BINDURA UNIVERSITY OF SCIENCE EDUCATION

FACULTY OF COMMERCE

DEPARTMENT OF ECONOMICS

SPEND ANALYSIS OF MINERAL FUELS AND OILS IN ZIMBABWE (2009 TO 2016)

RIXON MASAIRE

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SUPERVISOR: DR MUSHANYURI

A DISSERTATION SUBMITTED IN PARTIAL FULFILMENT OF THE REQUIREMENTS FOR THE MASTERS OF SCIENCE DEGREE IN PURCHASING AND SUPPLY OF BINDURA UNIVERSITY OF SCIENCE EDUCATION. FACULTY OF COMMERCE

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The project is a special gift to my wife, Wadzanai Talent Masaire, who has been a pillar to lean on during the entire research through her consistent support and encouragement. To her, I consecrate all the love, respect and gratitude.
Abstract

Higher fuel import shares in Zimbabwe triggered the spend analysis study from 2009 to 2016. The study was based on the positivism paradigm and adopted a deductive approach in trying to establish fuel import share percentages. Quantitative method was used to facilitate replication of findings. The study employed the descriptive and exploratory research designs. Case study method was used as the research strategy. The target population consisted of 40 trade commodities from the Harmonized Commodity Description and Coding system, Category 27 at HS4 level. Judgemental or purposive sampling techniques were used to come up with a sample size of 40 trade commodities.

Several statistical techniques were employed to analyze collected secondary data. Analyzed data was then presented as tables, trend graphs and time series graphs. The study revealed non-crude oils contributed to the greatest fuel spend share. Petroleum products are being imported at the expense of other commodities. There is also a very high significant difference between Zimbabwe’s fuel spend shares and regional spend shares. Zimbabwe had the greatest fuel spend share in the entire region.

The study recommended that the Government of Zimbabwe should allow holders of free funds to procure their own fuel rather than being allocated foreign currency by The Reserve Bank of Zimbabwe. Reserve Bank of Zimbabwe’s scarce foreign currency should be channeled towards the procurement of other strategic commodities. The Government of Zimbabwe should encourage stiff competition from various international suppliers of fuel to get favorable prices. The Government of Zimbabwe should also consider establishing a local crude oil refinery to reduce the importation of refined products. Investment in oil prospection and development should also be considered as a long-term plan.
Acknowledgements

I would like to thank all those who contributed in different ways to this project. Names are too numerous to mention but special mention goes to Dr Mushanyuri. The project supervisor was always available to provide guidance and assistance throughout the entire dissertation. Had it not been for his contribution, the study could never have been successful.

Special thanks are also extended to the entire Sakunda Managerial staff who willingly gave relevant information which was vital to the success of the study. Management sacrificed most of their time to give comments, suggestions and relevant information at each and every stage of the project. I also convey much appreciation to all workmates for their relevant information, constructive criticisms and encouragement during the course of the research.

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My wife, Wadzanai, should also be thanked for her valuable contribution in encouraging me to further my studies.
Declaration

I, Rixon Masaire, declare that this project is my own work and has not been copied or lifted from any source without acknowledgement of the source.

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<th>Full Form</th>
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<tr>
<td>BOP</td>
<td>Balance of Payments</td>
</tr>
<tr>
<td>GDP</td>
<td>Gross Domestic Product</td>
</tr>
<tr>
<td>HCDCS</td>
<td>Harmonized Commodity Description and Coding System</td>
</tr>
<tr>
<td>HS</td>
<td>Harmonized System</td>
</tr>
<tr>
<td>IPG</td>
<td>Independent Petroleum Group</td>
</tr>
<tr>
<td>NOIC</td>
<td>National Oil Infrastructure Company of Zimbabwe</td>
</tr>
<tr>
<td>PVI</td>
<td>Productivity Volume Index</td>
</tr>
<tr>
<td>RBZ</td>
<td>Reserve Bank of Zimbabwe</td>
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<tr>
<td>ZIMSTAT</td>
<td>Zimbabwe National Statistics Agency</td>
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CHAPTER I

INTRODUCTION

1.1 Introduction

This chapter looked at the spend patterns of mineral fuels and oils from 2009 to 2016. Mineral fuels and oils in Zimbabwe continue to be one of the key drivers of the country’s imports. Key drivers of the country’s imports require regular analysis into the overall spending patterns. Analysing spend data should be a continuous process which provides public entities and private corporates with actionable insight and knowledge of categories with greater spend. Categorizing commodities or goods is a strategic approach which help countries to focus on specific areas of spend. Purchasing decisions on expenditure must drastically change to reflect wider changes which have taken place in the business environment. The next section looked at the background of the study, statement of the problem, purpose of the study, research objectives and research questions, significance of the study, delimitations and limitations of the study.

1.2 Background of the study

Mineral fuels and oils, commonly grouped as mineral fuels, mineral oils and products of their distillation, bituminous substances and mineral waxes by the Harmonized Commodity Description and Coding System (HCDCS), remains one of the most imported commodities with greater spend in many countries across the globe. Minerals fuels and oils represents significant percentages of the total import bill. Spend analysis study therefore becomes critical following significant increases in the fuel import bill of Zimbabwe from 2009 to 2016. Spend Analysis is defined by many scholars as the organisation of procurement expenses to have a proper spend visibility. Marzic, Krneta and Palvic (2014), Lyons, Maloney and Rodgers (2014) and Pandit and Marmanis (2008). The ever-increasing fiscal pressures, economic challenges and changes in the business environment are forcing many
countries to cut on their import bill in-order to survive these downturns. The next section analyzes fuel import trends for the world, region and Zimbabwe.

1.2.1 World Petroleum Products Fuel Spend Share

Many developed countries have made progress to reduce their fuel import percentage share relative to total merchandise. Belarus, India and Greece are some of the top three countries in the world where fuel import comprise of larger shares of total imports. Fig 1.1 below shows the world’s petroleum products import share percentage relative to total merchandise from 2009 to 2016.

![Fig 1.1 World’s Fuel Import Share Percentages Compared with Zimbabwe](image)


Fig 1.1 above shows that the aggregated fuel import shares relative to total merchandise gradually increased from 2009 to 2012. (United Nations Comtrade Data). A gradual decrease occurred from 2013 up to 2016. In 2011, the world’s aggregated fuel import share relative to total merchandise was 17.6% against 14.6% for Zimbabwe. In 2012, the world’s aggregated fuel import share was 18.3% against 20.57% for Zimbabwe. The world’s trend of fuel import percentage share relative to total merchandise decreased to 17.5% in 2013, 16.3% in 2014, 11.3% in 2015 and finally 9.5% in 2016. In Zimbabwe, there was gradual increase to 20.99% in 2013, 24.57% in 2014, 26.39% in 2015 and finally 28.82% in 2016.
Overall, world’s trend shows that fuel import percentage share relative to total merchandise gradually decreased across the globe while it increased in Zimbabwe.

1.2.2 Regional Countries’ Fuel Spend Share

According to United Nations Comtrade International Trade Statistics Report, Zimbabwe’s fuel import share relative to total merchandise in 2008 was less than many regional countries such as Namibia, Zambia, Botswana, Mozambique and South Africa. Between 2014 and 2016, Zimbabwe had the highest fuel import percentage share. Angola has managed to maintain its fuel import share at less than 8% between 2012 and 2015. Countries like Malawi and Namibia have managed to maintain their fuel import percentage share at not more 15% between the period under study. The highest fuel import share was 29.40% for Mozambique in 2013. The fuel import percentage share is also high in Nigeria. In most cases, the Nigerian National Petroleum Corporation (NNPC) spends on average USD$16m dollars to USD$20m dollars per day on fuel imports which amounts to USD$1.9 billion dollars per quarter.

1.2.3 Zimbabwe’s Fuel Spend Share

Zimbabwe is one of the countries in the world which is self-reliant on fuel imports. Among the countries with fuel spend share comprise of larger shares of total imports, Zimbabwe is ranked the 4th after Belarus, India and Greece (World Bank). According to the World Bank Collection of development indicator compiled from officially recognized sources, fuel import share in Zimbabwe comprise of larger shares of total imports. Larger shares of total imports show that a lot of resources are being channelled towards the procurement of this strategic commodity. The higher demand for petroleum products by the agricultural, transport and industrial sectors has proved to be an unhealthy situation for Zimbabwe, especially on the import bill. Table 1.1 shows some of the top ten commodities imported by Zimbabwe between 2009 to 2016.
Table 1.1 Top Ten Imported Products in Zimbabwe (2009-2016)

<table>
<thead>
<tr>
<th>Rank</th>
<th>HS Code</th>
<th>Commodity</th>
<th>Aggregate Average</th>
<th>Av. Pre-dollarisation</th>
<th>Av. Post-dollarisation</th>
<th>% Change</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>27</td>
<td>Mineral fuels, mineral oils</td>
<td>963.90</td>
<td>419.59</td>
<td>1304.09</td>
<td>210.80%</td>
</tr>
<tr>
<td>2</td>
<td>67</td>
<td>Vehicles</td>
<td>557.54</td>
<td>260.86</td>
<td>731.08</td>
<td>160.49%</td>
</tr>
<tr>
<td>3</td>
<td>84</td>
<td>Machinery and mechanical appliances</td>
<td>439.20</td>
<td>275.84</td>
<td>541.29</td>
<td>96.22%</td>
</tr>
<tr>
<td>4</td>
<td>31</td>
<td>Fertilizers</td>
<td>357.02</td>
<td>85.39</td>
<td>526.17</td>
<td>509.04%</td>
</tr>
<tr>
<td>5</td>
<td>10</td>
<td>Cereals</td>
<td>276.14</td>
<td>122.34</td>
<td>375.52</td>
<td>209.95%</td>
</tr>
<tr>
<td>6</td>
<td>85</td>
<td>Electrical machinery and equipment</td>
<td>263.16</td>
<td>152.84</td>
<td>364.61</td>
<td>138.55%</td>
</tr>
<tr>
<td>7</td>
<td>39</td>
<td>Plastics and articles thereof</td>
<td>140.20</td>
<td>80.74</td>
<td>194.86</td>
<td>168.91%</td>
</tr>
<tr>
<td>8</td>
<td>15</td>
<td>Animal or vegetable fats and oils</td>
<td>123.00</td>
<td>44.31</td>
<td>172.18</td>
<td>288.82%</td>
</tr>
<tr>
<td>9</td>
<td>30</td>
<td>Pharmaceutical products</td>
<td>120.02</td>
<td>86.04</td>
<td>153.25</td>
<td>129.27%</td>
</tr>
<tr>
<td>10</td>
<td>73</td>
<td>Iron or steel articles</td>
<td>92.90</td>
<td>51.42</td>
<td>118.82</td>
<td>131.11%</td>
</tr>
</tbody>
</table>

Source: United Nations Comtrade Statistics

Table 1.1 shows that mineral fuels and oils was one of the top ten commodity with higher spend as compared to other commodities like vehicles, machinery, fertilizers, cereals, electrical machinery, plastics, animal and vegetable fats, pharmaceutical and iron and steel products. On average, total spend on petroleum products imports before dollarization was USD$419.59 million and the figure rose to USD$1 304.09 billion after dollarization, showing a 210.8% increase.

Since the introduction of multi-currency basket in 2009, statistics available from the Zimbabwe National Statistical Agency (ZIMSTAT) reveal that trade deficits were skewed towards consumptive goods like mineral fuels and oils. It is important to note that between February and June 2018 only, mineral fuels and oils represented 47.8% of the total import bill, which represents a higher spend figure. $1.378 billion dollars was spent on petroleum products only. Official figures released by the Reserve Bank of Zimbabwe (RBZ) also confirmed higher fuel import shares. During the first four months of 2017, USD$383 million was spent on fuel imports. In 2018, USD$474 million was spent for the same period on fuel imports.

Higher fuel import share relative to total merchandise was also confirmed recently by the Reserve Bank of Zimbabwe Governor, while presenting the 01 October 2018 mid-term policy statement. According to the presentation, the bulk of the country’s imports in 2018 were made up of fuel (24%), electricity (3%), crude soya bean oil (2%) and rice (2%).
Durum wheat, maize, medicament, vehicles, ammonium nitrate, aviation spirit, urea and herbicides had 1% each. The remaining 61% was made up of other commodities. The difference between the fuel import share figure and other commodities is worrisome, and requires proper spend visibility for policy makers. The majority of problems arising in Zimbabwe in terms of procurement of goods and services arise from not understanding the cost drivers as well as the absence of spend visibility.

