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Oil Discovery in Uganda and its Impacts on Poverty and Inequality:

A Computable General Equilibrium Model Analysis

By

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Abstract

Discovery of natural resources like oil in developing countries has mixed impacts on the economy. At best, it is positive, at worst negative and in the middle, insignificant or none at all. Such mix up in the impacts has been explained empirically in terms of technical challenges in fiscal, monetary and other decisions. Utilizing a Computable General Equilibrium model and the Uganda Social Accounting Matrix 2007, this study attempts to establish the possible impact of the country's oil on households. Three simulations are performed on production, absorption and export of oil. Thereafter, the results are analyzed using Distributive Analysis Statistical Package (DASP) software to establish their effects on households' poverty, inequality and welfare. Generally, the simulations show that the discovery reduces both poverty and inequality. Specifically, in comparison to the baseline simulation, oil production, absorption and exports reduces absolute poverty, poverty gaps and severity. Further, the simulation results show that production, absorption and export reduce the Gini coefficient, implying a reduction in inequality. Other measures of inequality, notably Thiel L, T and S produce similar results and conclusions across simulations like that of the first measure. In the context of welfare, we note that the Hoover Index, and other welfare measures such as HI, TL and TT show significant changes. These measures show an improvement in households' welfare for production, absorption and exports. The equivalent variation of individual households shows a positive effect on welfare except the urban farm households. By and large, the findings confirm the spillover effects of oil on all sectors of the economy with the exception of manufacturing and services. Further, we observe a positive impact of all the simulations on GDP, calculated by expenditures approach, exports, imports and private consumption; whereas a negative effect is noted for GDP, calculated by income and output approach, investment, government surplus and balance of payment position. This study recommends the managers of the economy to pay special attention to inject a reasonable portion of oil rent in those sectors which positively contribute to the economy, diversify the non-oil exports and above all boost private consumption.

Declaration of Authorship

I, Koire Twaha, pronounce that this write-up titled "Oil Discovery in Uganda and its Impacts on Poverty and Inequality: A Computable General Equilibrium Model Analysis", is my undertaking. I have carried it individually with the supervision and guidance of my advisors. I further declare that this work has not been submitted to any institution for the award of a certificate, or diploma or degree. It is done in partial fulfillment for the Doctor of Philosophy in Economics of the International Islamic University Islamabad.

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Disclaimer

The views in this publication are exclusively by the author. The author does not accept any responsibility for the validity of the evidence presented or costs resulting from its use by third parties.

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List of Abbreviations and Acronyms

ACME	Automated Certificate Management Environment
AfDB	African Development Bank
APML	Advanced Platform Management Link
BOP	Balance of Payment
CES	Constant Elasticity of Substitution
CIA	Central Intelligence Agency
CNOOC	China National Offshore Oil Corporation
DCs	Developed Countries
EAC	East African Community
EITI	Extractive Industry Transparency Initiative
GAMS	General Algebraic Modeling System
GDP	Gross Domestic Product
GEMPACK	General Equilibrium Modelling Package

HRW	Human Rights Watch
IBA	International Bar Association
IGG	Inspector General of Government
IMF	International Monetary Fund
I-O	Input-Output tables
LDCs	Least Developing Countries
MATLAB	Matrix Laboratory
MEC	Marginal Extraction Cost
MoEMD	Ministry of Energy and Mineral Development
MoFPED	Ministry of Finance Planning and Economic Development
MUC	Marginal Users' Cost
NRM	National Resistance Movement
OPEC	Organization of Petroleum Exporting Countries
PEPD	Petroleum Exploration and Production Department
PSAs	Production Sharing Agreements
RDCGE	Recursive Dynamic Computable General Equilibrium
SAM	Social Accounting Matrix
SUT	supply-use table

TI	Transparency International
UBOS	Uganda Bureau of Statistics
UNESCO	United Nations Educational, Scientific and Cultural Organization
UPC	Uganda People’s Congress
URA	Uganda Revenue Authority
UWA	Uganda Wild Life Authority
VAR	Vector Autoregressive
WB	World Bank

Chapter 1

Introduction

==

This chapter formulates the background, the statement, objectives, research questions, rationale and tentative organizational plan of the study.

1.1 Background to the Study

The discovery of commercially recoverable oil was officially announced by the government of Uganda on October 8, 2006, a day before the country's 44th independence anniversary Nakabugo et al. (2008). The announcement confirmed the suspicion that has been held by the locals and within the government circles for generations. As of 2014, the proven oil reserves are estimated at 6.5 billion barrels out of which, approximately 1.8 to 2.2 billion are classified as commercially recoverable. In addition to oil, 10 trillion tons of recoverable natural gas have so far been discovered (Abudu & Williams, 2015). With just about 40 percent of the potential hydro-carbon area explored (Bategeka & Matovu, 2011), this figure is likely to surge, placing the country in the club of African middle oil economies. Even then, what has been discovered so far places the country far above some of the known Sub Saharan Africa oil producers (Van-Alstine, 2014).

In the wake of the discovery, the country has both positive and negative expectations from this new wealth. The positive expectations are anchored on the ground that, this precious natural resource and its associated windfall revenue will enable the country to deliver on the much needed economic, infrastructural and social improvements including poverty and inequality. If this wealth turns into a magic bullet, the country's economic sovereignty will be asserted thereby liberating herself from the agony of donor-dependence. Oil wealth has the capacity to close the country's uninterrupted budget deficit, boost investment, lessen balance of payment, boost the countries international reserves and above all create opportunities necessary to transform the country, alleviate poverty, income inequality and improve the welfare of the masses among others. The possibility of this happening is real given the country's ruling National Resistance Movement's (NRM) good truck record on macroeconomic management since 1987 which simultaneously set the economy on a continuous high economic growth and reduced absolute poverty. In this regard, it is worthy to note that GDP growth rates in 1990's averaged 7 percent and 8 percent in 2000's on the other hand, poverty reduced from 56.4 percent in 1992/93 to 19.7 percent according to the latest surveys carried out (Appleton, 2001; UBOS, 2017). The nature of this growth and its impacts on both poverty and inequality is in line with Kuznets (1955), theory of growth and inequality. According to him, when a country is growth, due to the economic structure and other factors, inequality increase initially before leveling. Whether this growth rate was pro-poor or not requires to test it against some pro-poor measures. A pro-poor growth measure – the poverty bias of growth proposed by McCulloch and Baulch (2000), considers poverty to be pro-poor if it reduces inequality. Thus, according to this measure, the now three-decade growth the country is not pro-poor as during this period, inequality has slightly increased. However, according to the poverty equivalent growth rate proposed by, Kakwani and Son (2008); growth is pro-poor growth if it does not result into change inequality. Therefore, in accordance to this measure, the country's growth rate is not pro-poor. Another measure, the pro-poor index suggested by Kakwani and Pernia (2000), argues that pro-poor growth must have an index that lie between 0 and 1. There are apparently no work on this measure, and therefore, it is hard to evaluate how pro-poor Uganda's growth was.

However, from a development perspective, irrespective of what measure of pro-poor growth, the goal is always to achieve reductions in both poverty and inequality and general improvements in welfare. All these goals require sufficient public funding (Foster et al., 2002). A critical review of earlier public efforts to eradicate poverty in the country notably the farmers' scheme (1987)," Entandikwa[4]" scheme (1995), poverty eradication plan (1997) and prosperity for all since 2001 reveals that improving people's income and welfare has been hampered by operational challenges including financing (Hickey, 2003). Hence, given the limited sources of government revenue and unreliable donor funding, income from the discovery could consequently support government's efforts to tackle a wide range of socio-economic issues of concern to the economy. This argument is solidified by evidences of oil wealth's role in improving the economic and social outlook in some formerly backward African country like Equatorial New Guinea (McSherry, 2006), and Middle East (Cordesman, 2003).

Nonetheless, without prudent management, this black gold could twirl into a devil's excretion bringing about negative expectations to the country in the long run thus worsening the plight of masses, particularly the poor. This line of contention is grounded on the conceptual issues related to the paradox of plenty and the empirical evidences which have resolved that natural resources abundance is a double-edged sword

[4] It was a scheme by the government where poor small farmers and traders were given interest free loans to boost their businesses.

particularly in low developing countries. This nexus between the abundance of natural resources and the performance of the economy has been described by development economists and practitioners as the resource curse (Auty, 1995, 1997, 2007; Boschini et al., 2007; Mikesell, 1997; Papyrakis & Gerlagh, 2004; Robinson et al., 2006; Sachs & Warner, 2001).

In the current study, we show how oil discovery can affect an economy particularly an important economic agent like household, using General Equilibrium modelling and the 2007 Uganda Social Accounting Matrix, solved utilizing the General Algebraic Modeling System (GAMS) version 24.5. Three simulations are performed on oil production, absorption and export. In all the simulations, we introduce a positive shock on the proxies of production, absorption and export in the model. Generally, the results of the simulation are at sometimes, in line with earlier studies on natural resources, this is to say, they are inconclusive. A simulation on oil production is very crucial in understanding the impacts. This is so because mere discovery and leaving the resource in the ground has no real wealth effect. With production, wealth is created in the form of output increase, value-addition for both output and the factors of production – which includes labor and capital provided by households – the focus of our study. The extent to which oil is absorbed into the domestic economy and exported in the global market, greatly affects its production levels, consumptions and consequently households as already noted. Thus, given the relevancy of production, absorption and export in the discovery; we hereby evaluate their respective impacts on households' income, consumption patterns and in the process on their poverty, inequality and welfare.

