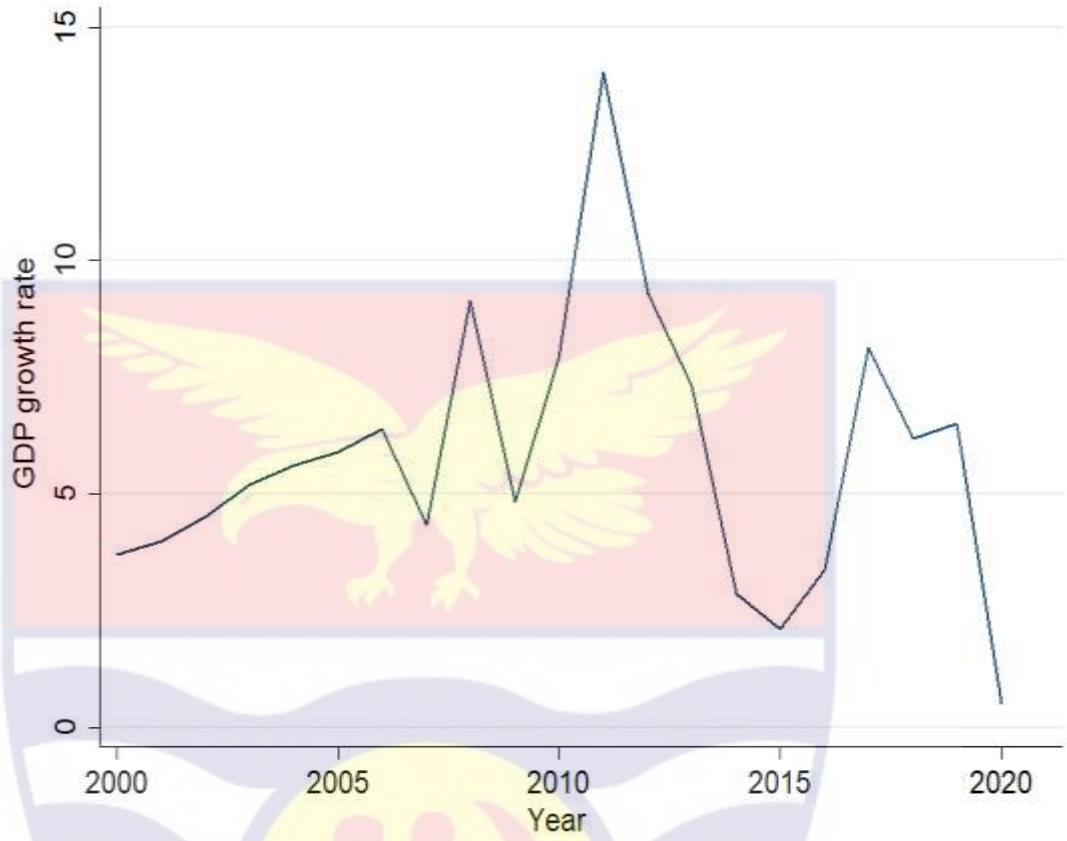

Figure 9: *Trend in Yearly GDP Growth Rate in Ghana (2000 – 2020)*
Source: Author's Computation, 2022

Figure 9 displays the trend of yearly GDP growth rate in Ghana over a period of 20 years, from the year 2000. The data presented in the figure shows that the GDP growth rate in Ghana has been on an upward trend over the years, reaching its highest point in 2011. However, after 2011, the GDP growth rate in Ghana began to trend downward, indicating a slowdown in the pace of economic growth. While there have been occasional fluctuations in GDP growth rate over the period under review, the overall trend has been towards lower levels of growth.

The trend depicted in Figure 9 is significant because it highlights the various shifts in Ghana's economic growth over the years. The upward trend in

GDP growth rate from 2000 to 2011 indicates that the country experienced a period of significant economic expansion, which could be attributed to various factors such as favorable policies, increased investment, and improved economic conditions. However, the subsequent downward trend in GDP growth rate suggests that the pace of economic growth has slowed in recent years. This could be attributed to various factors, including external economic shocks, changes in policy direction, and domestic economic challenges, among others.

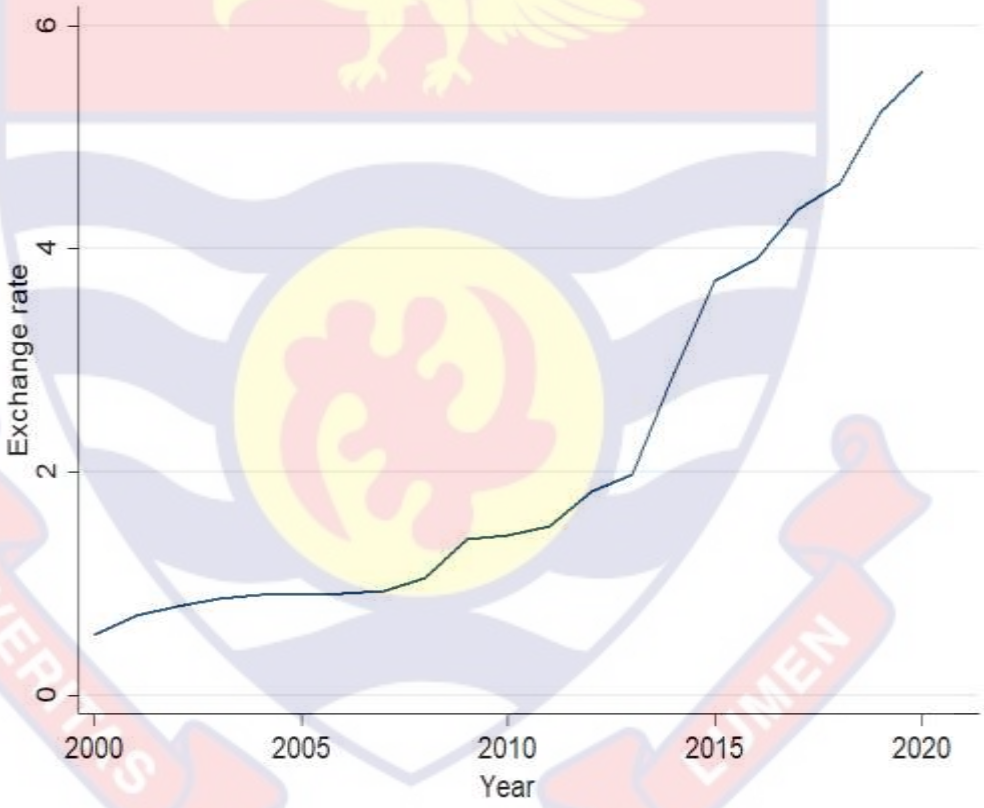

Figure 10: *Trend in Yearly Exchange Rate in Ghana (2000 – 2020)*
Source: Author's Computation, 2022

Figure 10 displays the trend of yearly exchange rates in Ghana over a period of 20 years, ranging from 2000 to 2020. The data presented in the figure shows that the exchange rate in Ghana has been on an upward trend over the period under review. This indicates that, on average, it took more units of the

local currency (Ghanaian cedi) to purchase a unit of foreign currency during this period. The upward trend in exchange rates is significant because a weaker local currency can raise the cost of imports significantly, which can increase inflation, and lower the purchasing power of individuals and businesses.

Moreover, an upward trend in exchange rates can also increase the cost of businesses borrowing, as they must pay higher interest rates to make up for the increased risk related to a weaker local currency. This, in turn, can lead to a slowdown in economic activity, as businesses reduce their investments and consumption in response to higher costs. This underscores the importance of monitoring and managing exchange rates to ensure a stable and predictable economic environment.

The Link Between Petroleum Prices and Household Consumption Expenditure.

Well-established literature has proposed several theoretical channels through which petroleum prices can affect household consumption expenditure (Mork, 1994; Brown & Yucel, 2002; Kilian, 2008). These channels are either directly or indirectly linked.

Brown and Yucel (2002) as well as Kilian (2008) argued that there are four direct channels by which petroleum price shocks influence consumer spending. First, the discretionary income channel asserts that increased fuel prices cause people to spend more on energy, which reduces their discretionary income. Second, fluctuating petroleum prices could cause uncertainty about the future direction of energy prices, leading consumers to delay irrevocable purchases of

durable consumer goods (Bernanke, 1983 and Pindyck, 1991). Thirdly, household consumption may decline in reaction to shocks in fuel price as consumers raise precautionary savings, even when purchasing decisions are reversible. This precautionary savings impact may result if consumers smooth their consumption spending because they anticipate a higher likelihood of future unemployment and income losses. Fourthly, higher petroleum costs influence the consumption of durables (such as cars and other machinery requiring fossil fuels) through operating cost effect. In other words, consumption of such goods is delayed as a result of rising operating costs caused by higher energy prices.

The real balance effect was the fifth direct channel that Mehra and Petersen (2005) also identified. The real balance effect suggests that rises in prices of oil leads to inflation, which lowers household real money balances, leading to lower aggregate demand. The income transfer effect, which counteracts the inflationary consequences of rising oil prices, depends on how much income is transferred from net oil-importing nations to net oil-exporting countries as a result of rising oil prices. In this case, rising oil prices at first reduce expenditure by net oil importers.

The claims made by Lee and Ni (2002) and Kilian (2008) contend that the indirect impact of petroleum price shocks could be greater than the direct impact and could potentially intensify the direct effects. Therefore, the welfare impact of higher fuel prices on household real incomes will depend on both the direct impact of higher prices for petroleum products consumed by households and on the indirect impact of higher prices for other goods and services consumed by

households to the extent that higher petroleum costs are transferred to final consumer prices (Coady & Newhouse, 2006).

The Link Between Inflation and Household Consumption Expenditure

Well-established literature has proposed several channels through which inflation affects household consumption expenditure. The most straightforward is that inflation erodes consumer confidence, which prompts households to save more money. By encouraging the ownership of real assets rather than assets with fixed nominal values, inflation also has an impact on household consumption spending. Inflation can erode the real value of nominal assets, thereby reducing the real value of wealth held in those assets. The distribution of income among households may vary as a result of inflation.

Additionally, if various groups within the household have various consumption tendencies and pay various taxes, reallocation will affect their aggregate savings (Howard, 1978). Examining these links and using the ordinary least squares econometric technique, Obinna (2020) empirically examined the impact of inflation on household final consumption spending in Nigeria from 1981 to 2018. The empirical results of his study demonstrate enough evidence that in Nigeria, there exists a positive significant long-run relationship between inflation and household consumption spending. In Ghana, using Engle-Granger Cointegration, Error Correction and Granger Causality as estimation techniques, Olusola, Chimezie, Shuuya and Addeh (2022), investigated the impact of inflation on private consumption spending for period 1990 – 2020. The study discovered inflation has a long run negative significant impact on private spending.