The absence of spend visibility or understanding of current expenditure on key imported commodities poses to be a serious challenge for many countries world-wide, and Zimbabwe is no exception. Spend analysis of fuel import shares permits company executives or public entities to attend to areas or commodities of greater spend. It was after a realization that since dollarization in 2009, the country has been experiencing high fuel import percentage share on petroleum products. Given this problem, the study therefore sought to analyze Zimbabwe’s petroleum products spend expenditure from 2009 to 2016.

1.3 Statement of the Problem

Higher fuel import share relative to total merchandise remains a challenge for Zimbabwe since the adoption of the multi-currency system in 2009. Higher fuel import share, coupled with the absence of spend visibility and acute foreign currency shortages puts tremendous pressure on the Government’s budget. This study therefore seeks to address the fuel spend share problem and to fill the gap identified in literature.

1.4 Purpose of the study

The motivation for conducting a spend analysis study for the Government of Zimbabwe was aimed at increasing spend visibility on fuel import shares. Modelling of spend patterns after the adoption of the multi-currency system was done to get greater appreciation of fuel import shares for various commodities which fall under category 27. The study also explored on the differences between local fuel import shares and regional fuel import shares. This was done to find out the extent to which Zimbabwe’s spend on petroleum products is economical relative to other regional countries.
1.5 Research Objectives

The objectives of the study were to;

a) To model overall spend on fuels in Zimbabwe from 2009 to 2016.

b) To explore whether there is a significant difference between Zimbabwe’s fuel spend share and the regional fuel spend share.

c) To model the optimal fuel spend share for Zimbabwe based on Regional fuel spend share trends.

1.6 Research questions

In addition to the above objectives, the study would be guided and sought to address the following research questions:

a) How does overall fuel spend share in Zimbabwe appear like from 2009 to 2016?

b) Are there any differences between Zimbabwean and Regional fuel spend shares?

c) What would be the optimal fuel spend share for Zimbabwe based on regional fuel spend share trends?

1.7 Hypotheses

Basing on the above objectives, the major research hypotheses were:

Hypothesis Objective 2

\( H_0 \): There is no significant difference between Zimbabwe fuel spend and the Regional spend

\( H_1 \): There is a significant difference between Zimbabwe fuel spend and the Regional spend
1.8 Significance of the study

Conducting spend analysis was aimed at obtaining improved knowledge on petroleum products spend share at it helps policy makers to move towards a cost-effective strategic approach to procurement, reduce procurement costs, identify cost savings opportunities and also to manage suppliers of goods and services. Analysis of past expenditure from 2009 to 2016 and to compare it with other regional countries will help Zimbabwe to manage its fuel spend share regarding the procurement of petroleum products.

Practical Significance

The study will help policy makers or the Government of Zimbabwe to effectively manage fuel import bill as well as to make informed decisions regarding the procurement of fuel. Policy makers are able to reduce their budget related with the procurement of fuel products and are also able to institute a strategic approach to procurement by moving away from a fragmented procurement process which has spend challenges and leakages.

Theoretical Significance

The rationale for this analysis was to bring a deeper understanding regarding fuel import shares. In other words, the study was intended to develop a better understanding on petroleum products spend.

1.9 Assumptions

The assumptions stated below will guide the study:
   a) The research instruments used for this study will be adequate to extract all the required information.
   b) Data used for this study will be extracted from various reputable sites to make the research instruments valid and reliable.
1.10 Delimitations of the study

The conceptual delimitation of this study focused on the analysis of fuel spend in Zimbabwe from 2009 to 2016. The study focused mainly on fuel spend shares for petroleum products which fall under category 27 of the HCDCS.

1.11 Limitations of the Study

There are a number of commodities where spend analysis can focus on but the study focused on petroleum products under Category 27, which are also commonly grouped by the HCDCS as mineral fuels and oils.

1.12 Definition of Terms

In this study, terms will be defined as follows.

a) Commodity – refers to category or groups of supplies or services. Rendon (2005)

b) Mineral Fuels and Oils – shall be construed to mean fuel, petroleum products and non-crude oils or oils in the entire study. It refers to petroleum and energy products which are generally referred to as mineral fuels, mineral oils, and products of their distillation, bituminous substances and mineral waxes by the Harmonized Commodity Description and Coding System. United Nations Comtrade (2009 -2016)

c) Spend Analysis - as an organisation of procurement expenses to have a proper spend visibility. Marzic, Krneta and Pavlic (2014)

d) Spend Visibility – Critical review of spend data in order to get a better view of the organization’s expenses. Lyons, Maloney and Rogers (2014)
1.13 Summary

The chapter gave a brief background of world fuel import shares, regional fuel import shares and the Zimbabwean situation. The aim of the study, significance of the study, Delimitations and limitations of the study have been discussed. Next chapter will look at conceptual, theoretical and empirical framework. Theoretical literature will help the researcher to know what other authors have said about spend analysis. Analysis of empirical literature helps to identify research gaps and also to develop deeper understanding about spend analysis.
CHAPTER II

Literature Review

2.1 Introduction

The study attempted to link all the relevant literature to assist in analyzing fuel import share of petroleum products after the dollarization period. A critical review of scholarly works provided useful methodological insights about what other authors said on spend analysis and it identified gaps that need to be filled. It also demonstrated value addition and contributed to the existing body of research as highlighted by Saunders, Lewis and Thornhill (2016). The chapter looked at ABC Analysis which is a spend management tool as its theoretical framework. Different strategies need to be implemented for different spend patterns or purchasing spend. To critically analyze fuel import share relative to total merchandise and key benefits for carrying out spend analysis, the study also looked at theoretical and empirical literature.

2.2 Theoretical Framework

The ABC Analysis or Pareto Principle has been identified as the best model that backs up the spend analysis study. It is a model which classifies spend by commodities. The ABC Analysis categorizes commodities into various classes such as A, B, and C category according to their annual spend as shown by table 2.1.
Rusanescu (2014) agrees with Nallusamy, Balaji and Sindar (2017) that the ABC analysis model is a critical spend management tool which divides products into various categories based on the spend over a period of time. They further argue that it separates low spend commodities from high spend commodities. According to the Pareto Principle, A category commodities is 20% of the items which account for 80% of the money spent. B category is made up of 30% of the items which account for 15% of the money spent. C category has 50% of the items which account for just 5% of the total spent. The ABC Analysis Model guided the following literature in answering the research objectives. It is important to highlight that, from the studies done by Rusanescu (2014) and Nallusamy et al. (2017), the ABC model is an essential tool in managing spend of various commodities.

Four important objectives which this study attempts to address are some of the basic steps for carrying out ABC Analysis. This model is a well-established technique which helps to evaluate items according to their spent value as highlighted by Liu, Liao, Zhao and Yang (2015), Rusanescu (2014) and Nallusamy et al. (2017).
2.2.1 Categorizing fuel spend share in Zimbabwe from 2009 to 2016

Zimbabwe is one of the net importers of mineral fuels and oils. Since the country is self-reliant on fuels and oils, it is inevitable to import these petroleum products. Petroleum products are required to bridge a gap between supply and demand. As Bhattacharjee and Srivastava (2013) rightly points out, increase in international oil prices will make imports very costly and over-dependency on imports is one of the problematic areas that may damage the economy. It is therefore necessary to understand these overall spend patterns on the economy. (Marzic et al. (2014). Petroleum products being one of the strategic commodities require regular spend trend analysis for better purchasing and management outcomes as one of the steps for carrying out ABC Analysis.

Marzic et al. (2014) agrees with Lyons (2014) that in analyzing historical spend patterns of commodities, it is ideal to analyze total aggregate spend for commodities, spend trend patterns for top commodities, valuable and strategic suppliers, amounts spend with performing and underperforming suppliers and percentage of spend associated with contracts. This idea is further supported by Moore, Grammich, Chenoweth and Mele (2011) who highlight that it is important for firms to model their spend patterns by dollar value or business volume. Modelling of spend patterns by dollar value is in line with the ABC Analysis model which requires closer attention for high value items representing a larger percentage of the total dollar value.

Moore et al. (2011) further highlight that many innovative companies or countries check their spend patterns regularly to manage their day to day expenditure. Marine Corps ranked its expenditure by contract dollars and contract transactions which enabled it to identify opportunities in its spend patterns as well as reduction in its transaction costs. It is therefore very important to point out that modelling of spend patterns attempts to answer key questions like what is the country buying, what are the suppliers, who is buying it and how often do we buy, when did we buy it and at what price, are we getting what we were promised and how does the spend patterns compare with those from previous years.
Moore et al. (2011) is also in agreement with Lyons, Maloney and Rodgers (2014) that data for analysing spend patterns can be analysed using relevant parameters such as spend by commodity or category (as suggested by the ABC Analysis Model), number of suppliers by commodity/category, number of transactions by commodity or category, average purchase order value, material prices and material price changes, total expenditure by suppliers and spend by procurement function. It is important to point out when numbers have been crunched, the results will show spend patterns and potential expenditure or savings in each category.

The most crucial part of modelling overall spend patterns is to identify cost reduction opportunities. Corporates analyze historical spend data in order to find opportunities. There are several cost reduction opportunities for spend analysis. Some of the cost reduction opportunities, as highlighted by Marzic et al. (2014), Pandit and Marmanis (2008) and Gangurde and Chavan (2016) are to ensure visibility of all expenses, improve on data accuracy, improve on the analysis of spent data, reduction of maverick purchases or spend, reduction of reporting time, reduction of administrative expenses, fast identification of savings opportunities, identification of contracting opportunities, eliminate overpayments, ensure contract compliance and the removal of disagreements about data quality. Though Marzic et. al (2014) highlighted the above as the cost reduction opportunities of spend analysis, the following are proper cost reduction opportunities achieved by carrying out spend analysis as highlighted by Duncan (2010).

Organizations must benefit from an increased purchasing strategy or leverage due to a continuous process of modelling overall spend patterns. The ABC Analysis Model, as indicated by Gangurde and Chavan (2016), Jenamani et al. (2016) and Medeiros and Ferreira (2018), is one of the tools used by public entities or private corporates to determine spend behavior in order to implement effective purchasing strategies. The ABC Analysis approach helps entities to critically decide where their priorities lie and then to develop the most appropriate purchasing strategies based on those priorities.
According to Pandit and Marmanis (2008), if too much spend associated with unreliable suppliers, prices with preferred suppliers are usually better than terms offered by unreliable suppliers. They further point out that if a commodity is fragmented (bought from many suppliers) it could be consolidated into fewer suppliers and better prices could be negotiated by channeling a higher volume of spend through them.

Identifying spend patterns and cost drivers in spend analysis process help to increase purchasing efficiency. According to Rendon (2005), The organization must monitor its purchasing spend patterns to ensure that strategies are still relevant in meeting changes in the business environment. Checks should be done regularly to reduce total costs of ownership as well as identifying changes in the environment and the supply market. It is also critical to highlight that continuous monitoring of purchasing or process efficiencies helps to manage risks such as supply disruptions as well as price increases. Maverick buying is one of the behaviors that results in unusual spend patterns.

Maverick buying practice results in increased procurement costs and reduced purchasing leverage. Angeles and Nath (2007) argue that maverick buying does not afford organizations with the opportunity to collect data about spend patterns resulting in firms loosing spend visibility over its expenditures. It also raises purchasing costs by 20% as compared to negotiated contracts. GSK, a pharmaceutical company, lost between $80million and $120million because of non-compliance.

In an effort to address the disadvantages of maverick buying, Karjalainen, Kemppainen and Raaij (2009), highlighted that maverick purchasing results in purchase price which are higher because most corporates’ contracts are based on leveraging the total spend volume to obtain reasonable discounts from preferred suppliers. Maverick spending or buying is a result of resistance to change or linked to an individual’s situational context.