Notably, the model provides results with regard to (i)sectoral (7 sectors) effects, (ii) macroeconomic, (iii) household income (5 households), (iv) Household consumption, (v) household utility (vi) domestic prices (vii) factor prices (viii) poverty, (ix) inequality and (x) welfare. Those results are of great help in discussing the findings, making conclusions and suggestions. From a general perspective, all the simulations showed poverty and inequality to have reduced. The simulations had a positive impact on the economy in general. The agriculture, industry, education and health expanded in the simulations. Macroeconomic variables such as GDP (expenditure approach), private consumption, too increased. The positive effects on sectors and macro-economy had a spillover which played a significant role in reducing of both poverty and inequality. Specifically, in comparison to the baseline simulation, oil production, absorption and exports reduces poverty in all the three-dimensional measures: absolute, gaps and severity. Similarly, inequality measured by Gini coefficient, Thiel L, Thiel T and Thiel S all improved. Finally, in terms of welfare similar changes were noted. The Hoover Index, HI, TL and TT show significant changes in household welfare. Both the compensating and equivalent variation of individual households shows a positive effect on welfare except the urban farm households. The magnitude of reductions in poverty and welfare and improvements in welfare were small due to among other the crowding out of the manufacturing and service sectors, the negative impacts of some of the macroeconomic variables such as GDP at factor prices and investment. Further, while household consumption increased in the results but income largely reduced for most of the households. Besides CGE modeling, we took an extra step to discuss qualitative issues of importance arising from oil in the country which cannot be handled mathematically in chapter 2. We noticed that in the wake of oil discovery, the country – in particular households living in the vicinity have been employed in the various oil related activities, businesses have cropped up to serve the increasing population, oil companies are undertaking corporate social responsibility such as providing safe-drinking water, schools, health facilities and efforts to boost agriculture and safeguarding the environment. We expect that the results of this study will have a contribution in guiding the government to formulate viable policies that could maximize the benefit of oil wealth on the country, in particular, the poor masses. The extent of the impact of oil and gas on income inequality and poverty in Uganda will certainly depend on the policies the government formulates and their implementation. Hence, the findings of this study offer the government an added input in the direction of oil and gas policy formulation.

1.2 Statement of the Problem

Poverty and income distributions are still a challenge to the economy of Uganda. Their evolution is historical, right from the colonial days until to date. The unbalance development in the country, cultural factors and the post-independence political crisis among others contributed greatly to the widening of the income gaps and drawing a reasonable number of households into poverty. The post-political period that emerged after the country's civil war in 1986, prepared the country for the take-off. The peace that was ushered in, the economic reforms that were launched and implemented and international donations, captained the country into rapid economic growth which consequently reduced poverty but at the same time increased inequality. This study aims at finding out how this newly discovered wealth will affect households? Will it be like the reforms or different? This is in brief the basis of our study.

1.3 Research questions, Objectives and Policy Issues

This study is meant to provide a general framework for evaluating a wide range policy of measures that can maximize the benefit of oil in Uganda. To do this, the study is guided by a number of questions and objectives elaborated below:

1.3.1 Research Questions

There are many questions guiding discussion particularly in chapter number two. From these questions, objectives of the study emerge. Some of the questions guiding this study are stated as follow:

a) How has poverty and inequality evolved in the country?
b) To what extent has the performance of the economy affected poverty and inequality in recent years?
c) What are the dynamics of poverty and inequality in Uganda?
d) What are the impacts of oil discovery so far in the country, especially in the greater Albertine Graben?
e) To what extent does boom in oil affect sectoral performance?
f) How does oil discovery affect the macroeconomy of Uganda?
g) What are the impacts of oil on the country's international trade balance?
h) How does boom in oil affect private consumption and investment?
i) To what extent does increasing oil production affect poverty, income inequality and welfare?
j) What impact does an increase of oil consumption and investment have on poverty, inequality and welfare?

k) How does exporting oil affect income distribution, welfare and poverty?

1.3.2 Objectives of the Study

From the study questions, we derive the objectives of our study. The general objective is to investigate the impact of oil discovery on the economy and in particular, households. The specific objectives are to:

(a) Examine the effect of oil discovery on the sectors of the economy

(b) Probe the impact of oil discovery on the macroeconomy of the country

(c) Identify how oil production could affect poverty, inequality and welfare.

(d) Establish the role of oil absorption on alleviating poverty, inequality and welfare.

(e) Analyze whether oil export could alleviate poverty, inequality and welfare.

1.4 Rationale – Motivation of the Study

Studies have been carried out in a number of natural resource rich developing countries, particularly to examine the impact of such resources on the economy. The results of these studies are inconclusive, rendering research on these resources to be a continuous process. This in part, is the main motivation for the current work. A few of the previous studies justifying our inroad into the natural resources' abundance are discussed below:

1) A number of studies have been carried out on the newly discovered hydrocarbon in Uganda. For instance, Wiebelt, Pauw, et al. (2011), used CGE to examine the impact of oil revenue on agriculture and poverty. We share only the technique used but differs in the scope and focus. Their study analyzes revenue, ours examines production, absorption and export. They pin down the impacts on agriculture and poverty, we

simply consider the role of the impacts on sectors including agriculture on not only poverty but also inequality and welfare. Another work on Uganda oil by Ogwang et al. (2018), focalize on the impacts of oil boom on locals in the oil rich region. Our analysis goes beyond the local community to view the impacts on the entire country. A study by Bategeka et al. (2009), on the other hand diverts from impacts. It examines how to manage expectations of the citizens with regards to oil. We offer suggestions on how government can come up with right policies that could help people realize such expectations. The study of Olanya (2015), diverts from impacts with its focus on whether the country is succumbing to the resource curse and Holterman (2014), specifies this curse in the analysis in form politics in oil extraction. In our analysis, we have limited ourselves to quantitative analysis – avoiding political issues such as corruption, patronage, clientelism and other aspects peculiar to resource curse and politics in extractive industry. The work of Bategeka and Matovu (2011), peg down the resource curse in the shape of Dutch disease. Ours examine how such a disease, if at all crops up, could affect households, especially, their poverty and income distribution. The legal aspects in the new oil sector has been examined by Van-Alstine et al. (2014), and Kasimbazi (2012), concentrating on governance and regulation of exploration and production respectively. We have not dwelled into the legal aspects since they cannot be examined quantitatively and moreover have no direct relation with what we are analyzing.

2) Some insightful studies have been done on the impacts of natural resources such as oil on poverty (Brabant & Gramling, 1997; Davis, 2009; Davis & Cordano, 2013) and inequality (Buccellato & Mickiewicz, 2009; Fum & Hodler, 2010). The technique

used in these studies is very different from ours. Some used simple descriptive analysis, while others carried out empirical analysis like we are doing. We differ with other studies in a number of ways: Our scope is broad and detailed, covering many aspects of oil and its impacts and the different linkages via which households are affected.

3) Other widely cited studies on oil and natural resources impacts for instance Auty (1988) on Nigeria and Cameroon, Auty (1995) on Bolivia, and Sachs and Warner (1999) globally, have made little attempts in linking their analysis on household poverty, income inequality and welfare simultaneously. Using a CGE modeling, this study hopes to fill in this gap.

4) In some of these studies on the impact of natural resources on the economy, the results are inconclusive. For instance, scholars like Sachs and Warner (1999), conclude that natural resource abundance in developing countries have a significantly negative impact on growth, while the likes of Sarraf and Jiwanji (2001) and Torvik (2009), have found a significant and positive relationship. The middle ground has been established by authors like Gylfason et al. (1999) and Stevens (2003), who argue that natural resource abundance have mixed effects. In a more elaborate way, Larsen (2006) has documented how Norway advanced tremendously with abundant natural resources in comparison with other Scandinavian countries without abundant natural endowment. The inconclusiveness in earlier studies renders research in this area a continuous process. Similarly, Sarraf and Jiwanji (2001), Atsushi (2007) and Chambers and Guo (2009), have elaborated how Botswana; despite being

geographically located in Sub-Sahara Africa has been able to use her massive diamonds to develop her economy.

5) Methodologically, our study differs from the previous on the following grounds;

    a. We aggregate most of the accounts in SAM in order to respond to the objectives of the study.

    b. The utilization of CGE approach is meant to enable us to understand the impact of the different oil discovery proxies (production, absorption and export) on the wider economy (sectoral, macro-economy) and its different agents (government, households, firms, rest of the world) that consequently affects households (poverty, inequality and welfare).

6) In addition, supplementation of quantitative analysis with qualitative analysis using different secondary sources of data regarding ongoing oil activities in the country to incorporate issues that are directly affecting the local communities that cannot be treated within the Computable General Equilibrium model framework.

1.5 Significance of the Study

Like any study in applied research, the current one is useful to the various stakeholders as follows: The results from the analysis affected the economy differently. With regards to the structure of the economy, some sectors expanded while others reduced. But there was no fundamental change in the structure, that is, not a single sector over took another. They all remained in their previous positions. Similarly, the shocks had different positive or negative effects on the macro-economic variables, household incomes and consumption, prices of goods and factors, which had a bearing on poverty and inequality.