The Link Between GDP Growth and Household Consumption Expenditure

While a high petroleum price may result in high national income and economic development, which would enhance consumer spending, a high oil price may also lead to increase production costs, which would raise production prices and decrease consumption expenditure (Ghalayini, 2011). For countries that produce petroleum, an increase in price leads to GDP growth, whereas for countries that import petroleum products, a great amount of GDP is invested on the purchase of petroleum-related commodities (Aucott & Hall, 2014). According to Vrontisi, Kitous and Saveyn (2015), a reduction in oil prices from $100 to $50 results in 0.7% gain in gross domestic product for both international and EU28 levels.

Petrol price has a significant effect on household consumption spending. According to research by Valadkhani and Mitchell (2002), Kinni (2006), and Rangasamy (2017), an increase in the price of petroleum has an impact on household and individual consumer spending through inflationary growth. Even non-petroleum products experience price hikes when the price of gasoline rises. For instance, if the price of petroleum increases the cost of transportation, the cost of production will likewise rise and the selling price for the finished goods will therefore follow the same pattern of price growth. In contrast to these results, the research by Algaeed (2017) analysing the relationship between petroleum price shocks and consumption in Saudi for the period 1985-2015 showed that petroleum price shocks enhance household income in Saudi Arabia and thus boost consumption. Similarly, De Michelis (2016) used quarterly data for 55 countries

from the period 1975 – 2018 and concluded that the decline in oil prices had positive and strong effects on the consumption of petroleum-importing countries.

The Link Between Compensation of Employees and Household Consumption Expenditure

Besides economic growth and inflation, consumption expenditure is also influenced by the levels of income. Research works by Diacon and Maha (2015), Keho (2019) in Cote d'Ivoire, and Sekantsi (2016) in Lesotho found that while households' consumption increases with income, private consumption is constrained by income. People who are financially secure are able to buy healthful foods, support their children's health and education, and purchase water from the tap rather than having to go for hours to a well. Due to the fact that a sizable amount of consumption is becoming more and more dependent on private income, changes in income have a big impact on changes in consumption. The majority of the population sees an increase in consumption as income rises continuously. However, for the same reason, spending plunges as incomes fall, which has terrible consequences for people's wellbeing. It makes sense to think that household consumption expenditure and disposable income would be closely related.

The relationship between consumption and accessible personal income is referred to as the consumption function. Consumption is impacted by real disposable income, wealth, the general price level and expectations. This suggests that these factors are quite important in influencing people's decisions to spend money on consumer goods. While some of these factors have a positive impact on

consumption expenditure, others have the opposite. Of all these factors, real disposable income is the most significant. If real disposable income increases, consumers are likely to spend more on consumer goods. The reduction in real disposable income will reduce overall consumption. Therefore, there is a positive correlation between real disposable income and household expenditure.

The Link Between Exchange Rate and Household Consumption Expenditure

The currency rate is one of the macroeconomic factors that could have a substantial effect on household consumption spending. Ezeji and Ajudua (2015), defined exchange rate as the value of one currency expressed in terms of other currencies. It therefore becomes challenging for domestic consumers to purchase either foreign currencies or products and services from abroad when the local currency loses its value or rather depreciates. In contrast, domestic consumers pay less for goods and services than foreign currencies. That is, the appreciation of the local currency strengthens the domestic purchasing power while domestic currency depreciation weakens it. This implies a link between domestic consumer spending and exchange rates (Choi and Devereux 2006). Heim (2010) stated that a decrease in the value of the US dollar between 2000 and 2008 in the United States of America essentially confirmed the validity of this relationship between consumption expenditure and exchange rate. According to Heim (2010), imports became more expensive for American consumers throughout this time. However, during the same period, the nation expanded its exports since they were competitively priced in the world markets.

Ezeji and Ajudua (2015) also found a correlation between consumption spending and exchange rate in Nigeria. When the Nigerian naira appreciated, consumer spending increased, and when it depreciated, consumer spending decreased. According to a study by Bahmani-Oskooee et al. (2015), fluctuations in the currency rate lowered the purchasing power of consumers. The research by Muzindutsi and Thandiwe (2018) supports these conclusions by confirming that South African families raise their spending levels as a result of the strengthening of the Rand. As a result, the connection between the exchange rate and consumption spending is inverse.

Despite these results indicating a link between currency appreciation and high levels of consumer spending, other empirical results (Opazo 2006; Benigno and Thoenissen 2008; Corsetti et al. 2008) testified that consumption spending rises when the local currency decline in value. Based on this duality of research discoveries, it is possible to conclude that the relationship between the level of consumer spending and the exchange rate depends on the economic structure and nature of the country.

Empirical Review

Few empirical research has been conducted on the relationship between petroleum prices and household consumption expenditure. Hamilton (1983) and Mehra and Peterson (2005) were among the first researchers to experimentally analyse the interaction between oil prices and consumption on a macroeconomic scale. Subsequently, several policymakers and academic experts have examined the relationship between petroleum prices and consumer spending and came up

with a variety of conflicting conclusions. Zhang, Broadstock, and Cao (2014), for instance, utilised the modelling technique of Mehra and Petersen (2005) to investigate the effect of oil price shocks on household consumption in China. The research was used to aggregate and disaggregate measures of household consumption. With reference to aggregate consumption, Zhang et al. (2014) claim rising petroleum prices have no discernable effect on household consumption, but falling oil prices result in higher consumption at the household level. At the disaggregate level, rising petroleum prices have a greater and more immediate effect on cost of transportation than health care expenditure for food, clothing, and other basics of life. Because rising oil prices have no negative effects on overall consumption. The research further contended that the Chinese government must decrease the current regulatory price structure.

Wang (2013) examines the effect of rising oil prices on personal consumption expenditures in the G7 economies between 2005 and 2010 using a logistic smooth transition model. The empirical findings reveal a nonlinear and asymmetric relation between oil price changes and personal consumption expenditures. In particular, the effects of rising oil prices on personal consumption expenditures are greater than those of falling oil prices. Below a threshold value, an increase in oil prices reduces personal consumption expenditures. In other words, in the face of uncertainty regarding future oil prices, consumers initially rationally postpone spending. However, once oil prices rise above the threshold value after a prolonged upward trend, the prices of domestic production factors rise.

Using the Vector Autoregressive Model, Zaman (2015) investigates if the spike in the price of petroleum on the global market has any impact on household consumption. The research examined both the immediate and long-term impacts of petroleum price shocks on consumer expenditure. Zaman took a representative sample of five OECD countries (Canada, Germany, Sweden, the UK, and the USA) and categorized them as petroleum importing and exporting nations. She discovered a strong short run effect on household consumption spending. In particular, the study found evidence that changes in petroleum prices do impact household consumption in Canada and the United States, but the findings for Germany, Sweden, and the United Kingdom were not conclusive. Based on the findings, Zaman contended that oil prices have an impact on consumer choices in oil-importing and -exporting nations.

In assessing the success of Iran's energy pricing reform for households with different income levels. Using data from the household budget survey for the years 2001–2008, Moshiri (2015) forecasted the system of petroleum spending shares using a two-stage consumer optimization model. While the income elasticities are nearly one, the overall price elasticities of demand are small, as demonstrated by the data. Moreover, the results demonstrate that various income groups react differently to changes in income and energy prices. Rural families, especially middle-class families, react to changes in income less strongly than urban families do to price increases. Increases in petroleum prices, will both decrease consumption and boost energy efficiency through several price- and non-price-related strategies.

Al-Tai (2015) employs the VAR model to analyse the impact of petroleum prices on Swedish households' final consumption expenditures from 1980 to 2013. The data indicate that the price of petroleum has a considerable effect on the consumption of Swedish households. The results correlated a decline in household spending with a rise in global petroleum prices. In addition, there was evidence indicating the influence of petroleum prices on consumption was greater prior to the mid-1990s than it was afterward.

Baumeister and Kilian (2016) evaluated the effect of the fall in petroleum prices on U.S. consumer spending from 2014 to 2016. The study employed a conventional linear regression model and defined gas oil price shocks as the difference between the expected and actual prices of gas oil. They discovered that decreased gas oil prices between 2014 and 2016 led to an increase in consumer spending through the effects of discretionary and operating costs.

Algaeed (2017) used data from the years 1985 and 2015 to study how the price of oil affected Saudi consumption. Using generalized autoregressive conditional heteroskedasticity model, the oil price shock is approximated as a proportional increase in oil prices. Applying vector autoregression and vector error correction models, the findings demonstrate the positive effects of oil price shocks on oil revenues and, subsequently, on overall consumption. That is, as oil prices rise, revenues also rise, leading to an increase in consumption.

In Norway, Boman (2019) used a VAR-model and Granger-causality tests to evaluate if petroleum price shocks had an impact on household consumption. The study examined how the relationship between petroleum price shocks and

household consumption appears in an exporting country and discovered that household consumption is affected by petroleum price changes, and disposable income and household consumption respond favorably to an increase in the price of petroleum.

Akhamad et al. (2019) employed a VAR model to evaluate the effects of petroleum price fluctuations on Indonesia's GDP, inflation, and poverty rate from 1980Q1 to 2017Q4. After controlling for Granger causation, the results indicate that oil prices have a substantial effect on economic growth and inflation, but no noticeable effect on poverty. Inflation, growth, or poverty had little effect on the price of oil. The study also found that an increase in gasoline prices had an indirect influence on poverty in the short term, an explicit effect on inflation in the long term, and a negative effect on the GDP. Short-term fluctuations in the economy are normal, and research conducted in the aftermath of oil price shocks demonstrates that these increases have a significant and contradictory influence on national income and lower the supply side of the economy by decreasing production.

Using the cointegration technique, Saudi Arabia's oil price movement was examined by Mahmood and Zamil (2019). Over the years 1970 to 2016, the study examined the connection between fuel prices and personal consumption per capita. The study found a direct relationship between the price of petroleum and personal consumption per person across both long and short time periods, indicating that if the price of petroleum changes, so would household consumption. The research assert that petroleum price crises have little impact on

per capita personal consumption; as a result, non-petroleum sectors increase consumption during economic downturns. They suggested, based on their findings, that a diversification approach is needed for long-term stabilisation of consumption patterns.

In Sweden, Byston (2020) examined the effect of rising petroleum prices on personal consumption expenditure using a vector autoregressive model and impulse response function. The Granger-causality test, the IRF graph, and the VAR model's findings all demonstrate that an increase in petroleum prices does have a short-term negative impact on household spending.

In Nigeria, Ogede (2020) used a vector autoregressive model to investigate whether changes in petroleum prices have an impact on household consumption spending from 1995 to 2019. The Vector Autoregressive Model's findings show that unexpected changes in oil prices have a significant impact on household consumption spending. According to the study, an increase in consumption spending of 28.31% is equivalent to one standard deviation of an unexpected rise in petroleum prices. In addition, neither the sign nor the significance of the household connection between the volatility of petroleum prices and consumer spending were modified by the variance's decomposition.