Spend analysis is an integral part of strategic sourcing. Pandit and Marmanis (2008) concurs with Marzic et al. (2014) that firms must ensure that components, commodities, products, services and parts are supplied at the best possible price (TCO). According to
the Censeo Consulting Group (2008), the strategic sourcing process starts with conducting a high-level portfolio analysis followed by a detailed commodity spend analysis.

Detailed commodity spend analysis helps procurement practitioners to understand the purchasing history of that particular product as well as spend patterns. Analysis of markets is then done to understand changes in the market. This is then followed by the development of a commodity strategy and implementation of an acquisition strategy. Finally, managing the sourcing performance is the last stage in the strategic sourcing process as shown by Fig 2.2 below.

Fig 2.2 Strategic Sourcing Process

Source : Censeo Consulting Group (2008)

In an attempt to explain the importance of strategic sourcing Rendon (2005) note that strategic sourcing involves the selection of key suppliers whose costs, qualities, timeliness, dependability and service best meet the organization’s needs. Rendon (2005) further highlights that strategic sourcing program aims to integrate the sourcing strategy with the firm’s corporate strategy. It is important to conclude that the strategic sourcing program is based on maximizing on cost reduction advantages.

Hawkins, Nissen, and Rendon (2014) state that spend analysis is used to come up with better choices in identifying opportunities and also suitable suppliers. This view is shared by Pandit and Marmanis (2008) who point out that spend analysis encourages firms to make good decisions in connection with their spend patterns. It is logical to argue that without timely and consistent check of spend visibility, an organization might never uncover the savings and opportunities inherent within their purchasing decisions.
Procurement should aim to reduce procurement costs and inventory costs through informed strategic sourcing strategies. Analysis of expenditures should be an ongoing exercise which allows proper visibility for goods or services or commodities. Spend visibility aims to answer key questions like what was bought, when, where, from whom and finally at what price. Categorizing goods and services is also a strategic approach which help and organization to focus on specific areas of spend. Ndandiko, Kiyangi, Ssennoga and Weert (2015) aptly round it off and state that it is critical for governments to appreciate spending patterns because such insights identifies opportunities for optimum planning or budgeting.

2.2.2 Differences between local spend patterns and regional spend patterns

Sollish and Semanik (2011) that spend analysis can be used as a benchmarking tool where spend patterns can be compared with other regional countries or other researched results. A fair attempt of how spend analysis provides valuable spend patterns information is given by Lyons et al. (2014). They further highlight that governments or policy makers are able to check spend patterns which will enable them to make the correct policies. Spend patterns arranges expenditure information to ascertain true category spend and identify strategic sourcing opportunities as per the ABC Analysis Model.

In United States of America, Veterans Affairs department, Health and Human Services Department and the Agriculture Department emulated best practices for leading companies to manage their spend patterns Gao (2004). Their main aim was to step up their efforts in gaining knowledge related to their spending patterns and then to apply appropriate action as suggested by the ABC Analysis Model. Comparing themselves with leading companies was meant to adopt the best practices with regards to strategic purchasing.

In Ghana, a 2013 law allowed local companies to compete with Multinational Companies (MNEs) in the energy sector. This was done following high spend patterns as highlighted by Nyameboame, Haddud (2017). Interaction between local and foreign countries brought
competition within the energy sector. Local companies were able to develop a commodity sourcing strategy based on spend analysis conducted.

Nyameboame and Haddud (2017) are in total agreement with the GAO report of (2004) that comparing local and regional countries spend patterns will assist governments in managing their spend patterns and adopting best practices for leading countries. Arranging spend for various regional countries’ comparison requires data to be accurate. For effective spend analysis, accurate and relevant data must be used. The Gao (2004) report states that data must be reliable and perfect for decision making. Accurate local spend patterns which are compared with spend patterns for other countries requires a successful spend analysis program or process which involves defining of proper scope, collection of data, developing spend profile, analyzing data and finally determining opportunities. These steps are also undertaken when firms are doing ABC Analysis. Although various authors such as Smith (2013) and Pandit and Marmanis (2008) have come with a number of approaches when conducting spend analysis and this also applies when comparing spend data between two countries, the one well-established method involves five main steps as shown by fig 2.3 below

**Fig 2.3 Spend Analysis Process**

![Spend Analysis Process Diagram](source.png)

**Source: Censeo Consulting Group (2008)**

During scope definition, it is important that parameters such as portfolio, organizational scope, timeframe and type of spend which guide data collection and analysis are clearly specified. Smith (2013). Scope definition is also one of the steps for carrying out ABC Analysis. According to Rusanescu (2014) and Nallusamy et al (2017), the first step is to identify the objective for analysis when classifying commodities according to their annual spend values.
Spend analysis requires reliable spend data from Enterprise Resource Planning (ERP) systems or software, accounting, suppliers, sales and stakeholders. Moore et al. (2011) and Smith (2013). Gathering data for spend analysis requires the participation and cooperation of internal and external stakeholders. Gathered data must include descriptions of items bought, quantities of items consumed, purchase prices, total values and suppliers. According to Smith (2013), the data must be organized into logical Portfolio groups and portfolio categories in preparation for analysis.

Moore et al (2011) and Smith (2013) are in agreement that all spend data collected must be cleansed and this process involves a variety of checks such as the total amount, whether all suppliers have been included, identification of duplicate suppliers and also normalizing prices to exchange rates. Smith (2013) highlights that the aim of this step is to produce clean data which accurately reflects the entire company spend.

With cleansed data available, a spend profile can be developed and available opportunities for sourcing improvements identified. Lyons et al. (2014) and Smith (2013). Addressable spend items can be segmented into various categories for example spend on hotels, airfares, rental cars, oil and gas, Similar categories such as spend on hotel, airfare, rental cars can be clustered together as subcategories to form Travel category

The most important thing is to identify categories with high impact spend or the most potential for delivering benefits to the organization. A useful tool for selecting high impact spend is ABC Analysis. According to Liu et al. (2015), The ABC Analysis groups commodities into three main categories. A category represents high value items with greater spend but small in number. C category represents items of low value but large in number and B category are the items which fall in between the two classes.
2.2.3 Benefits for Modeling Optimal Fuel Spend Share Patterns

There are several main key benefits for carrying out spend analysis as highlighted by Limberakis (2014), Marzic et al. (2014) and Lyons et al. (2014). The main key success factors fall into four main categories namely spend visibility, opportunities identification, spend management and finally contract compliance and control.

The main goal of spend analysis by firms is to get increased visibility that provides in most cases the means for improving spend and supplier performance within a procurement organization. (Limberakis (2011), Pandit and Marmanis (2008)). Moore et al. (2011) and Lysons et al. (2014) are also in agreement that the continued absence of spend visibility in several firms and even global corporations makes it difficult to realize huge savings and also to leverage their buying power. Given this view by Marzic et al. (2014) and Lysons et al. (2014), it is important to highlight that the availability of spend visibility allows Governments to appreciate their spending habits.

In United States of America, a company called Royal Ahold spend more than billion on commodities because of the absence of spend visibility. The absence of spend visibility resulted in its dismal performance as compared to its competitors. Royal Ahold was not able to identify its overall weaknesses and inefficiencies of its procurement system. According to Pandit and Marmanis (2008), when Royal Ahold introduced a good product category spend visibility, it was able to implement key saving programs. Savings on commodities were monitored on daily basis after the implementation of an online spend analysis system. Real online spend data encouraged managers to review their spending projects and this also helped them to identify cost reduction opportunities.

As Saranga and Moser (2010) rightly put it, the ever-increasing competitive pressures across the globe now requires the public entities and corporations to have a proper spend visibility to be able to cut unnecessary costs as highlighted by the ABC Analysis Model. Today, one the major costs component is purchasing spends which accounts to 40-70% of
a company’s sales volume. It is however important to point out that some global firms have implemented efficient purchasing systems through spend analysis.

Spend visibility also gives a macro and micro view of spending habits. In Ghana, a 2013 law which allowed local companies to participate in the oil energy sector. Nyameboame and Haddud (2017). Its aim was to reduce the control of the energy sector by Multinational Companies and foreign governments from enjoying a near monopoly of key resources. The fierce competition between local companies and foreign companies created a competing environment which forced local petroleum companies to adopt strategies and capabilities to maintain their competitive advantage. Local companies had to resort to outsourcing to remain competitive. Nyameboame and Haddud (2017).

Categorizing goods and services is a strategic approach as it helps firms to divert its attention specifically on specific areas of spend. In today’s business environment, purchasing decisions especially on expenditure must change to reflect wider changes taking place in the business environment. Pandit and Marmanis (2008), Monczka, Handfield, Guinipero, Patterson and Waters (2014).

Given the critical analysis of spend analysis by Limberakis (2011), Pandit and Marmanis (2008), Saranga and Moser (2010) Authur and Authur (2014), Ablo (2015), Nyameboame and Haddud (2017) and Monczka et al. (2014), it is logical to conclude that spend visibility is very critical for many organizations and countries because they are able to identify their weaknesses and overall efficiencies in their sourcing process. It actually provides a general insight into various key questions and is also an important planning instrument for various functions like purchasing, finance, operations, marketing and accounts. Spend analysis, when done properly, will result in improved supplier base rationalization, improved savings as well as improved contract compliance.

There are several opportunities which can be identified by keeping online spend data for various product categories. Moore, Cook, Grammich and Lindenblatt (2004) highlight that a first step in improving purchasing efficiency is to regularly conduct spend analysis for
various commodities and this must involve analyzing commodity’s expenditure and also to take note of other variables like the firm’s spend patterns. As Marzic et al. (2014) put it, categorizing spend data by categorizing goods and services help to identify categories with most spend and remedial action will be taken on time. The analysis can also help procurement practitioners to identify possible corruption happening for a range of products of the same category.

Spend management is one of the main benefits of spend analysis. Marzic et al. (2014), defines spend management as keeping transactions costs very low. It gives an organization control over its resources so that all requests are satisfied in the most economical way. Ndandiko, Kiyung, Ssennoga and Weert (2019) highlight that public entities, parastatals and local authorities have to manage costs resulting from economic challenges and rising operational costs. As Moore et al. (2011) put it, a third of the public expenditure comes from procured goods and commodities or services represents a growing portion of procurement spending. It is ideal to mention that government entities, parastatals and local authorities spend large sums of money on public transportation, key commodities, vehicle fleet management and engineering. It is also important to note that problems arising in the public sector in terms of procurement of goods and services arise from not understanding cost drivers as well the absence of spend visibility. Procurement practitioners are also not held accountable for maverick purchases.

Spend analysis should be an ongoing activity for most firms or organizations to enable them to critically analyze current, past and forecasted expenditures. This will enable firms to avoid spend leakages and cut costs to survive through operational excellence. Monczka et al. (2014) critically analyze spend analysis, and postulate that it attempts to answer several key questions like what did the business spend its money over the past year, were right products and services received over a specific period, which key suppliers were awarded the majority of the contracts and were the correct prices charged across all functions or commodities.
Global corporations as indicated by Saranga and Moser (2010), have indicated that it is possible to maintain costs through spend management. If implemented correctly, spend analysis provides a holistic aerial view of procurement inefficiencies, detailed visibility of petroleum products spend patterns and it is a platform from which opportunities for savings can be identified and remedial action taken.

According to Ellram, Tate and Billington (2007), poor procurement practices of commodities and failing to manage costs can be harmful to the organization’s performance. Moore et al. (2011) highlight that without spend analysis, proper purchasing and supply practices are difficult to implement, development of key supply strategies for commodities also becomes virtually impossible as well as to manage approved suppliers in a manner that maximize rewards and reduces risks.

In order to reduce costs, some companies or public entities are forming framework agreements. Framework agreements are meant to reduce purchasing costs, suppliers as well as increasing leverage with the remaining suppliers. Maverick buying is not ideal to the organization in a number of ways. Companies that best optimizes their spend patterns, as highlighted by Lyons et al. (2014), will be able to create sustainable savings for several years ahead. From this analysis, it is logical to conclude that spend visibility enhances the firm’s performance in terms of responsiveness, quality, reliability and flexibility.