Therefore, these findings can be used as an added benchmark in the formulation and implementation of policies by government that are likely to maximize oil benefits to the country at large and the poor specifically. The policies could range from allocating adequate share of oil proceedings in expanding sectors benefiting a large number of the population and some to sectors that are negatively affected by booms in the oil sector- to mitigate the impact on the economy such as massive unemployment. Policies should be in place to raise the payments from factors of production as evidenced by the negative impacts of oil on GDP (factor price and income). With the enhancement of earnings from factors through policies boosting investment in the educational sector, productivity can raise and hence the country can have a positive GDP in all dimensions. The findings and conclusions of this study are of great use to the government in much more ways than the foregoing elaboration. They can offer a sense of foundation and direction in relating and discussing with the international community particularly the World Bank, International Monetary Fund and other financial entities with stakes and interests in the extractive industry. Those entities usually provide guidance on the socio- economic affairs of different governments particularly in the developing world. This study provides extra data and information that the government could make use of while dealing with such financial bodies, including international oil corporations.

In the results, some households had no payment from factors while others earned just very little. Equally, aggregate investment by both households and government was negative while surprisingly private consumption was positive. With such finding, the government needs to come up with policies encouraging households to save more so as to boost their capital investments, so as to earn more to overcome their current plight of poverty.

1.6 Organization of the Study

Chapter 2 presents an overview of the performance of Uganda's economy and oil discovery issues. It discusses the macroeconomic performance, oil discovery history, opportunities and challenges. Chapter 3 reviews the literatures on oil impacts thematically. Chapter 4, presents and describes the theories related to the study. Chapter 5 describes and preliminarily analyzes the model data – 2007 Uganda SAM. Chapter 6, presents and elaborates the model in use. Chapter 7, presents and discusses the simulation findings of the study. Finally, Chapter 8, presents the conclusions and policy recommendations.

Chapter 2

The Economy of Uganda and Oil Discovery

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Preceding the introduction is an overview of the performance of Uganda's economy with some emphasis of oil discovery. In this chapter, we begin by summarizing facts regarding the country, move on to discuss its macroeconomics, household's compositions, brief history of oil on the continent and Uganda, ending with summaries.

2.0 Uganda in a nutshell

Uganda is a landlocked county located in East Africa bordered by South Sudan in the North, Tanzania and Rwanda in the South, Kenya and the Democratic Republic of Congo in the East and West respectively. It is endowed with substantial natural resources, notably sufficient fertile land, fresh water bodies, regular rainfall, mineral deposits, diverse wild life and landscape (BakamaNume, 2010). It has a total area of 241,550.7 square kilometers, out of which; 197,065.91, 36,864.01 and 7,620.76 square kilometers are covered by land, water and wetland respectively (UBOS, 2018). About 18.4% (3,627,000 hectares) of the total land area is covered with forests. However, like any other poor countries, it has lost 60 percent of its forestry cover in the last 25 years, to mostly agriculture and urbanization (UBOS,2018). The economy of Uganda has had ups and downs. To begin with, the British wars of occupation of 1894 to 1920s accompanied by local resistance of colonial rule notably by Buganda and Bunyoro kingdoms greatly devastated the economy(Mamdani, 1976). During the colonial rule, the British forced local farmers to abandon the growing of staple food stuffs like banana, millet, maize, beans plus rearing livestock and in place, forced them to grow cash crops such as coffee, cotton, tobacco, tea and sisal to feed their industries back in Europe(Mamdani, 1983). This greatly led to a reduction in agricultural production meant for the domestic market. By 1920s, the colonialists controlled the entire economic activities of the country. They controlled the means of production and determined what to produce, their earnings in form of the numerous taxes they introduced to the detrimental of Ugandan. Next in the hierarchy of economic control were the Asian. They were actually the ones in charge of the day to day running of the economy. They owned large pieces of land, factories, banks, shops (retail and whole sale) and generally dominated the country's trade sector. These Asian were infamous for their limiting of production and hoarding of essential goods to induce price surge, paying of very low wages to locals to ensure to ensure their vicious circle of poverty, preventing them from accessing loans from banks in order to starve them of investable funds and worse of all sabotaging their access to education to ensure their sustained illiteracy. The policies of both the British and their Asian partner where damaging to the locals thus in the long run, increased both poverty and inequality in the country. For these and other reasons, locals led by farmers and business men expressed their sentiments in form of protests for much of the colonial rule, culminating into independence in 1962. Immediately after independence, the country's economic prospects seemed promising. The country had a vibrant health system, excellent education system, adequate road and railway network and a booming agricultural sector (Kuteesa, Tumusiime-Mutebile, Whitworth, & Williamson, 2010). However, with the political upheavals after the 1966 crisis in which the country's first President Sir Edward

Mutesa was ousted by the then prime minister Dr. Milton A. Obote and thereafter after the launching of the common man's charter in which some sort of African socialism was adopted, economic challenges emerged (Suhrke & Haward, 2017). The political crisis was compounded by the underground activities of Asian entrepreneur to sabotage the economic efforts of the new administrators. General Iddi Amin Dada who overthrew Obote's first government expelled the Asians and some other entrepreneurs hailing from Europe in 1972. First, this deprived the country of highly skilled businessmen and entrepreneurs, which drastically affected the economy. Second, the economic embargo and sabotage that followed, almost brought the economy to its knees (Patel, 1972). The aftermath of Amin's rule was characterized by political instability which had an adverse effect on the economy, until 1986 when stability and peace was restored. In 1987, the new government under Y. K Museveni and the international community launched economic reforms, that triggered massive structural changes in the economy. The reforms included devaluing the country's currency – the Shillings, budgetary constraints, inflation control, public sector downsizing, freezing public borrowing, diversifying the economy and privatization (Kuteesa et al., 2010). Despite these reforms, until to date, Uganda remains a small open economy. As per the first quarter of 2018, the projected macroeconomic data suggests that the country has an estimated GDP of US$25.53 billion, per capita GDP of US$615.31and annual GDP growth of 5% (World-Bank, 2018a). In terms of livelihood for a majority of Ugandan, agricultural is still the backbone of the economy employing two-third of the population. Coffee is still the major export accounting for the bulk of export revenue. The country has a small manufacturing sector relying heavily on imported inputs of equipment and oil. Productivity is hampered by supply – side constraints, such as underinvestment in agriculture and high costs of production due to the pitiable infrastructure, small level of private investment and the sustainable depreciation of the Shillings (Edward, 2015). As at the end of 2018, the country had an estimated population of 34.6 million persons, of whom 81.2% live in rural areas, 54% are below 18 years of age and 55% are female(UBOS, 2018).The country has an average annual population growth of 3.03%, with a density of 174 people per one square kilometer of land. Fertility rate on average stands at 5.4 children per single mother. Life expectancy is 63.7 years, while mortality rate and under five years' mortality stands at 43 and 64 deaths per 1,000 live births, thanks to the donor community(UBOS, 2018). 19 million persons out of 34.6 falls under the working population out of which 78.8% are working. 44.4% of the persons employed are female, 43.2% are engaged in subsistence agriculture while 62.9% of workers have at least secondary education (UBOS, 2018). 8 million people are estimated to be poor, representing 21.4 percent of the population. Income distribution stands at 0.42. A significant of proportion of household expenditure (45.5 percent), is devoted to food and nutrition (UBOS, 2018). It has a presidential system of governance, where elections for the president and members of parliament is held after every five years. The current president is Yoweri Kaguta Museveni. He has been in power uninterrupted since 1986.

2.1 An Overview of the Macroeconomic Performance

In this section, we look at a few of the important macroeconomic indicators in order to understand the economy we are dealing with.

2.1.1 Economic Growth

Economic growth, traditionally stated in Gross Domestic Product (GDP), measures the adjustments in the productive capacity of an economy. It is one of the utmost significant indicators of a healthy economy. Along with economic development, the two supports improvement in the standards of living and reduce poverty.

As already mentioned, the GDP of Uganda as at the beginning of 2018 was estimated at US$ 25.53 billion with a growth rate of 5% (World-Bank, 2018a). It has improved steadily in the past three decades since 1990s at an estimated annual rate of 7.0. Recently however, the rate has steadily declined (Bigsten & Kayizzi-Mugerwa, 2001; World-Bank, 2018a)[5]. Several factors can explain the surge in the growth of the country's economy since the 1990s, including: the macroeconomic reforms carried out in the late 1980's, currency reforms that stabilized exchange rate, trade liberalization, world coffee boom of 1990s, rehabilitation and reconstruction programmes after the civil war and relative peace in the country (Bigsten & Kayizzi-Mugerwa, 2001). Economic developments in 1990s were supplemented by heavy government investment in physical infrastructure and targeted interventions in the agricultural sector that improved and integrated its chain value. Poverty reduction during this period was observed to have been strong in cash crop farming, trade and manufacturing. The households who were engaged in agricultural production represented half of the national poverty reduction during the period (Appleton

[5] WB has a link where series for different countries can be obtained in different formats including excel. Most of the data I am quoting in this study are from this website link. https://data.worldbank.org/country/uganda

2001). However, the price effect rendered urban households to benefit more than vis-à-vis the rural households throughout the coffee boom of 1990s (Chant et al., 2008). Despite the rapid growth in GDP then, GDP per capita grew at a slow rate of merely 3.6 percent during the same period due to partly high fertility rate (World-Bank, 2015). Until to date, GPD per capita is still low estimated at US$615.31, a lower figure compared to the target of $9500 meant for the country to achieve a middle income status by 2040 (NPA, 2013; World-Bank, 2018a). First and foremost, this lower per capita figure is linked to the structural bottlenecks in the labour market, particularly the high share of informal jobs and unemployment (NPA, 2013). The jobs in the informal sector are characterized with lower productivity, poor working conditions and wages, thus, the very need to enhance the formal sector and consequently the quantity of formal jobs. However, even in the formal sector controlled by an estimated 1% elites and foreigners, it is characterized by low wages, over working even on weekends and other poor working conditions, that can be equated to slavery, issues that require urgent attention. Secondly, efforts geared towards increasing the stock of human capital through training and skills development can help increase per capita GDP and the potential GDP (NPA, 2013). All these efforts require resources, yet current government revenues are inadequate. Any additional source into the government coffers is good news.