Between 1996 and 2018, Vizek, Lee, and Payne (2020) examined the impact of petroleum price variations on total family consumption. The study uses dynamic panel VAR econometric approaches to assess the impact of income, wealth, and debt in addition to petroleum prices on household consumption spending in 30 European nations. The results of the impulse response analysis and

the Granger causality test reveal that a sudden increase in the price of petroleum decreases household consumption. The study employed median oil price variations as a threshold indicator for estimating a threshold panel VAR model. The threshold test shows that household consumption only reacts to fluctuations in the price of petroleum when these fluctuations exceed the median rate of change. This demonstrates how household consumption responds differently depending on the regime to changes in petroleum prices. From the study, all consumption sub-components fall in response to increased petroleum prices, but as was expected, the consumption of durable goods experiences the greatest decline after a spike in petroleum prices.

To examine the welfare effects of gas price fluctuation, Kuhn, Kehrig and Ziebarth (2021), created a quantitative heterogeneous-agent general equilibrium model that quantifies the distributional effects of oil price shocks. They observed that although oil price shocks have moderate effects on the economy, low-income households are disproportionately affected, with the cost of lifetime utility being two to three times higher for those in the bottom income decile compared to those in the top income decile.

Focusing on studies in Ghana, Cooke et al (2016) examined the impact on household poverty of Ghana's regulatory fuel subsidy reform and a mitigation strategy. The study simulates the welfare effects of the early 2013 fuel subsidy reform and the necessary expansion of cash transfers to lessen the effect of the subsidy reduction on low-income households in Ghana. Less than 3 percent of fuel subsidies reached the quintiles with the lowest incomes, with the wealthiest

individuals receiving over 78 percent of the benefits. It was discovered that the elimination of fuel subsidies led to a rise in costs, which had a detrimental effect on household welfare. The most adverse impact is felt by the poorest category, which sees a 2.1% decrease in total consumption. The simulation estimated that, if the poverty rate increases by 1.5 percentage points, 395,180 more people will fall into poverty.

Abubakari and Laryea (2021) investigated the variables affecting petroleum product pricing in a deregulated environment to assess the impact on Oil Marketing Companies' performance. A survey methodology was used in the study to gather data from OMC decision-makers across the nation. The study used descriptive and Ordinary Least Square methodologies and found that, in a deregulated market, internal factors affected prices more than external influences. The study also discovered that the performance of OMCs in Ghana has significantly improved as a result of the deregulation of petroleum prices. The study's conclusion was that, while petroleum price deregulation has a favorable impact on OMCs' performance, the deregulated environment also presents a number of difficulties for OMCs.

Most of the empirical works reviewed used either the VAR approach or other cointegrated estimation methods, the use of Hansen's (2000) sample splitting approach is motivated by its suitability for uncovering the complex, non-linear dynamics at play and its capacity to robustly identify critical regulatory thresholds that influence household consumption expenditure in the context of fluctuating petroleum prices.

Table 2: *Summary of Empirical Review*

Author(s)	Study location	Modelling techniques	Study period	Results
Wang	G7	Logistic smooth Transition Model	2013	The effects of rising oil prices on personal consumption expenditures are greater than those of falling oil prices. Below a threshold value, an increase in oil prices reduces personal consumption expenditures.
Zhang, Broadstock, and Cao	China	VAR	2014	For aggregate consumption, rising oil prices have no discernible effect on household consumption, whereas falling oil prices lead to higher household consumption. At the disaggregate level, rising oil prices most significantly and immediately affect transportation costs, then health care costs expenses for food, clothing, and other living necessities
Zaman	OECD	OLS	2015	Oil price change does affect household consumption in Canada and the USA, but the findings for Germany, UK and Sweden were not conclusive.
Moshiri	Iran	VAR	2015	The findings show that various income groups respond to changes in income and petroleum prices in different ways. Rural families, especially middle-class households, respond to income changes less strongly than urban households to price increases.
Baumeister and Kilian	USA	VAR	2016	Lower oil prices from increased consumption expenditure through discretionary and operating cost-effect.
Jawad and Niazi	Pakistan	VAR	2017	An increase in the price of petroleum causes increased inflation, which in turn causes households to cut back on spending.

Table 2: Continued

Author(s)	Study location	Modelling techniques	Study period	Results
Algaeed	Saudi Arabia	VAR	2017	The study shows that petroleum price shocks have a favourable effect on oil revenues and, consequently, on overall consumption
Boman	Norway	VAR	2018	Boman found that oil price fluctuations have impact on household spending, and disposable income and that household consumption respond positively to an oil price increase.
Akhamad	Indonesia	VAR	2019	The study discovered a rise in gasoline prices had an implicit influence on poverty in the short term, but had an explicit impact on inflation in the long run and a negative effect on GDP
Mahmood and Zamil	Saudi Arabia	VAR	2019	According to the study, there exist a direct relationship between the price of petroleum and personal consumption in both the long and short periods, suggesting that if the price of oil changes, the consumption will also change
Byston	Sweden	VAR	2020	The results show that an oil price increase does hurt household consumption in the short run
Vizek, Lee and Payne	30 European countries	VAR	2020	The Impulse response analysis and Granger causality test findings indicate that a sudden rise in oil prices reduces household consumption
Kuhn, Kehring and Zeibarth		General equilibrium model	2021	The studies concluded that while oil price shocks have modest overall effects, low-income households are particularly affected, with the cost to lifetime utility being around two to three times greater for those in the bottom decile of income compared to those in the top decile.
Abubakari and Laryea	Ghana	OLS	2021	The study revealed that the performance of OMCs in Ghana has significantly improved as a result of the deregulation of petroleum prices.

Chapter Summary

This chapter examined pertinent literature on petroleum prices, regulatory quality and household consumption expenditure, to critique and establish a knowledge gap. Specifically, the chapter presented the general concept and definition of consumption expenditure, theories of consumption, a description of Ghana's petroleum industry, the concept of deregulation, regulatory agencies in the petroleum sector and price development of petroleum commodities in Ghana. Again, the chapter considered the links between household consumption expenditure and petroleum prices, inflation, GDP growth, exchange rate, and compensation of the employee. The empirical literature review focused basically on the studies done around the globe and in Ghana as well. Lastly, the research gap.

Overall, the review indicates that most of the studies that try to examine the relationship between petroleum prices and household consumption established that an increase in petroleum prices affects household consumption expenditure and that petroleum prices' effect on household consumption expenditure is similar across countries and over time.

CHAPTER THREE

RESEARCH METHODS

Introduction

The main aim of this chapter is to discuss estimation techniques and data used in achieving the objectives of the study. It is divided into four sections. In the first section, the research design was used for the study. The second section looks at the data used and source, the third section details modelling and model specification, and the fourth section explains empirical models and variable justification. However, the third section is further divided into subdivisions focusing on theoretical underpinnings and model specification as well as data validation.

Research Design

Harwell (2011) asserts that research design depicts the entire research process, from conceptualizing the problem to reviewing the literature, research questions, methodologies, and findings. In contrast to earlier studies, where research design may only refer to a study's methodology (such as data collection and analysis), Harwell's (2011) claim is that research design depicts the entire research process.

The data used in this study is a time series one, employing positivist ideology and supported by the neoclassical school of thought. Positivist thought allows socioeconomic phenomena to be examined objectively and the link between variables to be clarified (Cantah, 2017). The concept is founded on pure facts and objectively describes the research. The positivist perspective permits the

researcher to maintain objectivity and independence from the study. This suggests that the philosophy forbids involvement by humans in the phenomenon being studied (Crotty, 1998). Moreover, the research's conclusions and analysis are observable and quantitative. The philosophy adopts a quantitative research method because it promotes impartiality and makes use of quantitative tools like various statistical techniques for data analysis.

Research Approach

The study's quantitative research approach is appropriate for determining how Ghanaian households' consumption expenditures are impacted by price of petroleum. The strategy is centered on studying the relationship between variables through data collection of numerical form and analysis with the aid of statistical methodologies (Aliaga & Gunderson, 2002). Comparatively to qualitative research, quantitative outcomes are dependable, objective, accurate, and generalizable (Hammersley, 2008; Saunders, Lewis, & Thornhill, 2012). The study specifically used the explanatory design because it helps to recognise cause-effect relationships and provide each relationship an explanation. Explanatory study is typically done to assess how particular changes may affect already-existing processes. The design offers the greatest method for conducting the research since it offers a better understanding of the research and comes to a more precise conclusion.

Data and Data Source

All of the study's data came from secondary sources. Data were secured from World Development Indicators (WDI), NPA and BoG from the year 2000 to 2020.

Table 3: *Variable, Definition, Measurement and Sources*

Variable	**Definition & Measurement**	**Source**
Household consumption expenditure	The market value of all the goods and services that households purchase, including durable goods (such vehicles, washing machines, and home computers), is known as Household and NPISH final consumption expenditure. Although it doesn't cover imputed rent for owner-occupied homes, it does include home acquisitions. It also includes the sums paid as taxes and other charges to the government for licenses and permits.	WDI
Petroleum prices	Ghana's average annual ex-pump prices for petroleum products (diesel, petrol, kerosene and LPG). Petrol, diesel, and kerosene are measured in liter while LPG is measured in kg	NPA
Regulatory quality	It is the ability of the government to create effective rules and regulations that support and encourage the growth of the private sector. Estimate provides the aggregate indicator score for the nation in units of the ordinary normal distribution between -2.5 and 2.5.	WDI
Household income	Compensation of employees consists of the total amount paid to employees in exchange for services done, whether in cash or in kind (such as food and housing), as well as government contributions to social insurance programs that give benefits to employees, such as social security and pensions.	WDI

Table 3: Continued

Variable	Definition & Measurement	Source
Inflation	The annual percentage change in the cost to the typical consumer of acquiring a basket of goods and services that may be set or modified at predetermined intervals, such as annually, is what the consumer price index measures as inflation.	BoG
GDP growth rate	Based on constant local currency, the GDP at market prices experiences an annual percentage growth rate. The aggregates are based on 2015 prices that are constant and expressed in US dollars. GDP is calculated as the total gross value added by all producers who are residents of the economy, plus any applicable product taxes, minus any unaccounted-for subsidies. It is estimated without taking into account natural resource depletion and deterioration, or the wear and tear on manufactured assets.	WDI
GDP per capita	It is the gross domestic product divided by midyear total population. GDP is the total gross value added by all resident producers in the economy, plus any applicable product taxes and minus any subsidies not included in the value of the products. GDP is calculated without taking into account the depreciation of manufactured assets or the depletion and degradation of natural resources. Data are in current U.S. dollars.	WDI
Official Exchange rate	It refers to the exchange rate set by national authorities or the rate established in the market for exchange that is recognized by law. It is determined as an annual average using monthly averages (local currency units per unit of foreign currency).	WDI

Data Processing and Analysis

To demonstrate the content's relevance, the descriptive approach was adopted. In order to execute the tests designed to reveal the predicted sign, the data were analyzed using STATA version 14.2, which is the appropriate software that has features to carry out the various statistical tests.