Spend analysis help to avoid spend leakage by focusing more and controlling suppliers’ contract terms. Pandit and Marmanis (2008) also acknowledge the importance of spend visibility and highlight that monitoring of contracts should be an ongoing exercise for organizations. Contract compliance, as highlighted by Pandit and Marmanis (2008), is very important to put in some controls because failure to do that will result in some noticeable losses. From the assertions above it is imperative for firms to keep an eye on spend visibility, as this will give them the opportunity to take corrective measures early in plugging off spend leakages. Savings realized by companies is proportionally related to contract compliance. As companies increase their spend visibility awareness and control in sourcing, they can negotiate for better terms and conditions from their key suppliers.
2.3 Empirical Literature Review

A plethora of researchers such as Ndandiko et al. (2015) and Moore et al. (2011) and Jambo (2017) have carried empirical studies on spend analysis which guided this research in answering its research objectives.

2.3.1 Categorizing Overall Fuel Spend Share from 2009 to 2016?

Empirical studies have been done by several authors on spend analysis. Ndandiko et al. (2015) carried out a spend analysis study for the Government of Uganda. The study was driven by the desire to ascertain government spending which involved the total spend across various categories. In an effort to get the total spend across various categories, Ndandiko et al. (2015) used two major steps which are used by ABC Analysis Principle or Pareto principle. The first step was to prepare for data analysis. This step involved defining the spend analysis scope, putting commodities into various categories, extraction of data for the spend analysis study and finally data cleansing and classification. Data analysis and reporting were the second step done during data analysis.

During their study, invoices were subjected to Pareto Analysis and the aim was to establish whether invoices have significant influence on the spend. Ndandiko et al. (2015) analysed spend value using the ABC Analysis Model or Pareto Principle. On findings, 10% of the commodities bought for the Government of Uganda represented 55% to 61% of the total spend. These were for the combined years of 2013/2014 and 2014/2015. Over 80% of the total spend arose from 8% and 10% of the suppliers. The items which had the greatest spend required maximum attention from policy makers.

Moore et al. (2011) conducted an overall spend analysis study for the United States Marine Corps in 2006. The spend analysis study came after 40% of the spend or 7.6 billion was channelled towards the procurement of weapons. The study was meant to categorize goods as highlighted by the ABC Analysis Model and to have an insight into the spend patterns for goods and services. Goods were categorized according to spend contract values for various suppliers such as UNICOR and Oshkosh. According to Moore et al. (2011), commodities were grouped according to spend values to determine those with greatest
spend. Apart from looking at the overall spend patterns the study was also aimed at developing supply strategies for particular strategic commodities, to select the best suppliers, and to manage suppliers so as to minimize risks and costs. Findings revealed that greater spend patterns were witnessed on weapons and personal goods. Weapons was one of the commodities where a lot of resources were channelled to.

2.3.2 Differences Between Local Spend Patterns and Regional Spend Patterns

Jambo (2017) also conducted a study about the impact of government spending on Agricultural Growth. A regional comparison was done which looked at Zambia, Malawi, South Africa and Tanzania. In determining the percentage share to total agricultural expenditure, the study was benchmarked against four types of agricultural spending namely input subsidies, price supports, agricultural research and infrastructure development.

Zambia

Jambo (2017) carried out an empirical study to establish percentage shares of agricultural spending in Zambia. Findings revealed that the Government of Zambia placed more emphasis on price support between 2000 and 2003. When the Government of Zambia introduced input subsidies, there was a downward trend of the price support between 2004 to 2007 and from 2008 to 2013. The input scheme had the highest share of agricultural expenditure since 2004 especially after the introduction of Farm Input Subsidy Program in 2005. No attention was given towards Agricultural research and this program had the least share of agricultural expenditure and its highest share did not exceed 5% of the total agricultural spending. In 2006 infrastructure development had the highest share of 26% following infrastructure policy changes.

Malawi

Basing on the four programs, Jambo (2017) also conducted a study about the impact of Government Spending on Agricultural Growth. The aim of the study was to ascertain the
share of each of the four programs to total agricultural spending. Results were then compared with results obtained from the study of the Government of Zambia. Findings revealed that the significant. Huge percentage share of the total agricultural budget were noticed on input subsidies. The study revealed that the Government of Malawi heavily funded the agricultural sector from 2004 right through to 2014. In 2007, Input subsidies had large shares of 74.8%.

**South Africa**

Jambo (2017) also carried out an empirical study of the impact of Government Spending on Agricultural Growth. The study aimed at ascertain the share of each of the four programs to total agricultural spending. Agricultural Research had the highest shares of agricultural expenditure. The Government supported research from 2000 right through to 2014. Findings revealed that focus was shifted in 2007 to Comprehensive Agricultural Support Programme to assist beneficiaries of the Land Reform. Infrastructure Development and extension services had highest share of approximately 7.6% in 2014 and 4.3% in 2013 respectively.

**Tanzania**

World Bank public expenditure reviews provided data which was required for this study. Jambo (2017) also benchmarked the study by three programs namely input subsidies, research and extension and infrastructure development. Findings revealed that more money was spent by the Government of Tanzania in rehabilitating its infrastructure from 2000 to 2010. Research and extension percentage share to total agricultural budget increased from 2.57% in 2000 to 10.3% in 2007 before dropping to a share of 0.5% in 2014. Input subsidies dropped from 17.36% in 2000 to 5.62% in 2005 before rising again to 31.6% in 2011.

The Government Accountability Office in 2004 conducted a spend analysis study in various departments namely Agriculture, Health and Human Services (HHS), Justice, Transportation and Veterans Affairs. The aim was to compare and impart spend analysis to
various departments for them to improve on the procurement of goods and services. On findings, they discovered that three out of the five departments used spend analysis results to manage their procurement spend. Veterans department saved $394 million in 2003. They recommended all departments to leverage their buying power and reduce costs just like other leading companies compared with.

**2.3.3 Benefits for Modeling Optimal Fuel Spend Share Patterns**

Lyons et al. (2014) also conducted a strategic and spend analysis study in the Naval Postgraduate Contracting Office. The study was meant to identify cost reduction opportunities in the contracting office. As part of their findings, they recommended the reduction of the supply base, decrease in the number of contract action and this would make the overall contracting process more efficient.

Moore et al. (2004) carried out an empirical study of spend analysis for the United States Air Force to develop better Purchasing and Supply Management (PSM) practices. It was out of a realization that Airforce was facing greater pressure in making the most out of its resources. The main aim of the study was to identify the best likely PSM opportunities, to check whether their data was sufficient to identify these opportunities and what Air Force could do to support the application of best PSM practices. In their findings, they discovered that greater spend was done on aircrafts, followed by gas turbines and engine components. This is in line with the ABC Model which states that each product or commodity is rated according to its annual dollar value. Contracting inefficiency was also common which affected the economics of scale. Their findings also included opportunities for savings by consolidating contracts for similar goods and services, opportunities for performance improvement and prospective sourcing risks.

Rand Corporation recommended that Airforce must centralize all its operations for generating spend data and analyses. This was seen as a major step in maximizing performance among Air Force business units. They also recommended sharing of
information, aggregating purchases and analysis of trend data to move towards a most cost-effective approach to procurement.

2.4 Gap Analysis

Having gone through all the literature on spend analysis by a plethora of researchers such as Jumbo (2017) Hawkins, Nissen and Rendon (2014), Marzic et al. (2014), Lyons et al. (2014) and Pandit and Marmanis (2008), they are some areas which still need further attention. Moore et al. (2004) (2011) have also carried out spend analysis researches for the United States Air Force and United States Marine Corps. Main focus for all these authors was to increase spend visibility following categorizing of goods. Jumbo (2017) looked at the percentage shares of agricultural programs to the total agricultural budget. No particular attention was given on overall spend for fuel imported goods and their contribution to the total import bill. Research is needed at macro level to analyze fuel import spend share relative to total merchandise. No spend analysis study has been done about fuel import shares to fit the macro context. This is the research gap that this study intends to fill.

2.5 Summary

This chapter has highlighted the theoretical framework and empirical framework which was used as the basis of this research. It is evident from the literature review that no spend analysis study has been done on fuel import shares relative to total merchandise as well as significant factors affecting fuel import shares. Spend patterns in general have been well researched. Existing literature has proved that they are commodities with greater spend where management decisions are required regularly. The ABC Analysis is also a very useful tool which can be used when conducting spend analysis study. Most empirical researches were not carried out in the energy sector. This research would try to fill the gap identified from this literature review
CHAPTER III

Research Methodology

3.1 Introduction

This chapter covers the methodology that was used for this study. The discussions in this chapter are structured around the research philosophy, research approach, research design, ideal sampling procedure used, research instruments used for the study, sources of data used, how data was presented and analysed. It also looked at the reliability and validity of the instruments used. Quantitative methodology was used to gather data on fuel import share percentages. Data was mainly collected from secondary sources.

3.2 Research Philosophy

The study adopted a research philosophy which enabled the researcher to develop better knowledge in the field of spend analysis as emphasised by Saunders, Lewis and Thornhill (2016). The spend analysis study was based on the positivism paradigm. The positivism approach placed emphasis on numerical analyses of fuel spend patterns. Replication of findings was guaranteed by cross-validating export-reported data (COMTRADE) with import data from ZIMSTAT. The study focused on fuel spend data which was gathered and measured using several statistical techniques such as descriptive statistics, measures of central tendency (mean, median), measures of dispersion (standard deviation, skewness and kurtosis). Beyond descriptive statistics, the researcher also employed inferential statistics, principally, multivariate regression analysis and multivariate analysis of variance (MANOVA).
3.3 Research Approach to Theory Development

The study adopted a deductive approach in trying to establish fuel spend patterns for Zimbabwe as compared to other regional countries. Spend data was initially generalized from general data to specific data as theories were tested through a series of propositions. In carrying out this spend analysis study; appropriate data was collected to measure particular concepts or variables which was then followed by an analysis of results. Results obtained from various data sources were found to be consistent with the premises. A design of the research strategy was then used to test the theories.

3.4 Methodological Choice

A highly structured methodology was used to facilitate the replication of findings as highlighted by Saunders et al. (2016). In this study, the mono quantitative method was used in this spend analysis study. It is regarded by Saunders et al. (2016) to be purely scientific, justifiable, precise and based on facts often reflected in exact figures. In determining fuel share percentages, the study examined the spend patterns of various commodities under category 27. The relationship was measured numerically and analysed using several statistical techniques and graphical techniques.

3.5 Research Design

The study was descriptive and exploratory in nature. The descriptive research design was used because a plethora of authors such Saunders et al. (2016), Vartanian (2011) and Bryman and Bell (2011) agreed that quantitative research designs are more directly related to descriptive rather than exploratory design. In seeking to answer some of the objectives, the descriptive approach was suitable describe spend patterns of Zimbabwe and regional countries such as Angola, Botswana, Malawi, Mozambique, Namibia, South Africa and Zambia after the dollarization period.

Sekaran and Bougie (2009) is in agreement with Vartanian (2011) that exploratory study is normally undertaken when little is known about a particular phenomenon at hand, and no
information is readily available on how similar problems or studies have been solved in the past. Since this was a new area of study, exploratory research design was employed to gain insights about why spend on fuel relative to total merchandise for Zimbabwe is increasing, while it is falling for neighbouring countries. The exploratory research design was used to discover new ideas and also to increase an understanding of how regional countries manage to keep their fuel import share percentages at reasonable percentages.

3.6 Research Strategy– Case Study Method

The case study method was deemed to be an appropriate method to use for the study, as this analysis focused on the energy sector. De Vaus (2001) distinguishes a case study method from a survey in that a case study is an in-depth study rather than a sweeping statistical survey. The case study method enabled the study to deal with context-specific issues in contrast to other designs like survey which tend to generalize across multiple industries or context.

The strength in selecting a case study method was the opportunity for the study to generate further knowledge concerning fuel spend in Zimbabwe and it placed more emphasis upon intensive examination of the setting as noted by Bryman and Bell (2011). The case study design was very useful in drawing solutions to the problem under study based on past problem-solving experiences. However, the weaknesses of the case study method are that findings are quarantined to the setting of the bounded system.