The sources of growth of the economy has changed over time. Since time immemorial, agriculture has been the main driver of the country's GDP growth. Its contribution to GDP has been relatively high until 1999 when it was over taken by the service sector (World-Bank, 2015). The share of service sector in GDP in the Fiscal year 2017/18 was 47.6 percent, driven majorly by trade, with a contribution of 11.7%, followed in order by the real estate (4.4%), hotel and restaurant (2.8%) and transport (2.8%) (UBOS, 2018). The agricultural sector is the second contributor to the country's GDP with a share of 24.2%, -of which food crop subsector contributed in the fiscal year 2017/18 to 12.2% (UBOS, 2018). The sectoral composition targets by the year 2040 are 10.4% agriculture, 31.4% industry and 58.2% service (NPA, 2013). The industrial sector with a share of 19.9% falls in the third position as contributor to GDP. Its derivers are the construction subsector (13.8%) and formal manufacturing (5.8%) (UBOS, 2018, p. 218). Given the fact that the service sector employs only 15 percent and agriculture over 70 percent of the population (UBOS, 2018), the rapid expansion of the service sector at the expense of the agriculture sector can help us in explaining the persistence of poverty and inequality in the country. With the dismal growth of the agricultural sector, so did employment in the sector performed hence explaining the increase in poverty as noted in recently. Uganda as of 2018, it has an estimated 7.5 million households. Out of these, 5 million households are engaged in subsistence agriculture and only 2.5 million are in commercial farming, an issue that is impending poverty eradication (UBOS, 2018). Moreover, the country is in the midst of land grabbing crisis whereby political elites and foreigners are taking over land without adequate compensation from households that are engaged in subsistence farming. Land being a vital asset for the poor farmers, the rampant menace of grabbing is robbing them a vital asset hence worsening their plight.

The growth of the service sector is further bad for Uganda's poor in the sense that the thin section of entrepreneurs who dominant this sector are elites in government and influential foreign. These entrepreneurs are infamous in evading and avoiding taxes, which compromises public revenue necessary in resolving poverty and inequality in the country.

Worse still, they are known for paying less wages to the workers, something which keep them in the viscous circle of poverty and distances them further from the rich in the country. The majority of small participants in the service are engaged in petty services and trade such as hair cutting, grocery, motor cycle transporters and other petty trade, where they earn small margins that keeps them poor and far behind the rich households. The construction sub sector of the service sector is mostly engaged public road construction. However, the cost of road construction in Uganda is the highest in the world. A report by parliament led by Abdul Katuntu on Entebbe express high way, found that the road costed $9.2 million per kilometers far above the world average of $2 million per kilometer. Road infrastructure is draining the much-needed resources that could help in alleviating poverty. Further, the country has 6.2 million housing units for the 7.5 million households, leaving a deficit of 1.3 million house units, which raises the costs of accommodation hurting the poor and living them in constant poverty. In our analysis the service sector was crowded out while the agricultural sector expanded. This possibly explains the mild impact of oil discovery on poverty and inequality. Another worth mentioning aspect of GDP, is its composition with respect to end use, which is distributed as follows: household consumption (78.9%), government consumption (8.8%), investment in fixed capital (24.2%), investment in inventories (0.2%), exports (21.0%) and imports (-33.2%) (CIA, 2015)[6]. The GDP use decomposition show how the country has a negative net export, very high private household consumptions in comparison to investment (fixed assets or inventories). Such a composition depresses economic growth,

[6] The American Central Intelligence Agency has a data base called CIA World Fact Book with economics and other information about different countries of the world, The link for Uganda is: https://www.cia.gov/library/publications/the-world-factbook/geos/ug.html

an issue witnessed in our analysis, where higher imports coupled with higher private consumption lead to negative investments – another issue that could have dismayed the effect of oil on poverty and inequality.

The arrival of oil has implications on this important economic measure, - GDP, and its constituent GDP growth. Empirically, in some oil rich African countries such as Algeria, Libya, Nigeria, Angola, Cameroon and Equatorial New Guinea, the oil sector has come to be the major contributor to GDP, averaging over 50 percent (Barnett & Ossowski, 2003; Yates, 1996). However, when it comes to GDP growth, empirical evidence is inconclusive. Some studies show some oil rich economies experiencing positive growth (Alexeev & Conrad, 2009) while others negative or insignificant growth (Auty, 1995; Sachs & Warner, 1999). In our analysis, we observe similar inclusiveness of oil boom. In all the discovery proxies, sectors such as agriculture, industry, education and health expanded while manufacturing reduced. GDP measured using the expenditure approach show an increase while that of factor and income approaches was on the decline. Given such ambiguities, the government of Uganda need to focus on growth initiatives and policies that should enhance the overall growth ability of the economy in all sectors, and within the different measures of growth.

2.1.2. Investment - Savings

The levels of investment, savings and efficiency as measured by increases in capital output ratio, are key determinants of the achievable rates of economic growth and employment. The country's gross fixed capital formation relative to GDP is 30%, while gross domestic saving 19% (World-Bank, 2018a). The country has achieved the vision

2040 target of 30% investment but far from achieving the savings target of 35% (NPA, 2013, p. 14). Uganda's investment is majorly private sector driven (17.3%), while the public sector accounts for merely 6.7% (UBOS, 2018). The private led investment has been observed to have an adverse effect on the poor in the country. First, the dominant investors are political elites and foreigners who are estimated to be 1 percent of the population. They are harvesting all the fruits of investment while the majority takes leftovers. This is explaining the persistence of poverty and inequality in the country. Second, these small club of private investors pay peanut to the majority who work for them, as issue which is holding them in perpetual poverty and inequality. The main source of investment in the country is construction, accounting for 18.3% while equipment and machinery stands at 5.7% (UBOS, 2018). This again presents challenges to the poverty-inequality alleviation. Construction which constitutes the highest proportion of investment employs only 4.6 percent of the workforce (UBOS, 2018), hence, this renders the ongoing investments in the economy to have little if any effective effect on poverty and inequality alleviation.

Higher savings are a prerequisite for higher investment, majorly, because it lowers the cost of capital since there is no need to obtain funds from costly sources. The lower saving rate in the country is reflected in the higher costs of investment funds, an issue which is detrimental to investors, particularly the poor. Savings are low in the country partly due to the saving nature and culture that renders it difficult to mobilize funds. Majority of savers (81%) save in-kind, followed by 19% in cash in their homes and only 6% in banks (Pelrine & Kabatalya, 2005). With this nature of saving, the poor either remain in the vicious cycle of poverty or fall into chronic poverty since they are not bankable. It is difficult to access loans for banks engage in meaningful business ventures. Additionally, the reasons for saving is harmful to investment. Only 20% of savings are meant for purchase of business assets, the remainder (80%) is meant for consumptions such as school fees, medical care and other emergencies (Pelrine & Kabatalya, 2005). The purpose of saving of Ugandan also drive a majority into poverty or ensures their persistence. Whatever income households earn, it is largely consumed particularly on emergencies like medicine, food, shelter and school fees. In such a situation, they can hardly accumulate financial assets to do profitable business.

Much as the government's investment strategy of maximizing Foreign Direct Investment (FDI) has helped in bolstering economic growth and improved to some extent the country's overall long-term competitiveness, it has not necessarily alleviated poverty and inequality in the country. FDIs have not created the much needed jobs, provided the much required technology transfer and diversified the economy (Wakyereza, 2017).Hopefully, the emerging FDIs in the oil sector are expected to perform better in this regard. Government investment incentives such as tax holidays and free land has attracted substantial number of foreign investors but has not raised the country's competitiveness in the global economic community. The cost of production, remains high in comparison to other countries, partly due to supply side bottleneck such as energy (high costs of hydroelectricity) and inadequate infrastructure like roads, railway, air, internet (poor, slow and costly). The share of oil in production (value-added) as evidenced in the country's 2007 social accounting matrix is very small – both as an intermediate input and as a factor of production. This chiefly made oil production to have just minor impacts on the economy. Once oil production officially begins, it is likely to reduce the costs of value-addition and enhance factor payments during production, which could have a profound impact on the economy and its agents mainly households. In the meanwhile, the country needs to re-assess her investment criterion including the required capital outlay, put instruments to ascertain if the earmarked outlay is actually invested, verify the potential investors to discard bogus ones among others.