Model Specification

Theoretical Model

Given the study's objective, a model by Mehra and Petersen (2005), Romer (2012), Zhang and Broadstock (2014), and Kenton (2020) were adopted. For Mehra (2001), the main determinants of consumer expenditure are wealth and income. The life cycle theory suggests that, with their expected benefits in mind, people plan their spending over their lifetimes (Kenton, 2020). As a result, when they are young, they incur debt in the belief that their future income will enable them to pay it off. In addition to understanding the short-term behavior of consumer spending and consumer behavior, life-cycle aggregate consumption equations offer good estimates of wealth and income elasticities.

Wealth and income are identified as the main influences on consumer purchasing in the suggested aggregate life-cycle model of demand. Given that an individual who lives for T period, and his/her lifetime utility function is:

$$U = \sum_{t=1}^{T} u(C_t) \quad (1)$$

$$u'(\cdot) > 0, u''(\cdot) < 0$$

Where:

$u(\cdot)$ is an instantaneous utility function,

C_t is consumption expenditure in period t

The individual's wealth W_0 and labour income $Y_1, Y_2, \ldots, Y_T$, and s/he can borrow or save at an exogenous interest rate which is assumed to be zero. The budget constraint is:

$$\sum_{t=1}^{T} C_t \leq W_t + \sum_{t=1}^{T} Y_t \quad (2)$$

Given the marginal utility of consumption is positive, s/he will satisfy the budget constraint with equality. The maximization problem becomes:

$$U = \sum_{t=1}^{T} u(C_t) + \lambda(W_t + \sum_{t=1}^{T} Y_t - \sum_{t=1}^{T} C_t) \quad (3)$$

The first order condition for C_t is:

$$u'(C_t) = \lambda \quad (4)$$

From Equation (4), the marginal utility of consumption is constant and therefore, consumption is constant such that:

$$C_1 = C_2 = \cdots = C_T$$

Based on the above analysis, the consumption level C_t is affected by present income Y_t and wealth W_t and expected income as $E(Y_{t+1})$

Where $t = 1, 2, \ldots, \infty$. This gives a budget constraint

$$W_{t+1} = (1 + r_t)(W_t + Y_t - C_t) \quad (5)$$

As a result, wealth in the following period will be equal to the discounted wealth as well as earned income less consumption expenditures. With the assumption of a constant interest rate such that: $r = r_1 = r_{t+1}$,

Also $lim_{i\to\infty}(W_t + \left(\frac{i}{1+r}\right)^i = 0$. Then by repeated substitution W_t becomes:

$$W_t = \sum_{i=0}^{\infty} \frac{C_t + i}{(1+r)^i} - \sum_{i=0}^{\infty} \frac{Y_t + i}{(1+r)^i} \quad (6)$$

Given that consumption follows a marginal process then, $E(C_{t+1}) = C_t$. If we take expectation (6) we get the Permanent Income Hypothesis.

$$C_t = \frac{r}{(1+r)}\sum_{i=0}^{\infty}\frac{E(Y_t+i)}{(1+r)^i} + \frac{r}{(1+r)}W_t \quad (7)$$

Thus, $E(Y_{t+1}) = (1+g)Y_t + \eta_{t+1}$, where η_{t+1} is a white noise process. The term g represent the growth rate of present income Y

The equation then becomes:

$$C_t = \frac{r}{(r-g)}Y_t + \frac{r}{(1+r)}W_t + \sum_{i=1}^{\infty}\frac{\eta_{t+1}}{(1+r)^i} \quad (8)$$

From Equation 8, $\beta_1 = \frac{r}{(r-g)}$ and $\beta_2 = \frac{r}{(1+r)}$ and the expected value of the error term is 0.

By rearranging Equation 8, we have:

$$C_t = \beta_0 + \beta_1 Y_t + \beta_2 W_t \quad (9)$$

Equation 9, thus the relationship between consumption, wealth and income. This is known as C_t^p, the level of consumption.

Model Specification and Empirical Strategy

The general aim of this study is to empirically examine the effect of petroleum prices on household consumption spending. In doing so, a baseline model was set within a standard consumption model framework, where consumption expenditure is conditioned on petroleum prices together with the control variables. Also, the conditional impact of petroleum prices on household consumption was examined with regulatory quality acting as a mediating variable. The baseline model is specified as follows:

$$Y_t = \beta_0 + \beta_1 PPr_t + \beta_2 X_t + \varepsilon_t \quad (10)$$

Where;

Y_t = household consumption expenditure

PPr_t = petroleum prices (petrol, LPG, kerosene, diesel)

X_t = vector of control variables that affect household consumption expenditure. The control variables are household income, GDP growth rate, inflation, exchange rate and GDP per capita

ε_t = error term

Estimation Technique

To capture the existence of a threshold, the study relies on the Hansen (2000) sample splitting and threshold estimation approach which does not only estimate the threshold value but also indicate the confidence intervals for the estimated threshold value. The Hansen (2000) threshold method is robust to both the conventional regression tree and quadratic approaches because it uses the least square estimation of the regression parameters.

From Equation (10), the observed sample is $\{y_i, x_i, v_i\}_{i=1}^{n}$ where y_i and v_i are real-valued and x_i is an *m*-vector. The threshold variable v_i is taken as a continuous distribution and the v_i parameters form the estimated baseline model vary depending on the value of v_i. The resulting threshold model is given by:

$$Y_i = (\beta_0 + \beta_1 PPr_i + \beta_2 RQ_i + \beta_3 X_i) d_i\{v_i \leq \gamma\} + (\beta_0 + \beta_1 PPr_i + \beta_2 RQ_i + \beta_3 X_i) d_i\{v_i > \gamma\} + \varepsilon_i \quad (11)$$

Where Y and PPr are as defined above, RQ is the vector of threshold parameter; X is a vector of conditioning variables as previously defined $d(\cdot)$ is the indicator

function of dummy variable that takes the value 1 if the condition is satisfied and 0 otherwise; v is the threshold variable while γ is the threshold value.

In this estimation, the threshold variable v is regulatory quality and is used to split the sample into two different regimes or groups. This type of modelling strategy allows the effect of petroleum prices to differ depending on whether the regulatory quality is below or above some unknown level of γ. Following Alagidede, Mensah and Ibrahim (2018), the threshold effect hypothesis in this study is stated as follows:

$H_0 : \beta_1 = \beta_2$

$H_1 : \beta_1 \neq \beta_2$

Equation (10) is reduced to

$$y_i = \beta' x_i + \delta_n' x_i(\gamma) + \varepsilon_i \quad (12)$$

Where, $\delta_n = \beta_2 - \beta_1$ while $\beta_1 = \beta_2$. It is important to identify that $\delta_n \to 0$ as $n \to \infty$ while β_2 is fixed hence $\beta_1 \to \beta_2$ as $n \to \infty$. The Equation (12) is further specified in matrix notation expressing $n \times 1$ vector of Y and ε by stacking y_i and ε_i respectively and then $n \times m$ matrices X and X_γ by stacking the vector x_i' and $x_i(\gamma)'$ respectively as follows:

$$Y = X\beta + X_\gamma \delta_n + \varepsilon \quad (13)$$

Using least squares, the parameters β, δ, and γ are estimated where the least square estimator $(\hat{\beta}, \hat{\delta},$ and $(\hat{\beta}, \hat{\delta},$ and $\hat{\gamma})$ minimizes the sum of squared errors (SSE) of Equation (13) defined as:

$$SSE_n(\beta, \delta, \gamma) = \left(Y - X\beta + X_\gamma \delta_n\right)'(Y - X\beta + X_\gamma \delta_n) \quad (14)$$

Where the threshold value is restricted to a bounded set $[\underline{\gamma}, \overline{\gamma}] = \overline{w}$

The least square estimators ($\hat{\beta}, \hat{\delta},$ and $\hat{\gamma}$) are estimated using the concentration approach where $\hat{\gamma}$ is the value that minimizes $SSE_n(\gamma)$ and can therefore be uniquely estimated as

$$\hat{\gamma} = \underset{\gamma \in \overline{w}}{argmin}\, SSE_n(\gamma)$$

Where $\overline{w}_n = \overline{w} \cap \{v_1, v_2, \ldots, v_n\}$ while the slope estimators are therefore estimated as $\hat{\beta} = \hat{\beta}(\hat{\gamma})$ and $\hat{\delta} = \hat{\delta}(\hat{\gamma})$.

By employing the Likelihood Ratio test, we test the hypothesis $H_0 : \beta_1 = \beta_2$ as:

$$LR_n(\gamma) = n\frac{SSE_n(\gamma) - SSE_n(\hat{\gamma})}{SSE_n(\hat{\gamma})}$$

The H_0 is rejected for large values of $LR_n(\gamma_0)$. To establish the reliability of γ, the study depends on the confidence interval which is globally constructed using the inversion of Wald or *t*-test statistics. Nonetheless, Durfour (1997) and Hansen (2000) established that, when the asymptotic sampling distribution depends on unidentified estimators, the Wald statistic has poor limited sample performance especially when the parameter has an area of failed identification. Given the threshold model, when $\delta_n = 0$, the threshold value γ cannot be determined. Therefore, Hansen's (2000) threshold modelling addresses this anomaly by constructing an asymptotic confidence level (c) for γ using the $LR_n(\gamma)$ set at $\widehat{w} = \{\gamma: LR_n(\gamma) \leq c\}$.

Threshold Regression and Model Interpretation

The study employed the threshold regression method to shed light on the non-monotonic impact of regulatory quality. Regulatory quality is dynamic by

nature given who oversees authority and to comprehend the dynamism this technique could be employed. It may be essential to take the underlying process' dynamics into account in order to recover reliable estimations of other parameters.

The foremost part of the estimation is to test the null hypothesis of linearity $H_0 : \beta_1 = \beta_2$ against the alternative hypothesis $H_1 : \beta_1 \neq \beta_2$. If the hypothesis is not accepted, there is statistical support for threshold level regression with two regimes and a nonlinear model. When a threshold value exists, the sample is estimated to be $RQ_1 \leq \gamma$ referring to the first regime and $RQ_1 > \gamma$ refers to the second. Statistically, the two regimes provide a separate decision in estimation.

This work follows Hansen (1996, 2000), who recommends a heteroscedasticity-consistent Lagrange Multiplier (LM) bootstrap approach to compare the threshold regression alternative to the null hypothesis of a linear formulation. The p-values are calculated using a fixed bootstrap method because the threshold parameter is not identified under the null hypothesis of the no-threshold effect. Hansen (2000) demonstrates that these steps produce asymptotically accurate p-values. If the hypothesis of $H_0 : \beta_1 = \beta_2$ is rejected and a threshold level is determined, then we should retest the threshold regression model against a linear specification after dividing the original sample according to the threshold identified. This process is continued until the null of $H_0 : \beta_1 = \beta_2$ cannot be rejected any more.