3.7 Target Population

The population of the data comprised of 40 mineral fuels and oil commodities which fall under category 27 of the HCDCS. (United Nations Comtrade and International Trade Statics). The Harmonized System is in most cases governed by the International Convention and it classifies products using a 4-digit coding system and a 6-digit coding system.
3.8 Study Sample

The study had to identify a sample from the target population and a sample was selected using a reputable method of selecting a sample size by Krejcie and Morgan (1970). The research sample consisted of all 40 mineral fuel commodities drawn from category 27 at the HS4 level. The mineral fuels and oil commodities used for this study are petroleum oils (light oils), petroleum oils (non-light oils), petroleum oils (crude), pitch, coke, liquified propane, residues of petroleum oils, tar, toluene, bitumen and asphalt, bituminous mixtures, oil share, briquettes, coal gas, coal, creosote oils, ethylene, lignite, micro crystalline petroleum wax, naphthalene, natural gas (gaseous state), natural gas (liquified), oils from coal tar, other petroleum gases, paraffin wax, peat, petroleum bitumen, petroleum coke, petroleum gases, petroleum jelly, agglomerated lignite, anthracite, aromatic hydrocarbon mixtures, benzol, waste oils containing PCBs, PCTs, and PBBs, waste oils not containing PCBs, PCTs, PBBs and lastly xylol. Annexure A.

3.9 Sampling Procedure

3.9.1 Judgemental or Purposive Sampling

The study used judgemental or purposive sampling method which is a non-probability sampling method. The researcher used his judgement to select a population and a sample of 40 mineral oils and fuels commodities from Category 27 at the HS4 level. This was a true representation of the entire population.

3.9.2 Justification For Using Judgemental or Purposive Sampling

Judgemental or purposive sampling was selected for this study because it is ideal when working with small sample as highlighted by Saunders, Lewis and Thornhill (2009). Judgemental sampling enabled the researcher to use his judgement to select commodities that enabled the study to answer research objectives.
3.10 Research Instruments

Documents Analysis and Secondary data were used as main instruments to gather data. Documents were scrutinized to complement secondary data and these documents were available from reputable sites such as United Nations Comtrade International Trade Statistics reports, World Bank, ZIMSTAT and Resource Trade Earth Data. Secondary data was mainly used to gather data about aggregated spend patterns for Zimbabwe, aggregated regional spend patterns, fuel spend shares, factors influencing spend patterns and benefits available by carrying out spend analysis.

The rationale for using secondary data was readily available and it allowed easier examination of fuel spend patterns as highlighted by Vartanian (2011). Use of secondary data enabled the study to capture intergenerational spend patterns from 2009 to 2016. Secondary data alerted a researcher to a potential problem, provided solution to a problem, was very less costly to obtain and it also helped to define a problem. Data sets selected for the study had contextual validity and possessed other key dimensions like relevance, credibility, and believability as highlighted by Hazen, Boone, Ezell and Jones-Farmer (2014). It reduced the bias associated with case studies and was able to measure all the constructs that the researcher was interested in.

From the trend patterns, the study was able to identify factors that influenced spend patterns. Secondary data also came prepared and made it easier for the Statistical Package for Social Sciences Version 22 to organize the data, code it and also to analyze it.

The secondary data used in this study was collected using two major steps. The first step in this study involved defining the scope of carrying out the spend analysis study. This was achieved by categorizing all products under mineral fuels, mineral oils and substances of their distillation, bituminous substances and mineral waxes. HS4 codes from the HCDCS (Category 27) were used to extract data. H4 coding was mainly used rather than H2 code and H6 code. H2 code is an aggregate of mineral oils and fuels and it made it difficult to get spend patterns for various categories. H6 coding resulted in longer tables which were
difficult to process and comprehend. H4 coding had meaningful broader division of petroleum products and it extracted key and reliable data which was required for this study.

Extracted data from commodity source countries was then compared with official data reported by the country. Collected data from sources such as ZIMSTAT and Comtrade was then used to identify those categories with high fuel import share and categories with low impact spend. Cleansing of data followed whereby some variables such as quantities were left out. Quantities for mineral fuels, mineral oils and substances of their distillation were left out because they had different units of measurement and made the analysis virtually impossible. The analysis of categories helped to identify commodities with greater spend patterns.

The second step involved critically analysing data and reporting findings. In preparing the data for analysis, the study ensured that secondary spend data was gathered from various such as United Nations Comtrade Statistics and ZIMSTAT. The data was then collated to enable a comprehensive analysis of spend trends on the procurement of petroleum products in Zimbabwe as well as the regional countries.

3.11 Reliability and Validity of the Study

Just like survey data, Bryman and Bell (2015) recommend that validity and reliability of secondary data be evaluated. To ensure this, the validity and reliability of data collected was guaranteed by using authoritative sources. The study ensured that the results were repeatable by using HS2 code, HS6 code and HS4 code. Reliability was ensured by basing on official data reported by the country (ZIMSTAT) as well as data which was reported by the source countries. (UN Comtrade). Results obtained from the two sources showed more or less the same results, thereby increasing the credibility that the datasets were reliable. The integrity of the conclusions was made valid by making sure that the key research constructs were reviewed by experts and academics as also highlighted by Bryman and Bell (2011)
3.12 Data Presentation

Data collected for this study was presented using Time Series Graphs, Trend Graphs, Bar Charts and Tables. Presentation of data was done using various tables and graphs as the study sought to answer the research objectives.

3.13 Quantitative Data Analysis

For this study, several statistical techniques were employed. Because the study was quantitative, IBM SPSS was used to facilitate the quantitative data analysis.

Objective 1:

Descriptive statistics were used and these included the measures of central tendency – that is the mean, as well as the measures of dispersion – that is the standard deviation, skewness and kurtosis. For the standard deviation, the lower it is the closer is the data to the mean and the skewness determined whether or not the data was normally distributed or tended towards the negative or positive. Overall, the mean was at the centre of the interpretation as this was compared across the measured items to determine those with the highest means and those with the least means.

Objective 2:

Objective 2 sought to compare the local and regional distribution of the fuel spend. Three major statistical tests were computed. The first were the descriptive statistics and these covered the mean, standard deviation, skewness and kurtosis. A time series graphical plot was also carried out. The second statistical tests involved the multidimensional modeling (IBM, 2018). This allowed the modeling of the distance matrix for all the countries under study. Euclidean distance was computed and the resultant plots were done with the distances between plots demonstrating the gap in the fuel spend. To ensure the accuracy of the model, the requisite model fit tests were done, that is, S-Stress, Dispersion Accounted For (D.A.F.) and Tucker's Coefficient of Congruence. An S-Stress less than 10% was
considered based on Hair, Ringle and Sarstedt (2011), while for Dispersion Accounted For (D.A.F.) and Tucker's Coefficient of Congruence, the ideal minimum coefficient considered was 0.9 based on Dugard, Todman and Staines (2010).

The third statistical test that was considered was ANOVA analysis. With this procedure, the local and regional mean fuel spends were compared inferentially. A two-tailed test was considered at the 95% confidence level. To ensure the validity of the test, the principal assumption of the homogeneity of variances was tested for which a p-value less than 0.05 would violate the assumption (IBM, 2018). The eventual hypothesis tested was:

\[ H_0: \text{There is no significant difference between Zimbabwe fuel spend and the Regional spend} \]
\[ H_1: \text{There is a significant difference between Zimbabwe fuel spend and the Regional spend} \]

According to Field (2016), a p-value less than 0.05 would mean that there was a significant difference, while a p-value greater than 0.05 would mean that there was no significant difference. In the former case, the null hypothesis would be dropped.

**Objective 3**

This was aimed at modelling the optimal spend for Zimbabwe based on regional trends. For this analysis, the decision tree analysis was done. The Classification and Regression Tree (CRT) decision tree analysis approach was used as opposed to the CHAID approach, which is optimal when using a categorical dependent variable (Field, 2016). In the end, for the modelled classification of the expected Zimbabwe fuel spend share, the corresponding confidence interval was calculated using the formula:

\[ \mu = M \pm Z(s_M) \]

where:

- \( M \) = sample mean
- \( Z \) = Z statistic determined by confidence level
- \( s_M \) = standard error = \( \sqrt{s^2/n} \)
3.14 Ethical Considerations

In carrying out this study, various ethical issues were considered. Since the study relied on the analysis of secondary data, the study ensured that data collected was relevant for the topic in terms of accurateness and the purpose for which it was collected. The study ensured replicability of findings by comparing results obtained from two reputable sources that is, import data from ZIMSTAT and export data from UN Comtrade.

3.15 Challenges Faced

The differences in the unit of measurement was one biggest challenge faced in carrying out this research. However, the researcher used values as this were necessary in the analysis of fuel spend patterns of Zimbabwe versus regional countries such as Angola, Botswana, Malawi, Mozambique, Namibia, South Africa and Zambia.

3.16 Summary

This chapter highlighted on the research philosophy adopted for the study, the research approach to theory development, the methodological choice of the research study, the research design, the research strategy, population and study sample selected for the study, the instruments used to collect the data, and data analysis techniques, ethical issues and challenges faced. The research was based on quantitative analysis to allow the triangulation of results. The methods used were enough to gather relevant information on fuel spend patterns in Zimbabwe. Next chapter will look at data presentation and analysis of results.
CHAPTER IV
Data Presentation and Analysis of Results

4.1 Introduction

This chapter shall present the key statistical analyses that will help answer the major research objectives. The fuel spend data was collected in accordance with the methodology set forth in the preceding chapter. For this study, the researcher made use of secondary data. To this effect, authoritative sources were used cross-confirmed to ensure the replicability of the study (Zimstat, 2018; UN Comtrade, 2018). The chapter is divided into seven main sections. The first will present the key variables that the study considered and the reliability, validity and accuracy of the data. The second to fifth sections will present the results for the objectives one up to four. The sixth section will provide a discussion of the findings and the last section will be the chapter summary.

4.2 Evaluating Validity and Reliability

The study ensured that reliability and accuracy of the data was guaranteed by the very fact that authoritative sources were used. The spend data from the source country (Zimbabwe) was used and also cross-validated with the export-reported data from the countries that supplied Zimbabwe with fuel products. This spend data mapping process tested and validated the accuracy of the data. On the other hand, with respect to validity, face validity was confirmed by virtue of other scholars such as Johnson and Flynn (2015), Asongu (2015) as well as Jambo (2017) having used the same variables and same sources that this study used. The major construct considered in this study was fuel spend, and the use of import data as the primary measure of the country spend ensured the construct validity as researchers such as Cadot, Lavocone, Pierola and Rauch (2012) have also considered the import data as the appropriate measure of spend.
Table 4.1 Overall Fuel Spend in Zimbabwe from 2009 to 2016