Attracting big multinational corporations to set-up big businesses may be a good policy but to overcome poverty and inequality, there is a dire need for a vibrant small cottage and business sector. Such small entities will help in absorbing the ever-increasing youth unemployment. Annually, 400,000 youth enter into the labour market, but approximately only 113,000 are absorbed in formal employment, leaving the majority on the streets (UBOS, 2017). As the country's annual unemployment rate stands at 3.5 percent, youth unemployment is a whopping 32.2 percent and higher for degree holders, who represents 36 percent of all persons who are unemployed (UBOS, 2017). High interest rates on commercial bank loans, higher inflation and unstable power supply are impending efforts by households to establish small firms, thus, warrants government intervention, through investment policy redirection. Although in our analysis we have not looked at the possibility of parceling out a portion of oil revenue to small business entrepreneurs, public funds possibly from oil windfall, should be used to offer soft loans to such entities to create jobs and enhance household incomes thereby alleviating poverty and inequality. A large number of unemployed youths can easily descend the country into chaos thus compromising her economic and political stability, like those in the northern part of the continent. The government needs to be aware.

In addition to government soft loans to the youth, control of inflation and boosting of electricity supply, the government needs to use her new found oil wealth to boost investment-saving in order to create the much-needed jobs. Government policy statement on oil is that it is to be used for infrastructure and in other priority areas aimed at alleviating poverty and driving the country into the middle-income status in the mid-term. However, the details of the investment-saving allocation have not been revealed publicly. The prioritized use of oil; the infrastructure development particularly road, railway and air networks, is not likely to bring significant reductions in poverty and income distribution. This is so because, there are no vibrant domestic firms in the infrastructure construction sector and worse of all, foreign investors dominating this sector, are free to employ 100 percent their nationals and repatriate 100 percent their profits. The sector is too infested with corruption, which diverts much of the funds, making infrastructural projects very expensive in comparison to world average. Given the very fact that much of these projects are financed by foreign loans, it is increasing the debt burden of the country in terms of repayment.

The volatility in the global oil price presents challenges to the government of Uganda and oil investors. In case of sharp decline in prices like it happened in 1970s, 1980s and in the recent past, government revenue from oil will be little and hence lower funds for public investment and saving. With respect to the investors, lower prices slow down investment in the sector due to losses. This has been witnessed in the 2016 round of exploration bidding, big investors in Uganda's oil industry have opted not to participate in the exploration. Thus, declines in world oil prices adversely affects investment-saving. The discovery of oil had a negative impact on the country's total investment and her foreign savings. It is hoped that this trend could change in the future given the impending huge investment in the form of oil infrastructure development. Nevertheless, the result was expected given the deficit investment levels in the country's social accounting matrix used in the analysis.

2.1.3. External Sector Performance

This sub-section discusses the country's current account balance, remittances and direct foreign investment performance.

2.1.3.1 Current account balance

It is another crucial indicator of the health of an economy. It is defined as the sum of the balance of trade, net income from abroad, and net current transfers. It might either be a surplus or a deficit and correspondingly, there will be a registration of an opposite and equal amount. A positive balance in this account implies that the country in question is a net lender to others while on the contrary; a negative sign is an indication of it being a net borrower. The surplus rises a country's net foreign assets by the amount of the surplus, while a deficit cuts it by the deficit amount. The country has had a long uninterrupted trend of deficit in her current account (UBOS, 2018; World-Bank,2017).

These deficit trends continue up to date. For instance, in the fiscal year 2017/18, the country's deficit stood at 1,617.8 million US dollars; driven by the goods, services and income accounts estimated at Sh. 2284.95, Sh.346.48 and the Sh.676.81 million respectively (UBOS, 2018). The causes of deficits in the goods account is much imports, while that in services and income accounts is the large outflows[7] made by foreigners (UBOS, 2018). The current account as a percent of GDP was -8.1 percent in 2016 (World-Bank, 2018a).

Generally, the impact of oil on the current account depends on the price. Higher prices tend to improve the current account balance of exporters while deteriorating that of importers (Prat et al., 2010). But overall, the impact is pervasive on the part of exporter depending on the consumption pattern and preferences. Many exporters tend to have surpluses which encourage them to increase their preference of imports, consequently running into current account deficit (Morsy, 2009). In addition, due to fluctuation in the prices of oil, deficits in the current accounts usually emerges (Allegret et al., 2014). The growing deficit is bad for the country in the short and long-run. Apparent, the government is being forced to transfer the country's assets abroad to correct the imbalance, which is pushing exchange rate up. The government has to adopt policies to address the balance of payment position; including painful macroeconomic adjustments, reduce the flood into the country luxurious items and those items that can easily be produced locally through trade barriers or depreciate the Shilling. Otherwise, we are placing a huge burden on future generations to correct our balance of payment.

The results that emerged from our analysis show the government's foreign savings reduced. This could have been caused by a relatively larger increase in imports compared to the mild increase in exports during the analysis.

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[7] Foreigners mostly from India and China have a large share in the economy and the country's policy on capital flight is liberal. Foreigners can repatriate all their profits earned while doing business in the country.

2.1.3.2 Remittances

Remittances is another source of revenue to households and foreign exchange to the country. These are funds sent by expatriates back home. These funds are increasing becoming a major source of financial inflows in developing countries competing with international aid. In Uganda, remittances from expatriates in the Gulf, Europe and North America are going (Endo et al., 2010).

As of 2018, total remittance into the country reached US$1.3 billion (World-Bank, 2018). Remittances are however, prone to economic conditions in the host countries. A reduction in private remittances has a negative impact on poverty alleviation and capital investments; and consequently slows down GDP growth rate (Adams, 2006). Additionally, the slowdown in private remittances affect household incomes in the short term, depress consumption of goods and services, investments in the construction sector and other related capital investments (Adams, 2006). Empirical evidence has been deduced linking lower barriers to labour mobility to higher remittances and economic growth (Ratha et al., 2010). Another factor that is affecting remittance particularly from the Gulf countries is the alleged widespread mistreatment, enslavement, sexual exploitation, human trafficking, murder and human body parts harvest from migrant workers. Such allegations circulating in social media online is scaring potential migrant laborers particularly female from seeking employment abroad and hence reducing the size of potential remittances.

From a global perspective, boom in oil trade increases remittances (Ratha, 2005). However, for oil exporters, there is a tendency for increased remittance outflows because these economies are a magnet to foreign workers (Alkhathlan, 2013).In the analysis, we could not trace out the direct of remittances, simply because like many others our CGE model did not include the financial sector. We could have got a rough estimate regarding the flow of remittance if we had data in our social accounting matrix of foreign households, labour and possibly capital.

2.1.3.3 Foreign Direct Investment (FDI)

Investments made by foreigners are very vital to boost growth and stimulate economic developments especially in developing countries. Uganda has created a semi-independent body – the Uganda Investment Authority (UIA) to facilitate investors and enacted laws to attract FDIs in the country. It is estimated that FDI accounts for 70% of net financial inflows, far ahead of private and official loans (Asiedu, 2002).

Uganda's direct investment abroad is very small. In the fiscal year 2015/16, the total direct investment of the country abroad was $ 0.39 million and on the other hand, FDI into the country in the same period was $ 1275.37 million (UBOS, 2017). Net FDI as a percent of GDP as of 2016 was 2.2 percent (World-Bank, 2018). FDI is essential in creating employment and boosting export (Risheng, 2009), in securing the much needed capital, economic growth and technology transfer (Changyuan, 2007).

The oil sector is a magnet of FDI in developing countries due to scarcity of capital in these economies(David, 2012). These investments are made in all the cycles of oil from exploration, development, refinery and pipelines. However, fluctuations in oil prices tend to check on these type of investment and other factors such as political risk (David, 2012).The huge amount of capital needed to invest in the oil sector squeezes out domestic investors which often has an adverse effect on domestic wealth creation, household incomes and its distribution.

2.1.4. Fiscal Policy Management

Uganda has of recent pursued expansionary fiscal policies, compelled by the aspiration to develop the country's infrastructure, upsurge the production of assets, and expedite accelerated growth. Since the economic reforms of the late 1980s, the management of fiscal policy in the country has improved drastically, although in recent years, fiscal indiscipline in the form of supplementary budgets, corruption and unauthorized printing of funds for political consolidation and survival by NRM government, is becoming common. An elaboration of the performance of the country's fiscal system is as follows:

2.1.4.1 Revenue

Total revenue collections have increased steadily with the establishment of the Uganda Revenue Authority (URA) in 1992 (Kuteesa et al., 2010). This increase in revenue has been attributed to, among others, the re-organization and streamlining of revenue collection, expanding of the tax base, adequate remuneration, reduction of corruption, tax evasion and avoidance (Kuteesa et al., 2010).

In the fiscal year 2016/17 total government revenue stood at Sh. 13,905.4billion, of which 90.3% was generated from taxes and 9.3% from non-tax (UBOS, 2018). Despite the growth in tax revenue in the 1990s, recently, the factors that surged revenue collections decades back have turned around to haunt it. First, corruption in URA has gone beyond proportion, leading to losses and low collections recently. Second, the structure of the economy is not expanding rapidly leaving a small tax base to raise revenue. Third, the informal sector is increasing exacerbating tax avoidance and ability to pay tax. Forth, political interferences in the tax collection is exacerbating tax evasion and avoidance by big investors with political connections. Finally, the dwindling non-tax revenue especially grants from donor countries (UBOS, 2018).