Chapter Summary

The positivist philosophy, quantitative approach and the explanatory research design were adopted to examine the relationship between petroleum prices and household consumption expenditure in Ghana. Quarterly time series data on household consumption expenditure, petroleum prices, regulatory quality, household income, inflation, GDP growth rate and GDP per capita from January 2000 to December 20202 were employed for the study. The Hansen (2000) sample splitting and threshold estimation approach was used to estimate the threshold value. Least square estimation technique was also adopted for the study.

CHAPTER FOUR

RESULTS AND DISCUSSION

Introduction

The findings of the study are covered in this chapter. The descriptive statistics are reported first in the chapter and the relationship between the dependent variable (Household consumption expenditure) and control variables (Inflation, GDP growth, Exchange rate, GDP per capita, income (compensation of employee) and regulatory quality). This will be followed by a correlation matrix of the variables. Finally, chapter reports and discusses empirical results.

Descriptive Statistics

The impact of petroleum prices on the consumption expenditure is estimated using Equation (11). As stated earlier, the study adopted a splitting sample threshold technique by Hansen (2000) to examine the threshold impact of regulatory quality. The descriptive statistics of the variables have been presented in Table 4, which contains the unit of measurement of the variables, number of observations, mean, and standard deviation as well as the minimum and maximum values. From the Table 4, the average growth in Ghana within the period of 2000 and 2020 is about 5.74 percent. Within the same period Ghana experienced an average inflation of 15.7%, with the minimum, and maximum inflation of 7.1% and 41.5% respectively. Given the regulatory quality scale of -2.5 to 2.5, Ghana scores on average of -0.07 within the period under discussion. Concerning consumption expenditure, the statistics shows that Ghana spent on average 4.4% of GDP on consumption expenditure.

Table 5, present the correlation matrix, which measures the strength of the relationship among the variables. According to Pearson correlation coefficient, coefficient between $(0 < r \leq 0.19)$ is considered very weak, $(0.2 \leq r \leq 0.39)$ low correlation, $(0.4 \leq r \leq 0.59)$ moderate, $(0.6 \leq r \leq 0.79)$ high correlation and $(0.8 \leq r \leq 1.0)$ is regarded as very high correlation. From the table, the correlation coefficient of household consumption expenditure and the prices of petroleum products are Diesel (0.60), Kerosene (0.64), LPG (0.68) and Petrol (0.62). These indicate a high correlation between household consumption expenditure and prices of petroleum products.

Table 4: *Descriptive Statistics*

Variable	Unit of measurement	Obs	Mean	Std. Dev	Min	Max
Consumption Expenditure	% of GDP	84	4.39	0.08	4.25	4.54
Diesel	Ghp/lt	84	4.85	1.10	2.54	6.29
Kerosene	Ghp/lt	84	4.68	1.05	2.54	6.15
LPG	Ghp/kg	84	4.78	1.08	2.90	6.27
Petrol	Ghp/lt	84	4.89	1.04	2.61	6.28
Household income	U.S Dollar	84	3.62	0.07	3.49	3.83
Exchange Rate	%	84	2.28	1.67	0.54	5.59
GDP growth	%	84	5.74	2.68	0.51	14.04
GDP per capita	U.S Dollar	84	6.99	0.74	5.55	7.77
Inflation	Annual % Consumer Price Index (CPI)	84	15.75	8.11	7.14	41.50
Regulatory Quality	Scale -2.5 to 2.5	84	-0.07	0.15	-0.44	0.12

Notes: N = 84, T = 2000Q1 and 2020Q4
Source: Author's estimation, 2022

Table 5: *Correlation Matrix*

Variable	LHCExp	LGasOil	LKerosene	LLPG	LPetrol	LHINC	ExR	GDPg	LGDPpC	Inf	RQ
LHCExp	1.00										
LDiesel	-0.60	1.00									
LKerosene	-0.64	0.98	1.00								
LLPG	-0.68	0.99	0.99	1.00							
LPetrol	-0.62	0.99	0.99	0.99	1.00						
LHINC	0.30	-0.62	-0.61	-0.63	-0.61	1.00					
ExR	-0.80	0.99	0.91	0.92	0.89	-0.64	1.00				
GDPg	0.50	-0.02	-0.13	-0.11	-0.04	0.12	-0.32	1.00			
LGDPpC	-0.43	0.96	0.92	0.93	0.95	-0.59	0.74	-0.10	1.00		
Inf	0.18	-0.70	-0.65	-0.64	-0.69	0.12	-0.46	-0.29	0.73	1.00	
RQ	0.15	0.33	0.25	0.27	0.31	-0.46	0.08	0.29	0.51	-0.21	1.0

Source: Author's estimation, 2022

HCExp = Household Consumption Expenditure; LGasOil = Log of Diesel per litre; LKerosene = Log of kerosene per litre; LLPG = Log of Liquefied Petroleum Gas per Kg; LPetrol = Log of Petrol per litre; LHINC = Log of Household income; ExR = Exchange Rate; GDPg = GDP growth; LGDPpC = Log of GDP per capita; Inf = Inflation; RQ = Regulatory Quality

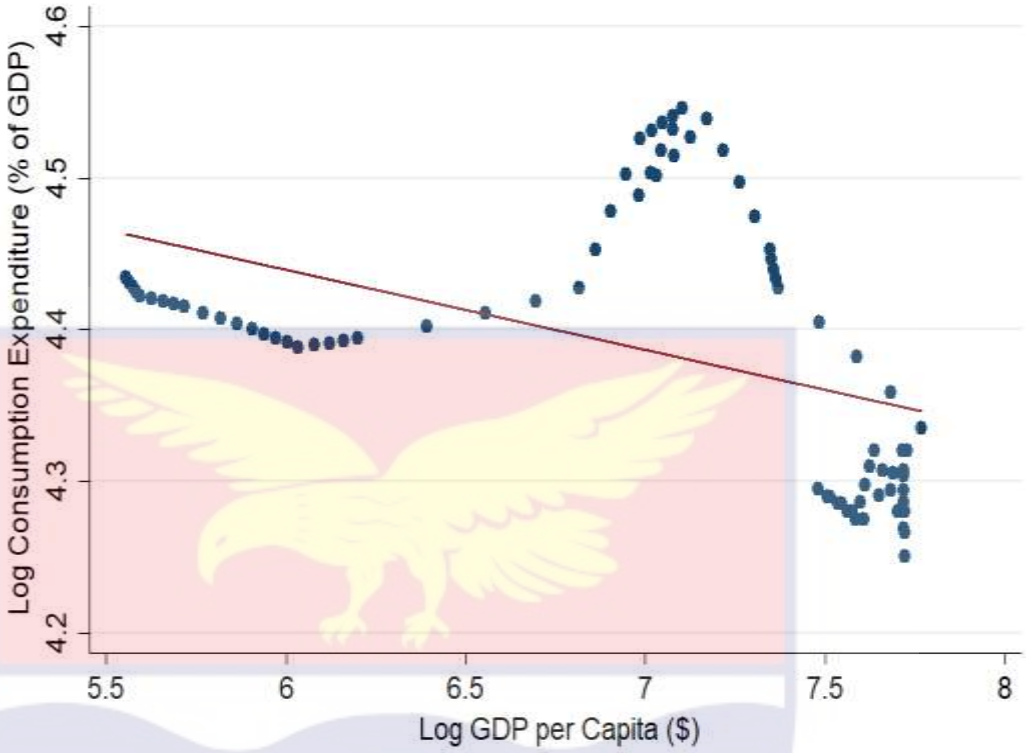

Figure 11: *Bivariate Relationship Between Household Consumption Expenditure and GDP per Capita*
Source: Author's Computation, 2022

Figure 11 displays a bivariate relationship between household consumption expenditure and GDP per capita in Ghana. The figure suggests that there is a negative relationship between GDP per capita and household consumption expenditure in the country. This shows that as GDP per capita increases, household consumption expenditure decreases. This can be caused by variables including depreciation of the domestic currency, regulatory measures, and savings.

Figure 12: *Relationship Between Household Consumption Expenditure and Household income*
Source: Author's Computation, 2022

According to Figure 12, there exist a clear and discernible relationship between the consumption expenditure of households and their income in Ghana. The figure indicates that as household income increases, there is a corresponding increase in household consumption expenditure, showing a positive correlation between the two variables. In other words, households in Ghana with higher incomes tend to spend more on consumption, while those with lower incomes tend to spend less. The figure provides visual evidence to support this relationship, indicating that as the income of a household increases, its consumption expenditure also increases.

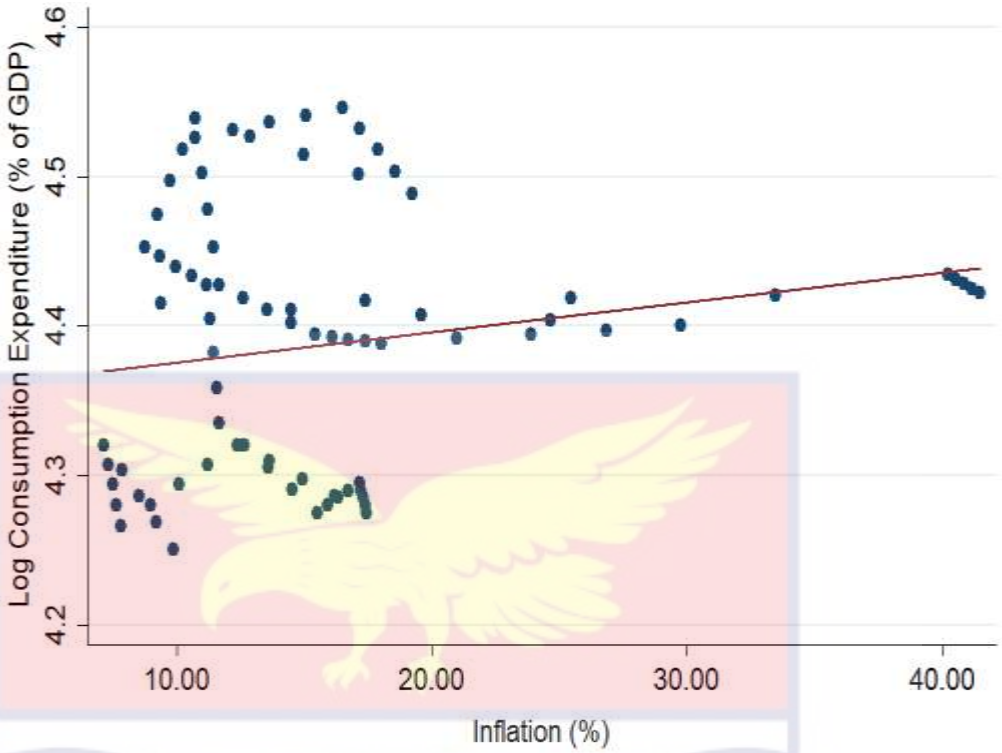

Figure 13: *Bivariate Relationship Between Household Consumption Expenditure and Inflation*
Source: Author's Computation, 2022

According to Figure 13, there exist a clear relationship between inflation and household consumption expenditure in Ghana. The figure indicates that as inflation increases, there is a corresponding increase in household consumption expenditure, showing a positive relationship between the two variables. This means, households in Ghana tend to spend more on consumption as inflation rises. This could be due to a number of factors, including the fact that rising prices may lead households spending more on goods and services. This underscores the fact that inflation has important implications for household spending patterns, and that rising price can have a significant effect on the purchasing power of households.