<table>
<thead>
<tr>
<th>Commodity</th>
<th>%</th>
<th>Sum</th>
<th>Mean</th>
<th>Std. Deviation</th>
<th>Skewness</th>
<th>Kurtosis</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bitumen and asphalt</td>
<td>0.047%</td>
<td>4652520</td>
<td>581565.00</td>
<td>481925.249</td>
<td>0.789</td>
<td>-1.096</td>
</tr>
<tr>
<td>Bituminous mixtures</td>
<td>0.177%</td>
<td>1746512</td>
<td>2183139.00</td>
<td>1798701.053</td>
<td>1.050</td>
<td>-0.632</td>
</tr>
<tr>
<td>Coal</td>
<td>0.260%</td>
<td>2564208</td>
<td>3205253.50</td>
<td>1328156.838</td>
<td>-0.523</td>
<td>-1.103</td>
</tr>
<tr>
<td>Coal gas, water gas</td>
<td>0.001%</td>
<td>58633</td>
<td>7329.12</td>
<td>8492.343</td>
<td>1.444</td>
<td>1.921</td>
</tr>
<tr>
<td>Coke</td>
<td>0.042%</td>
<td>4121050</td>
<td>588721.43</td>
<td>1468991.155</td>
<td>2.643</td>
<td>6.989</td>
</tr>
<tr>
<td>Lignite</td>
<td>0.000%</td>
<td>968</td>
<td>484.00</td>
<td>453.963</td>
<td>.</td>
<td>.</td>
</tr>
<tr>
<td>Oils from coal tar</td>
<td>0.065%</td>
<td>6434321</td>
<td>804290.13</td>
<td>389299.507</td>
<td>.252</td>
<td>.827</td>
</tr>
<tr>
<td>Peat</td>
<td>0.009%</td>
<td>894160</td>
<td>111770.00</td>
<td>96401.669</td>
<td>2.753</td>
<td>7.689</td>
</tr>
<tr>
<td>Petroleum coke</td>
<td>0.388%</td>
<td>38265102</td>
<td>4783137.75</td>
<td>3711030.448</td>
<td>.290</td>
<td>-1.482</td>
</tr>
<tr>
<td>Petroleum gases</td>
<td>0.887%</td>
<td>87532226</td>
<td>10941528.25</td>
<td>5983293.701</td>
<td>.233</td>
<td>-1.652</td>
</tr>
<tr>
<td>Petroleum jelly and waxes</td>
<td>0.731%</td>
<td>72189405</td>
<td>9023675.63</td>
<td>2955156.503</td>
<td>.241</td>
<td>-1.126</td>
</tr>
<tr>
<td>Petroleum oils (crude)</td>
<td>0.013%</td>
<td>1239849</td>
<td>15498.11</td>
<td>131530.809</td>
<td>.897</td>
<td>.842</td>
</tr>
<tr>
<td>Petroleum oils (non-crude)</td>
<td>97.379%</td>
<td>9611012564</td>
<td>1201376570.50</td>
<td>416095811.2</td>
<td>-1.568</td>
<td>2.039</td>
</tr>
<tr>
<td>Pitch and pitch coke</td>
<td>0.001%</td>
<td>69652</td>
<td>8706.50</td>
<td>7683.737</td>
<td>1.746</td>
<td>2.561</td>
</tr>
<tr>
<td>Tar</td>
<td>0.001%</td>
<td>103944</td>
<td>14849.14</td>
<td>18998.017</td>
<td>2.163</td>
<td>4.969</td>
</tr>
</tbody>
</table>

Source: Comtrade Data (2009-2016)

Table 4.1 shows the overall fuel import share percentage that each category represents in terms of overall spend in Zimbabwe. It is evident that petroleum oils such as diesel and petrol (non-crude oils) contributed 97.379% of the total spend on fuel. From the table above, a total of USD$9.61 Billion was spent on non-crude oils between 2009 to 2016. Average spend per year was USD$1.2 Billion and this represents that more resources are channeled towards the procurement of fuel. The standard deviation for non-crude oils was also very high, being USD$416 million. The distribution for non-crude oils was highly negatively skewed, with a skewness statistic of -1.568 and this according to Zikmund (2012) demonstrates how the spend on non-crude oil had been very high in the years close to 2016 than the years close to 2009.

The second highest spend on fuels was on petroleum gases whose overall spend percentage was 0.887%. USD$87.5 million was spent on petroleum gases between 2009 and 2016. The average spend per year was USD$10.94 million and had a standard deviation of USD$5.98
million. Prior to 2012, the importation of petroleum gases was very low due to reliable electricity supply. When electricity supply became erratic and load shedding became more prevalent from 2012 up to 2016, this resulted in the increase in the consumption of petroleum gases post-2012 and hence a high standard deviation when comparing with the mean spend on petroleum gases pre-2012 and post-2012.

The third highest overall spend on fuels was found to be on petroleum jelly and waxes and this attributed to an overall of 0.731%. A total of USD$72.19 million was spent between 2009 and 2016 and the average spend for petroleum jelly and waxes per year during that period was USD$9.02 Million. The standard deviation for petroleum jelly and waxes was USD$2.96 million. The spend on petroleum jelly peaked between 2009 and 2011, but started to decline post-2011. The other notable commodities include petroleum coke, whose overall spend was 0.388% as well as coal which was attributed to 0.260%. The spend on the rest of the other fuel commodities was less than 0.2% and this applied to bitumen and asphalt, bituminous mixtures, coal gas, water gas, lignite, oils from coal tar, peat, petroleum oils (crude), pitch and pitch coke and tar.

The first research objective modeled the overall spend of fuel products in Zimbabwe from 2009 up to 2016. This objective was very essential as Marzic et al. (2014) and Lyons et al. (2014) highlighted that in analyzing historical spend patterns of commodities, it is also ideal to analyze aggregate spend for commodities and spend patterns for top commodities. Marine Corps, according to Moore et al. (2011), ranked their expenditure by contract dollars and contract transactions which enabled them to identify categories with higher spend. The study is in with Ndandiko et al. (2015)’s spend analysis study for the Government of Uganda. Just like the Ndandiko et al. (2015) spend analysis study, two major steps for ABC Analysis model were followed. The study identified the spend analysis scope which was aimed at establishing fuel spend share, classified products into various categories and subjected those fuel commodities to a Pareto Analysis to establish the commodities which had the greatest fuel spend share. The study established that non-crude oils contributed 97.379% of the total spend on fuel. These are ranked as Category A items.
Analysis of petroleum products aggregates from 2009 to 2016 helped the study to establish the all-time primary fuel commodities which contributed to the greatest spend. The researcher used the descriptive measures of central tendency and dispersion, that is the mean as well as the standard deviation. This analysis was based on the four-digit Harmonized Tariff System Code 4 level (HS4), which established the relative spend for each fuel commodity.

**Fig 4.1 Distribution Of Spend on Non-Crude Oil From 2009 to 2016**

Distribution of non-crude oils is presented in Figure 4.1 above. There was a marked steep increase from 2009 to 2010 and from 2010 up to 2012, a slight increase between 2012 and 2013, a minor drop in 2014 before another slight increase in 2015. A marginal drop is noticed between 2015 and 2016. The graph shows there was a high demand of non-crude oils (refined oils) between 2009 to 2013.
The distribution of the non-crude oil and other products is also presented in Figure 4.2

**Fig 4.2 Distribution of Spend on Non-Crude Oil**

![Graph showing distribution of spend on non-crude oil from 2001 to 2016](image)

Source: Comtrade Data (2009-2016)

Figure 4.2 above shows that between 2009 and 2016, non-crude oils which include diesel and petrol accounted for 97.4% of the total spend figure. These commodities are grouped as A category commodity by the ABC Analysis model, and require special attention. Moore et al. (2011) highlighted that strategic items with the greatest spend should be given maximum attention to manage their expenditure. Non-crude oils significantly influenced the spend total on fuels as a whole while the spend on other fuel commodities was rather insignificant. Other commodities’ aggregate spend contributed only 2.621% of the total spend on fuels.
4.4 Zimbabwe vs Regional Spend on Fuels (2009-2016)

Table 4.2: Descriptive Analysis – Zimbabwe vs Regional Spend on Fuels (2009-2016)

<table>
<thead>
<tr>
<th>Country</th>
<th>Angola</th>
<th>Botswana</th>
<th>Malawi</th>
<th>Mozambique</th>
<th>Namibia</th>
<th>South Africa</th>
<th>Zambia</th>
<th>Zimbabwe</th>
</tr>
</thead>
<tbody>
<tr>
<td>2010</td>
<td>17.11</td>
<td>14.86</td>
<td>10.01</td>
<td>19.95</td>
<td>9.21</td>
<td>18.97</td>
<td>11.62</td>
<td>16.03</td>
</tr>
<tr>
<td>2011</td>
<td>11.64</td>
<td>16.65</td>
<td>8.80</td>
<td>23.59</td>
<td>9.18</td>
<td>20.70</td>
<td>7.42</td>
<td>14.60</td>
</tr>
<tr>
<td>2012</td>
<td>3.93</td>
<td>16.27</td>
<td>14.19</td>
<td>23.84</td>
<td>12.07</td>
<td>21.95</td>
<td>10.61</td>
<td>20.57</td>
</tr>
<tr>
<td>2014</td>
<td>5.70</td>
<td>15.51</td>
<td>13.49</td>
<td>19.50</td>
<td>6.37</td>
<td>23.29</td>
<td>14.92</td>
<td>24.57</td>
</tr>
<tr>
<td>2016</td>
<td>12.94</td>
<td>19.20</td>
<td>12.54</td>
<td>13.44</td>
<td></td>
<td></td>
<td></td>
<td>28.82</td>
</tr>
</tbody>
</table>

Source: Comtrade Data (2009-2016)

Table 4.2 above shows that very low spend percentages are evident for Angola, particularly between 2012 and 2015, with the lowest being 1.47%. Low fuel spend was also observed for Namibia, particularly, between 2009 and 2014 and had a record low spend of 6.37% in 2014. The record high spend was observed for Mozambique, which recorded 29.40% in 2013, but this declined from 2014 onwards. With respect to Zimbabwe, this percentage spend has been on the rise from 2009 up to 2016, with the 2016 spend of 28.82% being the region’s second highest between 2009 and 2016. The 2015 Zimbabwe spend percentage on fuels was 26.39% and it is worth mentioning that this was the region’s third highest between 2009 and 2016. Zimbabwe’s 2014 spend on fuel was 24.57% and this was the region’s 4th highest between 2009 and 2016. It is evident that between 2014 and 2016, Zimbabwe experienced an unprecedented rise in the fuel spend and this is best illustrated in Figure 4.3 below.
It can be observed that between 2009 and 2014, there were mainly two countries whose
spend share on fuels was higher than Zimbabwe and these were Mozambique and South
Africa. However, as the percentage spend on fuels in Zimbabwe was gradually increasing
from 2014 onwards, the spend on fuels in Zimbabwe became the region’s highest. From
fig 4.3 above, it can also be seen that only 3 countries exceeded the 20% fuel spend share,
and these were Zimbabwe, South Africa and Mozambique, while 4 countries were
concentrated below the 15% mark, that is Angola, Namibia, Zambia and Malawi. The
average percentage spend share of fuels between 2009 and 2013 is presented in Table 4.3.
Table 4.3: Average Percentage Spend Share (2009-2016)

<table>
<thead>
<tr>
<th>Country</th>
<th>N Statistic</th>
<th>Mean Statistic</th>
<th>Std. Deviation Statistic</th>
<th>Skewness Statistic</th>
<th>Kurtosis Statistic</th>
</tr>
</thead>
<tbody>
<tr>
<td>Angola</td>
<td>7</td>
<td>8.9842</td>
<td>5.88549</td>
<td>.254</td>
<td>-1.511</td>
</tr>
<tr>
<td>Botswana</td>
<td>8</td>
<td>14.8264</td>
<td>1.97305</td>
<td>-.393</td>
<td>-1.210</td>
</tr>
<tr>
<td>Malawi</td>
<td>7</td>
<td>11.7521</td>
<td>2.25779</td>
<td>.120</td>
<td>-2.029</td>
</tr>
<tr>
<td>Mozambique</td>
<td>8</td>
<td>20.4960</td>
<td>5.13554</td>
<td>.312</td>
<td>.191</td>
</tr>
<tr>
<td>Namibia</td>
<td>8</td>
<td>10.2392</td>
<td>2.74105</td>
<td>-.338</td>
<td>-.473</td>
</tr>
<tr>
<td>South Africa</td>
<td>8</td>
<td>19.6227</td>
<td>3.40859</td>
<td>-1.072</td>
<td>.039</td>
</tr>
<tr>
<td>Zambia</td>
<td>7</td>
<td>12.5833</td>
<td>3.67313</td>
<td>.453</td>
<td>.267</td>
</tr>
<tr>
<td>Zimbabwe</td>
<td>8</td>
<td>20.6055</td>
<td>5.77400</td>
<td>.035</td>
<td>-1.442</td>
</tr>
<tr>
<td>Valid (listwise)</td>
<td>7</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Source: Data Analysis

Table 4.3 above shows that the highest average share of spend on fuels was identified with Zimbabwe (20.6055%). What this mean is that of all the products that were imported for all the countries under study, the spend on fuel was the highest in Zimbabwe. In other words, regionally, Zimbabwe is importing more fuel than other products.

The second highest spend share on fuels was identified with Mozambique (20.4960%), while South Africa was the third highest (19.6227%). It is clear that only three countries had an average share that was greater than 15%. The rest of the other countries had a spend share on fuels that was less than 15%. The lowest average spend share was observed to be Angola (8.9842%), and the second lowest was Namibia (10.2392%), while the third lowest was Malawi (11.7521%). Multi-Dimensional analysis was used to show categories by fuel spend share.
4.4.1 Multi-Dimensional Analysis – Regional Percentage Spend on Fuels (2009-2016)

The goodness of fit of the multidimensional analysis is presented by table 4.4 below.