One of the major features of oil and gas rich developing countries is that they derive much of their revenue from it. On average, African oil-rich country generates 80% of their incomes from oil. The same is true when it comes to middle eastern countries. They generate much of their oil revenue through oil exploration bidding and license fees, income and corporate taxes, royalty fees, production sharing, and government participation (Johnston, 2007). Another unfortunate feature is that the smooth and higher revenues from oil tend to create higher levels of corruption, authoritarianism and armed conflicts (Di John, 2007; Karl, 2007a).Another ill-fated feature, is that the abundant and continuous flow of income from oil rent turns the government away from exploring other sources of revenue, continuation of tax source. The instead offer subsidies and all together except agents from paying taxes to earn their loyalty and legitimacy. In the country's social accounting matrix, categorization of government revenue sources does not specify income from the different sectors. It was therefore difficult to know the extent of oil revenue and its impacts.

2.1.4.2 Public Expenditure

Like revenue, government expenditures in Uganda have increased overtime, of which in financial year 2016/17 totaled Sh. 15,524.8 billion (UBOS, 2018). The mounting government spending scheme is meant to ensure continuity in resource allocation on the basis of prioritized programmes consistent with the country's Vision 2040 and the country's short-term plan aimed at accelerating growth, poverty reduction and youth employment creation (NPA, 2013). For some years, public spending has been prioritized at social programmes such as universal education, free health care and infrastructure (Williamson et al., 2003). The emerging challenges in the recent years have been over spending beyond the budget allocations creating unnecessary numerous budget supplements, the rampant corruption that is diverting a significant amount of the public funds into private pockets and ever increasing public sector (Tangri & Mwenda, 2008).

Oil abundance has the tendency to increase public expenditures in the form of importation of capital goods (Morsy, 2009). Expenditures also increase in the form of public transfers to buy political support and legitimacy (Mitchell, 2011). Readily available oil revenue particularly in the Gulf have been observed to stimulate over spending on arms and regional hegemony (Quandt, 2010). Given the current state of affairs, oil revenue is likely to surge public expenditure for the same purpose as the foregoing elucidation. Due to limited data disaggregation, we could not trace out the sectoral sources of income for public expenditure. However, a boom in oil was accompanied by an increase in government expenditure in our analysis.

2.1.4.3 Fiscal Deficit

The fiscal-deficit as of 2014 was US$-1.003 billion, which then equated to -3.8 percent of GDP that year (CIA, 2015). The fiscal deficit over time has followed public expenditure patterns, with an increase in expenditure, so has been the increase in the deficit. As earlier noted, expenditure increases have been due to many factors including fiscal indiscipline emanating from political pressure[8], fluctuations in coffee export and natural calamities. The impact on the macro economy come in the form of high inflation due to financing of the deficit via printing currency, increased debt burden on the economy-resulting from heavy borrowing from the private sector and continued conditional offer of grants by the donor community (Bräutigam & Knack, 2004; Buiter, 1985; Hemming et al., 2003; Solomon & De Wet, 2004). All these exacerbate the plight of the poor in terms of higher prices to make purchases and higher taxes to repay the amounting debt.

Oil wealth could help in reducing the deficit depending upon its management and international price. A mismanagement of oil revenue particularly on buying arms, political support and corruption could widen the country's fiscal deficit to the level of Nigeria (Adedeji, 2001). The sudden or gradual fluctuations in oil prices could equally aggravate the fiscal deficits like the 19.5% of GDP experienced by Saudi Arabia(Ellen, 2018). In the current study, boom in oil decreased the budget surplus implying a widening of the country's fiscal deficit.

2.1.4.4 Public Debt

The fiscal deficit arising from the mismatch between expenditures and revenues has led to an increase in public debt in the country. The country's public debt is rising at a rate surpassing domestic revenue growth, questioning its sustainability, especially given the fact that a significant part of it is for projects that have no or have less return (Among,

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[8] The regime in power since 1986 has a very large classified budget and is in the habit of over spending to buy off opponents and political support from the populous. Thus, many supplementary budgets are made in every financial year for this purpose.

2014). From the recent available data, the total stock of public debt amounts to Sh. 41.51 trillion (U$10 billion), which is 41.0 percent of GDP. A larger portion of this mounting debt is external amounting to approximately 67 percent (MOF&ED, 2019). According to the country's ministry of finance, the rise in public debt is due to largely low domestic revenue collections, that has exacerbated the need for more external debts to finance infrastructure and poverty reduction projects (MOF&ED, 2019).

The rising public debt is inimical to the national budget and the economy as a whole and is in total disregard to the National Debt Strategy[9] (Among, 2014). The rising debt and debt servicing are becoming a big burden to the economy due to among others: first, lower productivity and absorption rates of the loans. These sub-optimal productivity and absorption of debt funds in the country is as a result of among other reasons, poor management of loans, untimely and sometimes inadequate release of counterpart funds by the government, occasional delays in the release of aid by donors, poor planning and coordination, and related political and administrative shortfalls in the face of constraints imposed by the high corruption level in the country. Second, embezzlement of loan funds. Like any other poor countries, corruption in Uganda is a serious problem. Third, capital flights and unwarranted reverse flows via underpricing of exports and overpricing of imports. The total inflow in the form of aid, loans, and foreign investment, in the country is less than the outflow mostly by multinational corporations, debt payments, tax dodging, and the costs imposed by climate change caused by the global community. Forth, low or minimal local content of debt-financed projects plus high unit costs of the projects. Almost all resources in most debt-financed projects in the country including human

[9] It should not go above 50% of the GDP.

resource (skilled and unskilled) and raw materials – (say for dam and road construction) are sourced from abroad and moreover, the unit cost of implementing such projects are very high in comparison to other countries. Thus, the resultant repatriations by foreigners enhance the reverse flow of dollars to the debtor country. Fifth, the country has been turned into a super market of the rest of the world whereby cheap imports are flooding her market, an issue that is impending domestic production and henceforth constraining foreign exchange generation. Sixth, the increasing importation of unnecessary commodities such as cosmetics, hair conditioners to mention but a few, using scarce foreign exchange. Seventh, there are a lot of overt and covert political strings and unfavorable conditionality usually attached to these loans. Eighth, in some cases, the government is using borrowed funds to reserves to secure more funders, rather than investing in productive ventures to earn a return that can help in debt repayment. Finally, in some incidences, borrowed funds have been diverted to consumption and politicking rather than, investment goods to generate a return.

While the debt ratio to GDP is still in the safety range determined by the national debt strategy, for the country to sustain the debt, it has to come up with a strong debt management strategy. In this direction, the government of Uganda has tried the following strategy: “Any new borrowing must be on highly concessionary terms. A minimum of about 80% of borrowing should be on the International Development Agency (IDA) terms or better (this is to say, 40-year maturity, 10-year grace period, and 0.75% interest rate).The remaining borrowing should also be on highly concessional terms (23-year maturity, 6-year grace period, and not more than 2% interest rate). Further, it has intensified efforts to obtain relief from non-Paris Club bilateral creditors on terms comparable to those of the Paris Club members are always ongoing".

Despite the strategy, the debt burden is a tight noose around Uganda's neck—a noose that is getting tighter and tighter as with the passage of time. This is evidenced from the remarks of IMF Executive Board: "The directors stressed the prioritizing the safeguarding debt sustainability. In this regard, they called for continued domestic revenue mobilization and sound project implementation, especially to realize the envisaged growth dividend from infrastructure investment. Further, they advised the authorities to target the projected debt trajectory to provide a buffer relative to the Charter of Fiscal Responsibility's debt ceiling in case of adverse shocks"(IMF, 2017, p. 3).

The impact of the new oil wealth on public debt is yet to be ascertained. Stories from Nigeria, Venezuela and other oil-rich countries in the third world are in severe debt traps. They borrow heavily on the basis of future oil production for even non developmental goods and services. Uganda seems to be following the same pattern. Even before the sale of the first drop of oil, the government has started pledging future oil proceedings in some of its purchases, especially for security purpose (Denisentsev & Makienko, 2011). Given the prevailing socio-economic challenges, political polarization and fiscal indiscipline, public debt is likely to skyrocket in the future oil economy.

2.1.5 Monetary Policy Management

The main objectives of Uganda's monetary policy are price stabilization in the economy. Bank of Uganda has set to hold core inflation at 5% in the medium term.

2.1.5.1 Inflation

Control of inflation in Uganda has been historically challenging especially in 1970s to mid-1990s. Reducing inflation to a single digit was one of the main objectives of the economic reforms launched in 1987 after the civil war. (Kuteesa et al., 2010). In 1987, inflation was 240 percent, but reduced to 42 percent by June 1992. It drastically reduced to 5.4 percent in 1995 and since then, it has been contained in single digits, averaging 6.95 since 1998.(UBOS, 1995, 2006, 2017, 2018).

Oil discoveries are associated with increases in money supply which causes inflationary tendencies in the economy (Fardmanesh, 1991). Additionally, oil shocks have the tendency of increasing inflation in oil exporting countries (Barsky & Kilian, 2004). To control inflationary tendencies emanating from oil related money supply, revenue from oil needs to channeled through the budget. In the analysis, the prices of both factors and goods surged, but the surge was relatively mild and hence cannot be categorized as inflationary.