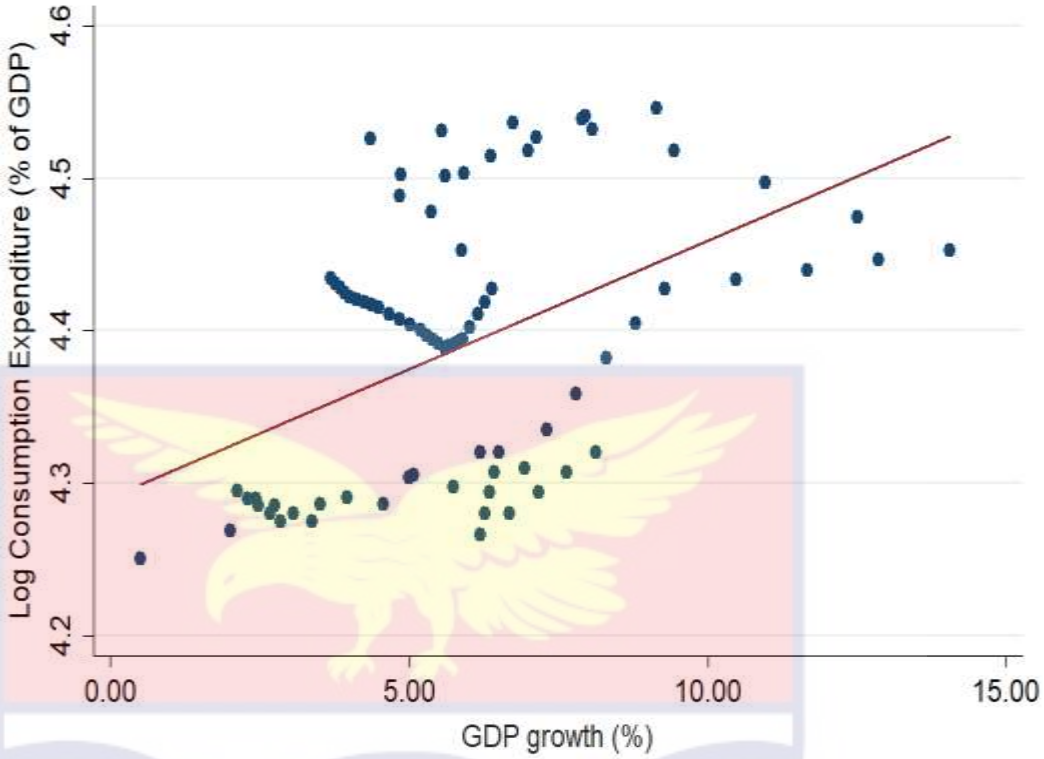

Figure 14: *Bivariate Relationship Between Household Consumption Expenditure and GDP Growth*
Source: Author's Computation, 2022

From Figure 14, there exist a clear relationship between GDP growth and household consumption expenditure in Ghana. The figure indicates that as GDP growth increases, there is a corresponding increase in household consumption expenditure, showing a positive correlation between the two variables. Thus, as the economy grows and becomes more prosperous, households in Ghana tend to spend more on consumption. This could be due to a number of factors, such as higher employment rates, increased wages, and greater economic stability, which can lead to higher levels of confidence and purchasing power among households. Overall, Figure 14 highlights the complex relationship between GDP growth and household consumption expenditure in Ghana and underscores the importance of promoting economic growth and prosperity in order to support household welfare and well-being.

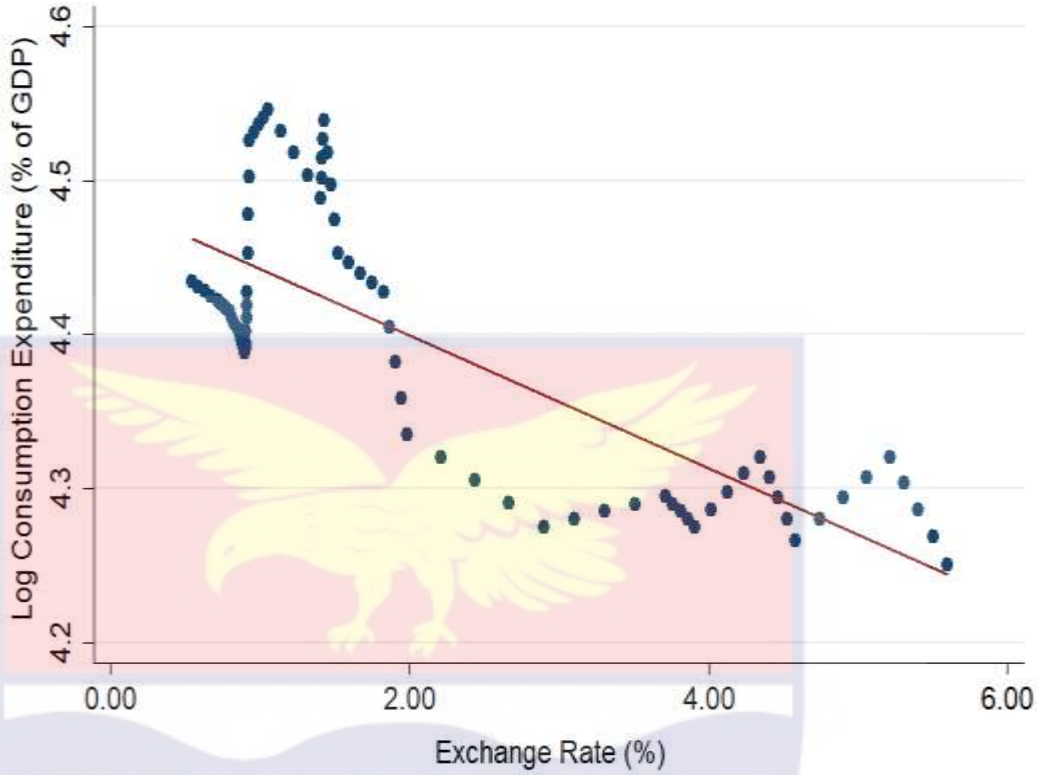

Figure 15: *Bivariate Relationship Between Household Consumption Expenditure and Exchange Rate*
Source: Author's Computation, 2022

Figure 15 indicates a negative correlation between exchange rates and household consumption expenditure. Specifically, the figure shows that as the exchange rate increases, there is a corresponding decrease in household consumption expenditure. This suggests that a weaker currency may make imported goods and services more expensive, which can lead households to reduce their spending on consumption. Conversely, a stronger currency may make imports cheaper, which can stimulate household consumption. This underscores the fact that exchange rates can have important implications on household spending patterns, hence regulatory institutions must carefully consider the effect of exchange rate fluctuations on households when making economic decisions.

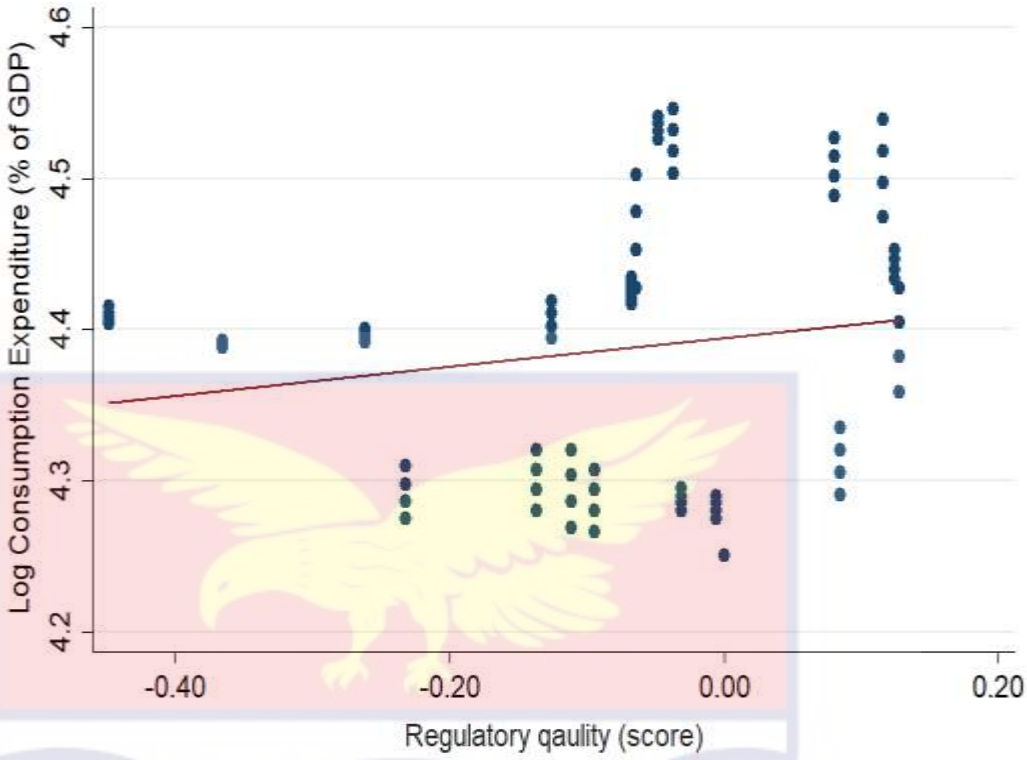

Figure 16: *Bivariate Relationship Between Household Consumption Expenditure and Regulatory Quality*
Source: Author's Computation, 2022

Figure 16 depicts the relationship between regulatory quality and household consumption expenditure in Ghana. Specifically, the figure shows the correlation between regulatory quality and household consumption expenditure, indicating a higher level of regulatory quality is associated with higher levels of household consumption expenditure, or vice versa. That is, better regulatory quality can create a more favorable business environment, leading to more economic opportunities, higher income, and higher consumer spending. Alternatively, poor regulatory quality could lead to a less favorable business environment, lower income, and lower consumer spending. This underscores the fact that regulatory quality can have important implications on household welfare, and that effective regulations in the petroleum downstream can help support household spending.

Empirical results

The empirical findings are organised as follows; determine the presence of a threshold effect in the relationship between petroleum price and household consumption. The section reports the regression results using different indicator of petroleum products. Specifically, Table 7 report on Diesel, Table 8 report on Kerosene, while Table 9 and Table 10, report on LPG and petrol respectively.