Table 4.4: Goodness of Fit – Regional Percentage Spend on Fuels (2009-2016)

<table>
<thead>
<tr>
<th>Stress and Fit Measures</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Normalized Raw Stress</td>
<td>.00426</td>
</tr>
<tr>
<td>Stress-I</td>
<td>.06525</td>
</tr>
<tr>
<td>Stress-II</td>
<td>.17027</td>
</tr>
<tr>
<td>S-Stress</td>
<td>.00867</td>
</tr>
<tr>
<td>Dispersion Accounted For (D.A.F.)</td>
<td>.99574</td>
</tr>
<tr>
<td>Tucker's Coefficient of Congruence</td>
<td>.99787</td>
</tr>
</tbody>
</table>

PROXSCAL minimizes Normalized Raw Stress.

a. Optimal scaling factor = 1.004.
b. Optimal scaling factor = .988.

Basing on the results above, the scaled stress (S-Stress) was 0.00867, or rather 0.867%. According to Hair et al. (2011), the S-Stress ranges from 0 to 1, and a goodness of fit less than 10% are optimal. The Dispersion Accounted For (DAF) and Tucker's Coefficient of Congruence are optimally expected to be higher than 0.9 (Dugard, Todman and Staines, 2010), and both met this criterion, being 0.99574 and 0.99787 respectively, and this validates that the regional spend data that was used passed the goodness of fit tests necessary for the use of multidimensional scaling. The final coordinates are presented in Figure 4.4.
The similarity of the statistics was done by determining the degree of proximity of the distance measures (Euclidian Distance) between cases as posited by Li and Yu (2008). Table 4.4 shows that multi-dimensional scaling was the best test (IBM, 2018). Zimbabwe was clustered in its own domain whose dimensions are both negative. This on its own shows how divergent the fuel spend in Zimbabwe is, relative to other regional countries. The other countries which were established to be dimensionally close to Zimbabwe were South Africa, Botswana and Mozambique, which were clustered in their own domain, followed by Malawi Zambia and Namibia, again, in their own domain, and the farthest to Zimbabwe was Angola, which was in a separate domain as well. Effectively, the analysis above grouped the fuel spend shares for Zimbabwe, Mozambique, South Africa, Botswana, Malawi, Namibia, Zambia and Angola into four groups.

Zimbabwe stood on its own in the far negative side, while Angola stood on its own in the far positive side. What this mean is that regarding the fuel spend share, Zimbabwe had the greatest spend share on fuels than the regional countries, and again, Angola had the least
spend share on fuels. The second cluster of countries with high spend share was made up of Mozambique, South Africa and Botswana, while the third cluster was comprised of Zambia, Namibia and Malawi. Effectively, according to multi-dimensional analysis, the spend share on fuels in Zimbabwe between 2009 and 2016 was the worst in the region and not comparable to any regional country.

4.4.2 ANOVA Analysis – Zimbabwe vs Regional Fuel Import Share % (2009-2016)

Table 4.5: Homogeneity of Variances - Regional Percentage Spend on Fuels (2009-2016)

<table>
<thead>
<tr>
<th>Test of Homogeneity of Variances</th>
<th>Levene Statistic</th>
<th>df1</th>
<th>df2</th>
<th>Sig.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Spend Share</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Based on Mean</td>
<td>.000</td>
<td>1</td>
<td>59</td>
<td>.994</td>
</tr>
<tr>
<td>Based on Median</td>
<td>.000</td>
<td>1</td>
<td>59</td>
<td>.986</td>
</tr>
<tr>
<td>Based on Median and with adjusted df</td>
<td>.000</td>
<td>1</td>
<td>58.437</td>
<td>.986</td>
</tr>
<tr>
<td>Based on trimmed mean</td>
<td>.000</td>
<td>1</td>
<td>59</td>
<td>.994</td>
</tr>
</tbody>
</table>

Source: Data Analysis

This approach that was used to compare Zimbabwe’s average spend share against the regional countries. According to Field (2016), ANOVA analysis is the best test when comparing means for fuel import shares. ANOVA analysis was used because variances were homogeneous (IBM, 2018). This was tested and the results are summarized in Table 4.5 above. Because the p-values were all greater than 0.05, it meant that the variances were not statistically different. In this regard, the assumption of the homogeneity of variances was met. Having met the homogeneity of variance assumption, ANOVA analysis was carried out and the results are presented in Tables 4.6 and Table 4.7.
Table 4.6: Descriptive Statistics - Regional Comparison of Spend on Fuels (2009-2016)

A 2-tailed ANOVA test was run at the 95% confidence level and sought to answer the following hypothesis:

$H_0$: There is no significant difference between Zimbabwe fuel spend and the Regional spend

$H_1$: There is a significant difference between Zimbabwe fuel spend and the Regional spend

<table>
<thead>
<tr>
<th>Spend Share</th>
<th>Descriptives</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>N</td>
</tr>
<tr>
<td>Region</td>
<td>53</td>
</tr>
<tr>
<td>Zimbabwe</td>
<td>8</td>
</tr>
<tr>
<td>Total</td>
<td>61</td>
</tr>
<tr>
<td>Model Fixed Effects</td>
<td></td>
</tr>
<tr>
<td>Random Effects</td>
<td></td>
</tr>
</tbody>
</table>

Source: Data Analysis

From the Table 4.6, the regional average of fuel spend share was 15.7872%, with a standard deviation of 5.86%. What this meant was that for the regional countries, between 2009 and 2016, the average spend share of fuels against the total spend was 15.7872%. However, with respect to Zimbabwe, this average was 20.6055%. These findings generally show that the average fuel spend share was higher for Zimbabwe than the entire regional countries considered in this analysis. The test was done and the results are presented in Table 4.7.
Table 4.7: ANOVA Test: Regional Comparison of Spend on Fuels (2009-2016)

<table>
<thead>
<tr>
<th>Spend Share</th>
<th>Sum of Squares</th>
<th>df</th>
<th>Mean Square</th>
<th>F</th>
<th>Sig.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Between Groups</td>
<td>161.423</td>
<td>1</td>
<td>161.423</td>
<td>4.715</td>
<td>.034</td>
</tr>
<tr>
<td>Within Groups</td>
<td>2019.763</td>
<td>59</td>
<td>34.233</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td>2181.186</td>
<td>60</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Source: Data Analysis

From the analysis, $F(1, 59) = 4.715$ (p=0.034). The p-value was less than 0.05. In this respect, we reject the null hypothesis and conclude that there was enough statistical evidence at the 95% confidence level that there was a significant difference between the Zimbabwe fuel spend and the regional fuel spend.

In conclusion, the second research objective sought to establish the spend share pattern of fuel products between 2009 and 2016. This analysis was important as it was an extension of the first research objective as it sought to standardize the spend on fuel. The second research objective sought to determine the extent of similarity or difference of the spend share of fuel products. While the statistics in the first objective relate to the overall spend value, to standardize the comparison for all the regional countries, this objective was achieved by comparing the percentage of the value of the spend of fuels relative to the total spend (spend share) for each and every country. This analysis was important as it presented a holistic picture of the growth, similarity or decline in the spend on fuel products by the Government of Zimbabwe relative to the region. Angola, Botswana, Malawi, Mozambique, Namibia, South Africa, Zambia and Zimbabwe were considered in this analysis.

The comparison for fuel import share of Zimbabwe as compared with regional countries is similar to the study done by Jambo (2017). Jambo (2017) compared Zambia, Malawi, South Africa and Tanzania when a study was conducted on the impact of Government spending on Agricultural growth. The study was carried out to identify percentage shares of agricultural programs to the total agricultural budget.
In analyzing differences between Zimbabwe’s fuel spend share and the region’s fuel spend share, three statistical tests were employed for this analysis. The first was descriptive statistics where the regional spend on fuels was calculated for each and every country and presented from 2009 up to 2016. The second was multidimensional scaling where the countries were compared and classified depending with the extent of similarity of the trend of the spend. The last analysis was ANOVA, where the inferential analysis of the fuel spend of Zimbabwe was compared to the regional spend. This test was aimed at answering the hypothesis that:

\[ H_0: \text{There is no significant difference between Zimbabwe fuel spend and the Regional spend} \]

\[ H_1: \text{There is a significant difference between Zimbabwe fuel spend and the Regional spend} \]

### 4.5 Optimal Spend Modeling (2009-2016)

The third research objective was aimed at modeling the optimal spend patterns for Zimbabwe based on regional trends. Earlier findings herein above did confirm the significant deviation of the Zimbabwean fuel spend distribution from the regional spend. With a view to minimizing this, this objective sought to extend the findings by computing the best spend that Zimbabwe should have if we benchmark to the regional trend. This analysis was important as the results had proved Zimbabwe to be an outlier with respect to its fuel spend patterns. The establishment of the optimal fuel spend for Zimbabwe would help as this would help in identifying areas where Zimbabwe was lacking and areas that if improved would ensure that the spend on fuel for Zimbabwe is restored to regional trends.

To achieve this objective, the researcher made use of two main statistical techniques. The first one was decision tree analysis and the second was the determination of the confidence interval of the expected fuel spend share for Zimbabwe. Because the dependent variable used was a continuous variable, the Classification and Regression Tree (CRT) decision tree analysis approach was used as opposed to the CHAID approach, which is optimal when using a categorical dependent variable (Field, 2016). The results are presented in Figure 4.5.
Fig 4.5 Decision Tree Analysis – Regional Fuel Spend Share Modelling

Source: Data Analysis
Figure 4.5 shows that the overall regional average spend share on fuels was 15.787% (SD = 5.861). This was confirmed in the first objective to be statistically different from the average spend share on fuels for Zimbabwe. The principal factor found to determine the regional share patterns was the GDP per capita. Countries with a GDP per capita less than US$5085.13 were modeled as having an average fuel spend share of 13.753%. On the other hand, countries with a GDP per capita greater than US$5085.13 had an average fuel spend share of 18.437%. It follows, therefore, that there was a positive relationship between the fuel spend share and the GDP per capita.

The factors that were confirmed to be determining the secondary nodes were the industrial productivity as well as the GDP per capita respectively. With respect to the countries with a GDP per capita less than US$5085.13, the optimal fuel spend share was 11.487% (Standard Deviation = 4.285) where the industrial productivity index was less than or equal to 431.799. For those countries whose industrial productivity index was greater than 431.799, the corresponding optimal fuel spend share was found to be 21.210% (Standard Deviation = 5.095). From this finding, it is confirmed that there is a positive correlation between the fuel spend share and the industrial productivity levels in a country. On the other hand, for countries whose GDP per capita was greater than US$5085.13, the fuel spend share was again further determined by GDP per capita. In this category, those countries whose GDP per capita was less than US$5790.261, the optimal fuel spend share was 17.225% (Standard Deviation = 3.899), and for those with a GDP per capita greater than US$5790.261, the optimal fuel spend share was 24.195% (Standard Deviation = 3.556). Again, from this finding, the positive correlation between GDP per capita and fuel spend share is confirmed.

There was a common factor in the tertiary child node, and this was population. In both scenarios, a positive relationship between the population and the fuel spend was confirmed.
For countries whose GDP per capita was less than US$5085.132, with an industrial productivity index less than 431.799 and with a population that was less than 24.657 million, the respective fuel spend share was 10.7% (Standard Deviation = 2.981), while those with a population greater than 24.657 million people had a higher fuel spend share of 12.916% (Standard Deviation = 2.647). On the other hand, for countries whose GDP per capita was greater than US$5790.261, the optimal spend share was 15.109% (Standard Deviation = 2.396) if the population was less than 2.453 million and 19.576% (Standard Deviation = 3.191) if the population was greater than 2.453 million.

To relate the above decision tree model to Zimbabwe, the country attributes for the GDP per capita, population and industrial productivity for Zimbabwe between 2009 and 2016 were computed and are presented in Table 4.12.