2.1.5.2 Exchange Rate

During the period of economic decay in Uganda; 1971 to 1985, the country lost control over exchange rate market. There was an official and a vibrant black market ("Kibanda") for foreign currency, operating side by side (Barungi, 1997). Foreign currency in the central bank was scarce due to low levels of export and higher levels of importation of military hardware to support war efforts during the civil war (Bigsten & Kayizzi-Mugerwa, 2001). Even after the war in 1986, exchange rate instability continued due to heavy importation of capital goods to rehabilitate the war shattered economy (Bigsten &

Kayizzi-Mugerwa, 2001; Kuteesa et al., 2010). It thus, took years after the launch of the recovery program for the exchange market to stabilize in 1992, when the official and black markets were unified and market forces left to determine the price in the foreign currency market (Kuteesa et al., 2010). Foreign exchange market however, has remained prone to fluctuations in coffee[10] and other exports, and the violability in the international price of crude oil will affect it (MacBean, 2012). Nevertheless, the central bank has often intervened to correct some swings in this vital market. As at the end of 2017, the exchange rate position of the local currency against the U.S dollar is; Sh. 3,596 per dollar (UBOS, 2018). The discovery of natural resources has traditionally been associated with the appreciation of the local currency against foreign currency such as the dollar – a phenomenon referred to as Dutch disease (Auty, 2001). The extent of this appreciation depends largely on the wealth effect of the new resource and the macro-economic management in place. What is certain is the very fact that an appreciation of the local currency crowds out exports consequently harming the economy. In our analysis, we balanced the current account by fixing foreign savings but flexed the exchange rate. Exchange rate appreciated and foreign savings reduced in the process.

2.2 Households Population, Poverty and Inequality

This subsection presents and elaborates the characteristics of households in Uganda in form of population, incomes and its distribution. This is very essential given the fact that the focus of our analysis is geared at these important socio-economic issues.

[10] Apparently, the chief export of the country.

2.2.1 Population

Uganda had a population of 34.6 million according to the 2014 census, of whom 54% are youth below the age of 18 years, females are more than male having a share of 55% (UBOS, 2018, p. 13). The youthful population is a blessing in disguise. If the government plans for it – in terms of quality education, health and employment opportunities, it is likely to help the country in her journey into the middle-income economies. On the other hand, poor planning for the youth – to the extent that a majority remain illiterate and jobless. may pause socio-economic challenges and socio-political upheavals in the country-like those that occurred in Northern Africa (the Arab spring). Besides the youth, there is need to plan for females who are the majority. A majority of Ugandan female are illiterate and mostly housewives working at home and on farm for the household sustenance. Currently, there is a trend for them to migrate into the Gulf region as housemaid – working in slave like conditions. Further decomposition shows that a majority of the population 81.2% live in rural areas, where they are preoccupied mostly in subsistence agriculture, mostly for their mouth and to a little extent for a small wage. The birth and death rates are estimated at 42.9/1000 and 10.2/1000 respectively, which figures are lower thanks to the international donor community. However, this imply future increase in population with all its challenges to the economy including poverty and inequality reduction. The dependence ratio of the total population is 101.6, of which 97.2 are youth and 4.4 elderly with a possible support ratio of 22.8. This suggests that the country's working population is under intense stress supporting a lot of youth and elderly. With this high ratio, savings rates in the economy are low and thus long run interest rates are likely to go up. With lower saving rates, investment rates are likely to be lower in future due to fewer availability of investable funds. The larger proportion of youth is likely to change the consumption pattern of the economy to such luxurious goods and services including computer games, smart phones, and so forth which are likely to drain the country's exchange rates. Hence, the dependence ratio bounds bad to the country's effort to fight poverty and income distribution. In another perspective, studies show that resource endowment particularly oil have the tendency to slow down or rather lower per capita income growth, due to high populations. A case in point is Nigeria, despite its huge oil and natural gas, its per capita income is merely US$ 2,028.2 (World-Bank, 2018). However, higher populations in resource rich countries is not generally as a result of resource endowment. More often, it results from higher birth rates, lower death rates and immigrations, - changes that are better for the economy's growth and development. From the demand side, high population with ability to pay are good for an economy including the oil one. Such an empowered population stimulates supply and consequently creates jobs and surges factor demands thereby increasing income. On the other hand, high populations without financial muscle, may aggravate unemployment and increase government expenditure on the unemployed and the poor in form of subsidies and other payments. Thus, the former, alleviates poverty and inequality in the economy while the latter exacerbates it. Therefore, the government should create opportunities to empower the youthful population financially for the long run prosperity of the country.

2.2.2 Poverty

Overall, Uganda has made greater strides in reducing poverty since early 1990s when it was estimated at 55.5%. It has actually achieved the millennium goal of halving poverty by the turn of the last century, where in the year 2000, it stood at 24%. This gives the impression that the rapid economic growth of the 1990s was pro-poor, as it coincided with the massive reductions in poverty and inequality. The reforms that largely implemented IMF's structural adjustments and liberalization programmes, generated rapid growth in all sectors of the economy. In addition to the growth, the government adopted many policies aimed at reducing poverty and improving the distribution of income in the country. In its efforts, the government was largely supported by the international donor community that extended financial aid, loans and grants. Privatization that witnessed once unproductive and loss-making public enterprise make profits and expand, helped many people to get employed. Moreover, the return of the deported Asian community in addition to the steady flow of FDI during the period equally boosted the economy and offered the masses the much-needed employment and income. While structural adjustment programmes led to loss of jobs particularly in the public sector and the wages offered by FDI in the liberalized sectors are very low on average, there is an observed evidence which show that both poverty and inequality, largely reduced since the reform period. Latest data on poverty from the Uganda Bureau of Statistics are presented in Table 2.1. From this table, nationally, we see poverty in the form of absolute (P0), gaps (P1) and severity (P2), on average increasing in the periods 2012/13 and 2016/17. But still, the position is far better compared to poverty rates in early 1990s, when more than half of the population were classed as poor. Although the poverty alleviation figures since 1990s are generally impressive, they disguise a great deal of poverty characteristics and dynamics.

Table 2.1: Poverty estimates for the year 2012/13 and 2016/17

	Poverty estimates 2012/13				Poverty estimates 2016/17			
	Pop. Share	P0	P1	P2	Pop. Share	P0	P1	P2
National	100	19.7	5.2	2.0	100	21.4	5.3	1.9
Rural	77.4	22.8	6.0	2.4	75.5	25.0	6.3	2.3
Urban	22.6	9.3	2.5	0.9	24.3	9.6	2.0	0.6
Central	25.8	4.7	1.0	0.3	27.6	12.7	3.1	1.1
Eastern	29.7	24.5	5.3	1.7	26.2	35.7	8.7	3.1
Northern	21.1	43.7	14.1	6.2	20.8	32.5	8.6	3.3
Western	23.5	8.7	1.7	0.5	25.5	11.4	2.4	0.8

Source: UBOS (2018)

Notes: P0 = Absolute Poverty, P1 = Poverty gaps, P2 = Poverty severity

Foremost, Uganda has an extremely low poverty line that leads to a flawed picture being specified on the scope of deprivation. Further, consumption distribution in the country is enormously flat. This flatness suggests that a significant number of people live on the boundaries of poverty line, are extremely vulnerability to the extent that any "minor shocks" can plunge them back into poverty.

It is noted however that the poverty reduction steam that picked up in the early 1990s has continued into 2000s. What are factors explaining continued reduction in poverty in the country in recent years? First, households increased agricultural income and specialization. In the period 2006 to 2010, income from agriculture production has accounted 53 percent of poverty reduction in the country whereas from 2010 onwards, agricultural income share in national poverty reduction has increased to an overwhelming 77 percent (USAID, 2016). Subsistence farming is the chief source of earning of 53 percent of the poorest 40 percent and 51 percent of households living below $1.90 per day (World-Bank, 2015a). Second, diversification of economic activities by households. Unlike in the 1980s and 1990s, from 2000 onwards, households in the country have now multiple sources of income. While 76 percent of the population still derive their earnings from agricultural production, the earnings from this sector is only most crucial for 42 percent and merely 26 percent rely exclusively on this sector whose output and thus income heavily depends on weather conditions (USAID, 2016). In recent years, off-the farm employment in the country including in the rural areas where the poor mostly live has increased and it is apparently one of the leading drivers of poverty reduction. Over 70 percent of households in the country now derive their earnings from wage or other non-farm employments (MoFPED, 2014). Thus, the diversification of earning sources has helped households overcome shocks associated with agricultural production that is rainy-fed. This in turn has helped them accumulate resources to finance education to enter formal employment where they are earning a stable income (World-Bank, 2015a). Third, education. A study by Ssewanyana and Kasirye (2012) found that the more years of education individuals in Uganda attained the higher the income they obtained. Household heads in the country who completed primary school was found to be earning 10 percent more than the ones who dropped out (World-Bank, 2015a). The increased attainment of education is playing a role in poverty reduction in the country. Finally, Peace dividend in Northern Uganda is an important factor in explaining reduction in poverty in that region.

In 2006, there was a truce accord signed between the government of Uganda and the Lord's Resistance Army rebels in the North headed by Joseph Kony that formally ended the insurgency. Despite the continued pockets of resistance, the relative peace prevailing in the country has helped households who were displaced into camps return back to their homes to restart their livelihood and accumulate assets (CPAN, 2013). The return of peace has been associated with the reduction in the number of persons who are chronically poor, from 45 percent in 2005/06 when the accord was signed to 26 percent in 2009/10 (USAID, 2016).