Threshold estimation

Using the Hansen threshold testing approach, the empirical study first determines if a threshold effect in terms of regulatory quality exists. There being no threshold effect is the null hypothesis in this situation. In Table 6, the LM-test statistic and accompanying p-values are shown for testing the null of no threshold effect. The bootstrap method p-value with 5000 replications and 15% trimming percentage was used to assess the statistical significance of the threshold estimate. The bootstrap p-values, as given in Table 6, reveal that the test of no threshold effect can be rejected, which raises the possibility of a sample split on regulatory quality. Hansen (2000) claims that further splitting of these two subsamples can be examined to make the results' 95% confidence intervals reasonably narrow. In this regard, the value below and above can be split further into sub-regimes. The study tested for the value above the first threshold value. For the second sample split, the bootstrap p-value indicated significance which shows there might be a second sample split.

Table 6: *Threshold Estimates of Regulatory Quality*

	First sample split	Second sample split
LM test for no threshold	42.49	17.67
Bootstrap *p*-value	0.000***	0.039***
Threshold estimates of regulatory quality	-0.067	-0.005
95% Confidence interval	[-0.067, -0.067]	[-0.005, -0.005]

Notes: *** denote significant at 1%
Source: Authors' estimation, 2022.

The graph in Figures 17 and 18 shows the normalized likelihood ratio sequence LR(Gamma) as a function of the threshold in regulatory quality for first and second sample split respectively. As can be seen in Figure 17, the least square estimate of Gamma is the value that minimizes this graph, which occurs at -0.067. The red line on the graph represents the 95% critical value at 42.49. Hance, we can read off the asymptotic 95% confidence set at a point of -0.067 from the graph from where LR(Gamma) touches the red line. The result shows that there is reasonable evidence for a two-regime specification. Next, the obtained thresholds value is applied in the regression estimations.

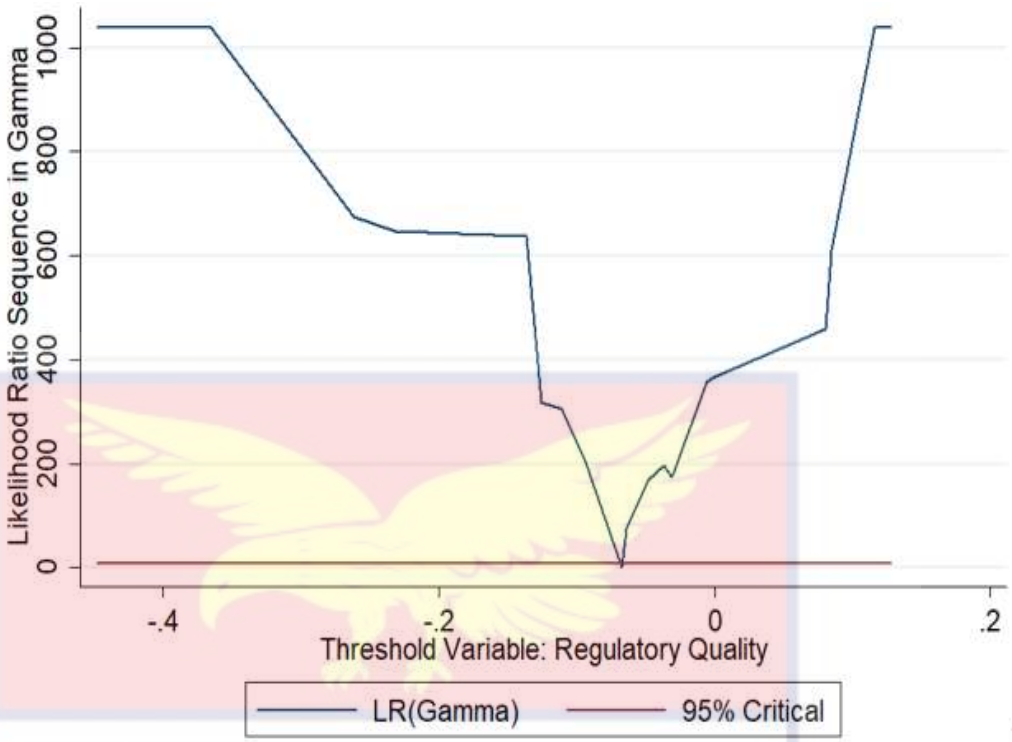

Figure 17: *First Sample Split Confidence Interval Construction for Threshold*
Source: Author's Computation, 2022

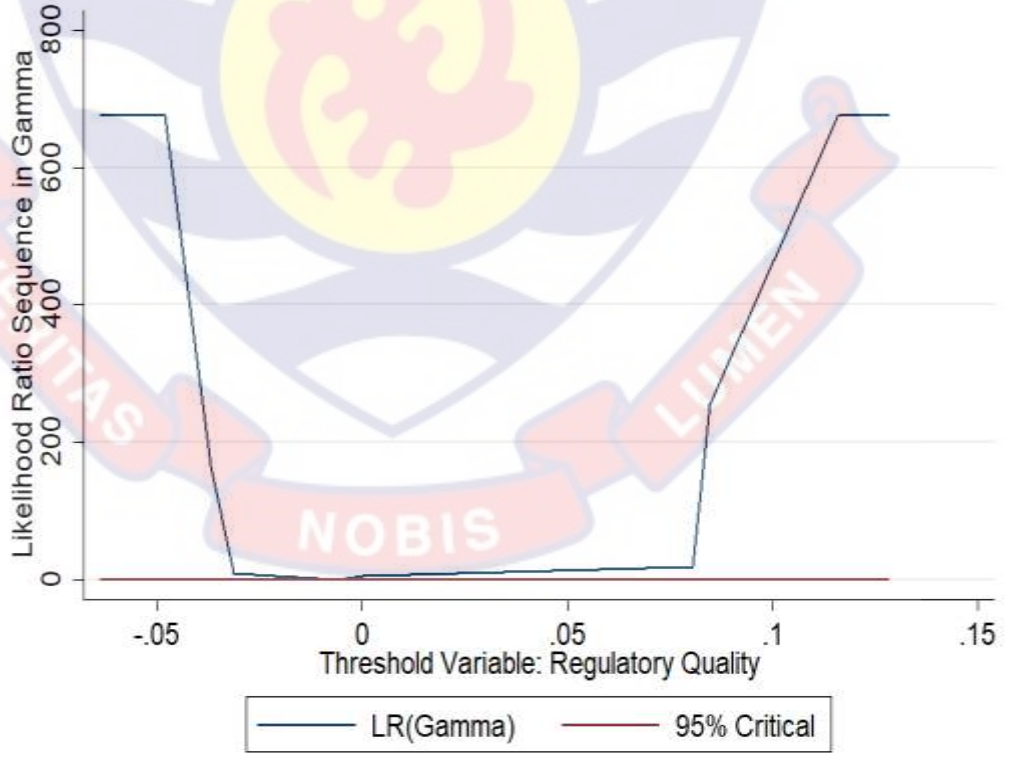

Figure 18: *Second Sample Split Confidence Interval Construction for Threshold*
Source: Author's Computation, 2022

Baseline Results

This sub-section reports the baseline results for regression analysis for the four different petroleum products.

Table 7: *Regression results for Diesel*

Variable	Global OLS, without threshold	Regime 1: RQ ≤ -0.067	Regime 2: RQ > -0.067
Constant/Intercept	6.808***	4.458***	8.065***
	(0.498)	(0.238)	(0.214)
LGasOil	-0.050	-0.041***	-0.438***
	(0.038)	(0.011)	(0.034)
LHINC	-0.615***	0.010	-0.797***
	(0.111)	(0.044)	(0.068)
ExR	-0.048***	-0.007	0.083***
	(0.010)	(0.005)	(0.009)
GDPg	0.003	0.006***	0.010***
	(0.002)	(0.002)	(0.001)
GDPpC	0.030	0.008	0.154***
	(0.048)	(0.025)	(0.034)
Inf	-0.004***	-0.0004	0.007***
	(0.0008)	(0.0003)	(0.001)
RQ	-0.014	0.046***	0.146***
	(0.048)	(0.018)	(0.040)
R-square	0.82	0.96	0.98
Heteroscedasticity test (p-value)	0.099	-	-
No. of Observation	84	40	44
Degrees of freedom	76	32	36

Source: Authors' estimation

Notes: Number in parentheses are standard errors

***, **, and * denote significant at 1%, 5% and 10% levels, respectively

LGasOil = Log of Diesel per litre; LKerosene = Log of kerosene per litre; LLPG = Log of Liquefied Petroleum Gas per Kg; LPetrol = Log of Petrol per litre; LHINC = Log of Household income; ExR = Exchange Rate; GDPg = GDP growth; LGDPpC = Log of GDP per capita; Inf = Inflation; RQ = Regulatory Quality.

The threshold model specifications for diesel in Table 7 show that in both regimes, the coefficient of Diesel is significant and negatively affects household consumption expenditure. Above the threshold value of -0.067, increase in Diesel price will decrease the household consumption expenditure. Therefore, once a particular threshold level is reached, an increase in the price of diesel has a large negative impact on household consumption expenditure. Thus, 1 cedi increase in Diesel price will decrease household consumption by 0.041% and 0.438% in a low and high regime of regulatory quality respectively. Above the threshold level of regulatory quality (RQ > -0.067), all the estimated coefficient of control variables (Household income, exchange rate, GDP growth, GDP per capita, inflation and regulatory quality) are significant at 1 percent significance level. The coefficient of GDP growth and GDP per capita are consistent with economic theory while inflation, household income, and exchange rate are inconsistent. It shows that one percent increase in GDP growth and GDP per capita will increase household consumption expenditure by 0.010 and 0.154 percent respectively. In contrast, below the threshold level (RQ ≤ -0.067) the estimated coefficient on household income, exchange rate, GDP per capita and inflation are statistically insignificant in influencing household consumption spending.

Table 8: *Regression Results for Kerosene*

Variable	Global OLS, without threshold	Regime 1: RQ ≤ -0.067	Regime 2: RQ > -0.067
Constant/Intercept	7.064***	4.495***	8.777***
	(0.441)	(0.233)	(0.365)
LKerosene	-0.029	-0.014***	-0.052
	(0.028)	(0.009)	(0.039)
LHINC	-0.609***	0.014	-0.750***
	(0.103)	(0.045)	(0.099)
ExR	-0.065***	-0.003	-0.027**
	(0.008)	(0.005)	(0.011)
GDPg	0.004**	0.006***	0.001
	(0.002)	(0.002)	(0.002)
LGDPpC	-0.058*	-0.0009	-0.187***
	(0.033)	(0.0220)	(0.044)
Inf	-0.004***	-0.0004	0.002**
	(0.0008)	(0.0003)	(0.001)
RQ	0.048	0.044**	0.167**
	(0.050)	(0.019)	(0.076)
R-square	0.82	0.96	0.96
Heteroscedasticity test (p-value)	0.053	-	-
No. of Observation	84	40	44
Degrees of freedom	76	32	36

Source: Authors' estimation
Notes: Number in parentheses are standard errors
***, **, and * denote significant at 1%, 5% and 10% levels, respectively

Table 8 reports the threshold regression model for Kerosene. It shows that above the threshold level (RQ > -0.067), the coefficient of Kerosene is insignificant in influencing household consumption spending. This does not support literature. In contrast, the coefficient is negative and significant in influencing household consumption below the threshold level (RQ ≤ -0.067). Hence below the threshold level, 1 unit increase in Kerosene price, household consumption spending will decrease by 0.014 percent. This finding suggests that regulatory quality could replicate a nonlinear relationship between

petroleum price and household consumption expenditure. Above the threshold level the estimated coefficient of household income, GDP per capita are significant at 1 percent level, while exchange rate, inflation and regulatory quality are significant are 5 percent level. Exchange rate negatively associated with household consumption expenditure. Below the threshold level, GDP growth and regulatory quality are significant at 1 percent. Thus, below the threshold level, 1 unit increase in GDP growth, household consumption spending increase by 0.006 percent. However, other variables have insignificant coefficient.