Table 4.8: Zimbabwe Country Attributes (2009-2016)

<table>
<thead>
<tr>
<th>Attribute</th>
<th>N</th>
<th>Mean</th>
<th>Std. Deviation</th>
<th>Std. Error</th>
<th>Between-Component Variance</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Fuel Spend Share</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Zimbabwe</td>
<td>8</td>
<td>20.6063</td>
<td>5.77543</td>
<td>2.04192</td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td>61</td>
<td>16.4192</td>
<td>6.02935</td>
<td>.77198</td>
<td></td>
</tr>
<tr>
<td>Model Fixed Effects</td>
<td></td>
<td>5.85092</td>
<td></td>
<td>.74913</td>
<td></td>
</tr>
<tr>
<td>Random Effects</td>
<td></td>
<td></td>
<td>2.76141</td>
<td></td>
<td>9.14</td>
</tr>
<tr>
<td><strong>GDP Per Capita</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Zimbabwe</td>
<td>8</td>
<td>1749.55</td>
<td>136.36751</td>
<td>48.21319</td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td>63</td>
<td>4417.267</td>
<td>2789.33253</td>
<td>351.42287</td>
<td></td>
</tr>
<tr>
<td>Model Fixed Effects</td>
<td></td>
<td>2650.54366</td>
<td></td>
<td>333.93711</td>
<td></td>
</tr>
<tr>
<td>Random Effects</td>
<td></td>
<td></td>
<td>1649.13571</td>
<td>3351144.78</td>
<td></td>
</tr>
<tr>
<td><strong>Population</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Zimbabwe</td>
<td>8</td>
<td>13.9235</td>
<td>.82486</td>
<td>.29163</td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td>63</td>
<td>19.5211</td>
<td>15.63097</td>
<td>1.96932</td>
<td></td>
</tr>
<tr>
<td>Model Fixed Effects</td>
<td></td>
<td>15.65750</td>
<td></td>
<td>1.97266</td>
<td></td>
</tr>
<tr>
<td>Random Effects</td>
<td></td>
<td></td>
<td>1.97266</td>
<td>-3.68</td>
<td></td>
</tr>
<tr>
<td><strong>Industrial Productivity Index</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Zimbabwe</td>
<td>8</td>
<td>79.6230</td>
<td>9.20274</td>
<td>3.25366</td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td>63</td>
<td>226.8109</td>
<td>148.65720</td>
<td>18.72905</td>
<td></td>
</tr>
<tr>
<td>Model Fixed Effects</td>
<td></td>
<td>138.58844</td>
<td></td>
<td>17.46050</td>
<td></td>
</tr>
<tr>
<td>Random Effects</td>
<td></td>
<td></td>
<td>101.46931</td>
<td>12837.44857</td>
<td></td>
</tr>
</tbody>
</table>

Source: Data Analysis

Table 4.8 shows that the average GDP per capita for Zimbabwe between 2009 and 2016 was USD$1749.55. On the other hand, the average population was 13.9235 million and the average industrial productivity index was 79.6230. Based on these attributes,
comparing with the regional model, the supposed average fuel spend for Zimbabwe was expected to be 10.7% (Standard Deviation = 2.981) as shown in Figure 4.6 below.

Fig 4.6 Decision Tree Analysis – Classifying Zimbabwe based on Regional Model

Source: Data Analysis
The corresponding confidence interval was calculated manually using the following formula:

\[ \mu = M \pm Z(s_M) \]

where:
- \( M \) = sample mean
- \( Z \) = \( Z \) statistic determined by confidence level
- \( s_M \) = standard error = \( \sqrt{(s^2/n)} \)

\( M = 10.7 \)
\( Z = 1.96 \) (at 95% confidence level)
\( s_M = \sqrt{(2.9812/4)} = 1.49 \)
\( \mu = M \pm Z(s_M) \)
\( \mu = 10.7 \pm 1.96*1.49 \)
\( \mu = 10.7 \pm 2.921 = 7.779 \) and 13.621

From the above analysis, \( M = 10.7, \) 95% CI \([7.779, 13.621]\). From these findings, we can be 95% confident that the average optimal fuel spend for Zimbabwe based on the regional patterns mean (\( \mu \)) between 2009 and 2016 was supposed to fall between 7.779% and 13.621%. This range was way off the observed average fuel spend share of 20.6063% (Table 4.12).

4.6 Summary

Analysis of fuel spend share using various statistical methods have shown that Zimbabwe has the highest spend on fuel than the regional countries. Since the adoption of the multi-currency system, fuel has been contributing a higher percentage to the total import bill. From 2014 right up to 2016, the fuel spend share percentage has been increasing due to an increase in demand by the transport and agricultural sector. Next chapter will look at summary of the study, conclusions and recommendations.
CHAPTER V
Summary of the Study, Conclusions and Recommendations

5.1 Introduction

The study in this chapter seeks to critically discuss the findings of higher fuel spend share in Zimbabwe from 2009 to 2016 using relevant and published literature. Findings were then compared to the published works findings to verify consistency. This study drew conclusions from the findings to justifiably link them with the research objectives. Contributions to the body of knowledge and opportunities for further research are also highlighted.

5.2 Summary of the Study

The study looked at the spend analysis of mineral fuels and oils in Zimbabwe from 2009 to 2019. It was motivated by increasing fuel import shares relative to total merchandise. It was based on a positivism paradigm and it adopted a deductive approach to try and establish fuel spend shares for Zimbabwe and the entire region. The quantitative method was used to gather data. Several statistical methods were employed to analyze secondary data. In pursuit of the objectives, the study found out that non-crude oils contributed 97.379% of the total spend on mineral fuels and oils. The remaining thirty-nine commodities from the HCDCS, Category 27, at HS4 level contributed a paltry 2.631%. Zimbabwe’s fuel import share relative to total merchandise was found to be higher as compared to the regional countries. This indicated that a lot of fuel is being imported at the expense of other commodities.

From the optimal spend modelling that was done basing on regional patterns, Zimbabwe’s fuel import share was supposed to fall between a region of 7.779% to 13.621% in terms of spend share, but this range was way off the observed average fuel spend share of 20.603% obtained by using a decision tree approach.
5.3 Conclusions

From the discussions and analysis of the findings in Chapter 4, the following conclusions were drawn. Zimbabwe is spending more money towards the procurement of fuels. Findings also reveal that fuel imports share for Zimbabwe comprises of larger shares of total imports. Non-crude oils, which include key products like diesel or gasoil and petrol or gasoline, were found to the main strategic commodities allocated a lot of foreign currency by the Reserve Bank of Zimbabwe.

Findings show that non-crude oils accounted for 97.379% of the total spend on fuel. Between 2009 to 2016, USD$9.6 billion was spent towards the procurement of these commodities. Findings concur with what was found by Moore et al. (2011) while carrying out a spend analysis study at Marine Corps in the United States of America. They found out that 40% of the spend was channelled towards the procurement of weapons. The spend on the rest of other commodities like bitumen and asphalt, bituminous mixtures, coal, gas, water gas, coke, lignite, oils from coal tar, peat, petroleum coke, petroleum gases, petroleum jelly and waxes, petroleum crude oil, pitch, pitch coke and tar was not significant as they only accounted for a paltry 2.631% of the total spend.

The study found out that the second highest fuel import share were petroleum gases whose overall spend between 2009 to 2016 was 0.887% and the third highest overall spend were petroleum jelly and waxes with 0.731%. USD$87.5 million and USD$ 72.19 million were allocated towards the procurement of petroleum gases and petroleum jelly and waxes respectively. These commodities were mainly imported when the country started having intermittent power cuts or electricity challenges and are classified as B or C category by the ABC Analysis model. Non-crude oil falls under the A Category which requires maximum attention.

Findings from the comparison that was done between Zimbabwe’s fuel spend share vis-à-vis regional countries such Angola, Botswana, Malawi, Mozambique, Namibia, South Africa and Zambia revealed that Zimbabwe’s fuel spend percentage share became the
highest in the region in 2014, 2015 and 2016. Zimbabwe had 12.88% in 2009, 16.03% in 2010, 14.6% in 2011, 20.57% in 2012, 20.99% in 2013, 24.57% in 2014, 26.39% in 2015 and 28.82% in 2016. Fuel pend share results for 2015 and 2016 were similar to the World Bank Collection of development indicator which had 26.41% in 2015 and 28.839% in 2016. This shows that the bulk of the foreign currency were channeled towards the procurement of diesel and petrol at the expense of other strategic commodities like drugs, agricultural inputs, machinery, wheat and electrical energy. The Reserve Bank of Zimbabwe Governor also mentioned that, while presenting the October 2018 monetary statement, that the bulk of the country’s imports were made up of diesel and petrol (24%), electrical energy 2%, crude soya bean oil 2%, Rice 2%, Durum wheat, Maize, medicaments, Maize (excluding seeds), vehicles, Ammonium Nitrate, Aviation Spirit and Urea had 1% each while others accounted for 61%.

Findings revealed that countries such as Angola have managed to reduce their fuel spend share to as low as 1.47%. Namibia and Malawi have never exceeded fuel imports share of more than 15%. Botswana and South Africa have also made great progress in reducing their fuel import shares relative to total merchandise. The Euclidean distance model also revealed that Zimbabwe has divergent fuel import share relative to Mozambique, South Africa, Botswana, Zambia, Namibia and Malawi. Angola had the least spend share on fuel. Regional comparison revealed that the regional average of fuel spend share was 15.782% while Zimbabwe had 20.6055. These averages show that Zimbabwe had a higher fuel spend average than the entire regional countries considered in the analysis. A 2-tailed ANOVA test also revealed that Zimbabwe’s fuel spend share is higher than the regional fuel spend share.
5.4 Recommendations

Having made some conclusions above, the study recommends that the Government of Zimbabwe, through the Reserve Bank of Zimbabwe, should allow holders of free funds to procure fuel using their own foreign currency. This should be done through Petroleum Companies licenced in terms of Section 29 of the Petroleum Act and must also be extended to other critical sectors like mining and agriculture. Currently the Reserve Bank of Zimbabwe allocates foreign currency to private firms to import fuel. Allowing holders of free funds to import their own fuel will reduce the fuel import bill. Foreign currency should be channelled towards the procurement of other strategic commodities such as drugs, electricity, agricultural inputs as well as equipment.

The Government of Zimbabwe, through the National Oil Infrastructure Company of Zimbabwe) NOIC, should also encourage greater competition in the procurement of fuel so that the product is bought at competitive prices. An open tendering system should be introduced to all international suppliers of fuel such as Trafigura, Glencore, Galana, Independent Petroleum Group (IPG) and Vitol. Regional countries such as Angola, Namibia and Malawi have managed to keep their fuel import bill at reasonable minimums because of the open tendering system. Swiss based Trafigura has enjoyed near-monopoly over the supply of fuel in Zimbabwe. Angola through the state controlled Sonagol has managed to reduce its fuel import share by encouraging stiff competition from several international suppliers.

The Government of Zimbabwe should seriously consider establishing a local crude oil refinery plant to cut on the ballooning fuel import bill. Establishing a local fuel processing capacity will cut the import bill. In Nigeria, the Nigerian National Petroleum Corporation (NNPC) recently introduced plans to revamp all its refineries with the aim of saving billions of dollars on fuel imports. The Corporation recently held talks to revamp its dilapidated refineries to reduce its high fuel import bill. Sonagol of Angola has plans to construct high conversion refinery with a capacity to process 200,000 barrels per day in Lobito by 2022.
Besides the conversion refinery, The Government of Angola has a plan to optimise and modernize Luanda Refinery plant.

The Government of Zimbabwe should also consider exploiting local resources to reduce larger spend on fuel products. This is being done but on a lower scale. Angola set aside USD$6 billion investment for oil prospection and development. This also help to reduce the higher import bill.

5.5 Contribution to previous research

The study adds to the previous studies which were done about fuel imports share relative to total merchandise. The study will help the Government of Zimbabwe to make informed decisions regarding the procurement of this strategic commodity and also to reduce its high import bill.

5.6 Recommendations For Further Research

In Zimbabwe, high fuel spend share has been the main driver or cause of trade deficits. Trade deficits occurs when imports exceed exports. Further research can be carried out on how higher fuel import shares results in trade deficits. There is also need to do a benchmark study Zimbabwe’s fuel procurement system against Angolan’s Procurement system.
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