Table 9: *Regression Results for Liquefied Petroleum Gas*

Variable	Global OLS, without threshold	Regime 1: RQ ≤ -0.067	Regime 2: RQ > -0.067
Constant/Intercept	5.949***	4.229***	6.849***
	(0.479)	(0.219)	(0.226)
LLPG	-0.236***	-0.122***	-0.348***
	(0.039)	(0.024)	(0.033)
LHINC	-0.566***	-0.003	-0.764***
	(0.105)	(0.048)	(0.030)
ExR	0.003	0.016***	0.025***
	(0.012)	(0.006)	(0.007)
GDPg	0.003	0.009***	-0.0005
	(0.002)	(0.002)	(0.0007)
LGDPpC	0.231***	0.094***	0.270***
	(0.045)	(0.028)	(0.046)
Inf	-0.002***	0.0002	0.002***
	(0.0008)	(0.0004)	(0.0005)
RQ	-0.192***	0.015	-0.330***
	(0.046)	(0.019)	(0.065)
R-square	0.87	0.97	0.99
Heteroscedasticity test (p-value)	0.170	-	-
No. of Observation	84	40	44
Degrees of freedom	76	32	36

Source: Authors' estimation
Notes: Number in parentheses are standard errors
***, **, and * denote significant at 1%, 5% and 10% levels, respectively

Table 9 above provides the regression results for LPG. It shows that for both regimes the coefficient of LPG is negatively significant at 1 percent level in influencing household consumption. However, the degree of impact differs in both regimes. Above the threshold level (RQ > -0.067), 1 cedi increase in LPG price, decrease household consumption spending by 0.348 percent, while below the threshold level, a cedi increase in price of LPG decreases household consumption expenditure by 0.122 percent. These results are consistent with the study done by Wang (2013). This finding suggests that a minimal regulation is important to bring relief to household. Above the threshold level, the estimated coefficient of household income, exchange rate, GDP per capita, inflation and regulatory quality are significant at 1 percent significance level. Exchange rate and inflation positively associated with household consumption spending, meanwhile, household income, GDP growth and regulatory quality negatively associated with household consumption spending. This finding is inconsistence with economic theory. Below the threshold level, the estimated coefficient of exchange rate, GDP growth and GDP per capita are significant at 1 percent level and positively associated with the household consumption expenditure. Hence, below the threshold level, 1 unit increase in exchange and GDP growth, increase household consumption spending by 0.016 percent and 0.009 percent respectively. Other variables like household income, inflation and regulatory quality are insignificant in influencing household consumption spending below the threshold level. The next table present regression result for petrol.

Table 10: *Regression results for Petrol*

Variable	Global OLS, without threshold	Regime 1: RQ ≤ -0.067	Regime 2: RQ > -0.067
Constant/Intercept	6.650***	4.440***	7.916***
	(0.158)	(0.235)	(0.233)
LPetrol	-0.088**	-0.040***	-0.331***
	(0.037)	(0.009)	(0.029)
LHINC	-0.591***	0.024	-0.683***
	(0.114)	(0.044)	(0.072)
ExR	-0.039***	-0.007	0.050***
	(0.010)	(0.005)	(0.009)
GDPg	0.004**	0.005**	0.007***
	(0.002)	(0.002)	(0.001)
LGDPpC	0.064	0.004	0.620***
	(0.044)	(0.023)	(0.029)
Inf	-0.004***	-0.0004	0.004***
	(0.0008)	(0.0003)	(0.0008)
RQ	-0.036	0.048***	0.092**
	(0.043)	(0.017)	(0.043)
R-square	0.82	0.96	0.98
Heteroscedasticity test (p-value)	0.122	-	-
No. of Observation	84	40	44
Degrees of freedom	76	32	36

Source: Authors' estimation
Notes: Number in parentheses are standard errors
***, **, and * denote significant at 1%, 5% and 10% levels, respectively

From Table 10, the table shows that above threshold level (RQ > -0.067), coefficient of petrol is negative and significant in influencing household consumption expenditure. Thus, 1 cedi increase in petrol reduces household consumption spending by 0.331 percent. Meanwhile, below the threshold level, 1 cedi increase in petrol price decrease household

consumption by 0.040 percent. This is consistent with the study done by Wang (2013). For both regime 1 and 2, GDP growth is significant at 1 percent level and positively associated with the household consumption expenditure. Hence, 1 unit increase in GDP growth, increase household consumption spending in regime 1 and 2 by 0.005 percent and 0.007 percent respectively.

Chapter Summary

This chapter has presented the analysis and discussion of results. The study employed the Hansen (2000) sample splitting model to examine the threshold effect of regulatory quality on the relationship between petroleum prices and household consumption expenditure. The baseline results are then presented for the different petroleum products, including LPG, diesel, kerosene and petrol. The regression analysis shows that for both regimes, the coefficient of Petrol, LPG and Diesel is negative and significant in influencing household consumption. In contrast, the coefficient of Kerosene above the threshold level is insignificant but negative and significant in influencing household consumption spending below the threshold level.

CHAPTER FIVE

SUMMARY, CONCULUSION AND RECOMMENDATIONS

Introduction

The study sought to examine the role of regulatory quality in petroleum price and household consumption expenditure. Specifically, the study was steered by four hypotheses. This chapter deals with the summary of findings in relation to the study in entirety. It goes on to provide conclusions made from the study and therefore gives recommendations. The chapter also provide limitation of the study as well as suggestions for further study.

Summary

It is widely considered that petroleum products are one of the most common sources of energy in households, nonetheless, price changes for petroleum products are unavoidable, and it has been demonstrated that these changes have a major impact on the costs of other commodities and services that have an impact on household welfare and consumption. The challenge with the few existing work in Ghana were based on theoretical assumption and lacks time series data for empirical testing or simulations that are not often driven by the nature of the economy. With this background, coupled with regulatory deficiencies, this study aimed to empirically examine the impact of petroleum prices on household consumption expenditure, using quarterly time series data from 2000Q1 to 2020Q4.

The study's broad goal was to investigate the influence of institutions as measured by the regulatory quality in the relationship between petroleum prices and household consumption expenditures. Specifically, test the threshold effect of regulatory quality in the petroleum prices and household

consumption expenditure nexus as well as investigate effect of petroleum prices on household consumption expenditure.

The threshold effect of regulatory quality was specifically tested using the Hansen sample splitting threshold testing methodology. The conclusion was reached that there is evidence in favor of a two-regime specification. Thus, there is a threshold effect of regulatory quality in the relationship between petroleum prices and household consumption expenditure.

The study then investigated the impact of petroleum prices in both regimes after establishing the presence of a threshold effect in petroleum prices and household consumption expenditure nexus. Household income, exchange rate, GDP growth, GDP per capita, inflation, and regulatory quality were all factors that the study considered.

The study found that for diesel, higher prices for diesel result in lower household consumption spending under both regimes. However, the impact on household spending is substantially greater for high regulatory quality scores than for lower regulatory quality scores. In a similar vein, it was found that LPG influences household consumption expenditure. Again, the degree of impact differs in both regimes. For kerosene, it was found that above the threshold value, kerosene is insignificant in influencing household consumption spending but significant in influencing household consumption below the threshold level. Likewise, petrol was found significant in influencing household consumption expenditure.

Conclusions

The study sought to examine the role of regulatory quality in the petroleum price and household consumption expenditure nexus. Based on the findings of the study the following conclusions were drawn:

First, there is a threshold effect in the relationship between petroleum prices and household consumption expenditure. A priori monotonic restriction on the analysis of petroleum price on household consumption expenditure, could result in a hasty conclusion. However, this offers a novel finding on the relationships between petroleum price and household consumption spending.

Second, diesel is negative and significant in affecting household consumption expenditure in both low and high regime threshold level (RQ). Particularly, the effect of diesel on the household consumption expenditure is much stronger for the high regulatory quality score than with a lower regulatory quality score.

Third, Kerosene is negative and significant in affecting household consumption spending particularly in the low regime threshold level (RQ).

Fourth, LPG is significant and negatively influence household consumption in both regimes, specifically, in the high regime, the impact of LPG on household consumption spending is much stronger than that of the lower regime of the threshold level. Lastly, petrol is also significant and affect household consumption expenditure negatively.

Recommendation

Regional crises and wars, together with other political and economic occurrences, frequently cause shocks that affect the global oil market, as petroleum supplies are becoming increasingly scarce. This suggests that the

petroleum pricing regulation should be considered to safeguard Ghana's macroeconomic stability. Having also demonstrated that a rise in petroleum product prices has significant influence on Ghanaian household consumption, in both regimes and even more so in the higher regime for LPG and diesel, the study recommends the following solutions:

- Based on the evidence that there is regulatory threshold effect, governments should work to enhance the quality of regulations governing the petroleum industry by ensuring that regulatory bodies are transparent and accountable in their decision-making processes. This will reduce the impact of petroleum price fluctuations on household consumption expenditure.
- The governments through the Ministry of Energy can encourage households by promoting energy-efficient practices and technologies, such as solar-panels, or electric vehicles to reduce household energy consumption on diesel and petrol for electricity generation and for transportation.
- Based on the evidence that higher petroleum prices have adverse effect on household consumption, the governments through the Ministry of Energy can provide subsidies or targeted assistance to low-income households to help them cope with rising petroleum prices. This could include free or reduced-cost public transportation, energy-efficient appliances, or cash transfers. Also, some levies and taxes on petroleum products during price hikes can be removed to reduce the burden on households.

- The Ministry of Energy and other regulatory institutions can implement policies to stabilize petroleum prices, such as establishing a strategic petroleum reserve or implementing price controls, to help households and businesses plan their budgets and reduce volatility in the market.
- The Ministry of Energy through regulatory institution such as BOST and TOR must ensure that petroleum products are always available in the country since they constitute a significant portion of household consumption expenditures in the country. This can be achieved through effective measures to combat those who hoard or smuggle the product to other neighbouring countries in order to create artificial scarcity.

Suggestions for Further Study

The study presents a few possibilities for future research. First, other institutional variables such as corruption and rule of law could be added to regulatory quality to generate an index to enhance the efficiency of its measurement. Second due to the limitation of data availability in this study, future researchers should split the data into before and after the deregulation in order to capture the actual impact of regulation.

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