In terms of numbers at the national level, poor people have been unstable in the period between 2005/06 to 2016/17. The numbers first reduced from 8.4 million in 2005/06 to 7.5 million and further to 6.7 million in 2009/10 and 2012/13 respectively, only to rise again to 8.0 million in 2016/17 (Table 2.2).

Table 2.2: Poor Persons in Uganda 2005/06-2016/17 (in millions)

	2005/06	2009/10	2012/13	2016/17
National	8.4	7.5	6.7	8.0
Rural	7.9	7.1	6	7.1
Urban	0.6	0.4	0.7	0.9
Central	1.3	0.9	0.4	0.9
Eastern	2.5	2.2	2.5	3.6
Northern	3.5	2.8	3.1	2.3
Western	1.4	1.6	0.6	1.1
Source: UBOS (2018)				

According to the data in this table, poverty in the country remains a rural phenomenon to the extent that almost all the poor people in the country, 7.1 million persons resided in rural areas in the fiscal year 2016/17. This therefore suggests that efforts to reduce poverty in the country needs to be rural biased.

Regionally, the Eastern part of the country has the largest number of poor persons (3.6 million) followed by the northern (2.3Million). What could be the reason behind high numbers of people still trapped in poverty in these two regions? First and foremost, the answer lies in the historical development of the country. These two regions have lagged behind other areas due to colonial policies that developed at the central parts plus other regions where they acquired raw materials for their factories in Europe and sold finished products. The biased development policy seems to be followed by the current NRM leadership which has been in power since 1986. The central region where the capital is located and the western region where most of the political elites are drawn, are far ahead of other regions. Another prominent factor explaining the dismal performance of Northern Uganda in as far as poverty reduction is concerned is insurgency that ranged on since the late 1980s until recently. The insurgency was characterized with massive loss of lives, assets and livelihood as well as displacement of households who were forced to live in internally displaced campus protected by the army (MoFPED, 2014). Thus, the prolonged insurgency greatly reduced household livelihood options and aggravated other household shocks driving many into poverty. The performance of the Eastern region with regards to poverty reduction was equally poor. There are a couple of factors accounting for the dismal performance of the East including poor weather conditions that increased crop failure, high dependence ratio that drained most of the household resources and the growing population pressure contributing the land fragmentations and soil degradation (MoFPED, 2014).

With respect to poverty by the source of income presented in Table 2.3, poverty is, predominantly an agricultural spectacle.

Table 2.3: Poverty by most important source Household Income 2009/10

		Poverty Levels			Contribution to Poverty		
	Population share	P0	P1	P2	P0	P1	P2
Agriculture	51.5	28.6	7.7	3	60.2	58.8	56.2
Wage Employment	21.3	17.1	4.3	1.7	14.9	13.7	13
Nonagricultural firms	20.4	22.1	6.6	3.1	18.4	19.8	22.5
Remittance	4.5	20.5	6.2	2.6	3.7	4.1	4.1
Others	2.3	29.1	10.6	5.1	2.7	3.6	4.2
Source: (UBOS, 2017, 2018; UNHS, 2010)							

Households engaged in agricultural activities are poorer than those drawing their earnings from other undertakings, as measured by P0, P1 and P2, and has the largest share of contribution to poverty respectively. This is a very big challenge to government given the fact that the agricultural sector employs the largest number of the country's population. Some interventional policies must be adopted including injection of financial resources into this sector. Households in nonagricultural activities follows those in agriculture in poverty (see Table 2.3). Households in wage employment and those who depends on continuous remittances experience lower poverty overall. These statistics therefore suggests that, efforts to increase households in formal employment and remittances can assist the government to reduce poverty.

Empirical studies on the effects of oil on poverty are rather pervasive. In some, oil has been found to increase poverty (Aaron, 2005; Ali-Akpajiak & Pyke, 2003; Ucha, 2010), while in others, it has helped in reducing it (Ite, 2005). In our analysis, oil has been found to reduce poverty. The channels through which oil reduced poverty was via its impacts on economic sectors, GDP growth, plus the improvements on inequality and welfare.

2.2.3 Inequality

Inequality is measured in Uganda by the relative mean expenditure and Gini coefficient. To understand the scope of inequality in Uganda for the purpose of this study, we look at the Gini coefficient. For, it is a useful measure that provides the extent of equitability of the distribution across the population. In 1992, a few years after the launching of the economic reforms in late 1980s, the Gini coefficient for the country was estimated at 0.36, but since 2000, it has averaged 0.40. However, the latest data as of 2016/17, show inequality in the country to be 0.42, a slight increase from the previous survey 2012/13 where it was 0.40 (Table 2.4). The trend of inequality is showing a zig zag trend (increase and decrease). It has increased from 0.41 in 2005/06 to 0.426 in 2009/10. In 2012/13, it again reduced from 0.426 in 2009/10 to 0.40 only to rise to 0.42 in 2016/17.

By and large, these statistical trends suggest that a small portion of the population are very rich while a larger portion are struggling financially. Inequality is an urban challenge and more in the central region, which is the center of the country's economic activities.

Table 2.4: Gini Coefficient by Sub region 2005 - 2013

	2005/06	2009/10	2012/13	2016/17
National	0.408	0.426	0.40	0.42
Residence				
Rural	0.432	0.447	0.341	0.38
Urban	0.363	0.375	0.41	0.42
Region				
Central	0.417	0.451	0.392	0.41
Eastern	0.354	0.319	0.319	0.34
Northern	0.331	0.367	0.378	0.39
Western	0.342	0.375	0.328	0.39
Source: UBOS (2018)				

That makes the regions to naturally have more rich people than other regions. National inequality reduction is largely as a result of the reduction in inequality in rural areas. Thus, like poverty, efforts to reduce inequality by policy makers and implementers, needs to have a rural bias element.

Finally, the decomposition of inequality presented in Table 2.5 reveals a lot of useful information about the between and within income gaps by area of residence, region and educational level of households.

For the period 1992/03 to 2012/13, within rural or urban inequality has been high on average compared to between the two residential areas. Within either rural or urban inequality was 83 percent while between was only 17 percent. Similar patterns are observed regionally and by educational levels.

Table 2.5: Decomposition of Inequality (%)

Sub-groupings		1992/03	2002/03	2005/06	2009/10	2012/13
Rural/Urban	Between	14.6	20.7	15.6	17.1	17
	Within	85.4	79.3	84.4	82.9	83
Region	Between	8.7	17	19.6	20.7	16.5
	Within	91.3	83	80.4	79.3	83.5
Education	Between	14.6	27.3	25.4	28.6	24
	Within	85.4	72.7	74.6	71.4	76
Source: UBOS, (2017)						

Within regions, inequality was estimated at 83.5 percent and between regions 16.5 percent, within educational attainment was 76 percent and between, it was 24 percent. Inequality in the country is largely a within the different sub-grouping challenge. However, to overcome the challenge of inequality in the country, the government should focus their attention on both between and within inequality, since both have high incidences.

From these figures and discussions, we note that inequality in the country is still a change despite the significant growth and developments that has taken place since independence partly since the late 1980s. What are the factors explaining the evolution and persistence of inequality in Uganda? Inequality in Uganda has existed since time immemorial, but its proper evolution can be traced from the colonial period beginning in 1893 (Mamdani, 1983). Colonialism destroyed the local economy which grossly increased incidences of inequality. Firstly, locals were forced reduce the supply of local food crop and in their place, they adopted foreign cash crops mostly on government farms (Mamdani, 1983). This reduced the incomes partly of the small farmers while the new class of commercial farmers climbed up. Secondly, white farmers took up most of commercial farming, large businesses and administration. This ensured their accumulation of assets and harvesting of huge profits. The Asian, partly from the Indian sub-continent took over must of the commerce in the country from the local. This widen the income gap between the rich and poor in the country (Mamdani, 1983). Finally, the colonialists redistributed land in such a way that those persons and individuals who helped them in their colonial project were awarded with bulk land at the expense of those who did not get the privilege to work for or with colonialists. This aggravated inequality in the country. Inequality has continued unto date and more importantly in recent years due to many factors. Following a report by Oxfam by (Nuwagaba & Muhumuza, 2017), we discuss a few of them in this section.

1. Non-inclusive growth

GDP growth has been documented to improve poverty and inequality reductions. GDP growth in Uganda however, has largely been driven by service and manufacturing sectors since the 1990s, however, these sectors employ merely 1.6 percent of formal workforce who are mostly educated (Nuwagaba & Muhumuza, 2017). This has ensured that the few who obtain employment in these sectors continue getting reasonable income while the rest are left behind. Agriculture which employs approximately three-quarters of the population is lagging behind in its contribution to GDP growth.

Non-inclusive growth emanated from the implementation of the world bank structural adjustment programmes, by which the government liberalized the economy. The liberalization mostly benefited middlemen and large traders who harvest huge profits, leaving out small farmers and traders. For instance, the 1990s coffee boom benefited farmers who earned reasonably at farm gate prices. But this was short-live by the emergency of middlemen and large traders who came in and too much of the profits previously enjoyed by the farmers (Nuwagaba & Muhumuza, 2017).

Apart from the hijack the farmers had in the marketing of their crops which negatively affected their income and drove many into poverty, full liberalization of the economy particularly the commodity market destroyed the platform such as the cooperative boards which provided them safety net in adverse situations. For example, when the prices of major cash crops like coffee, vanilla collapsed in the period 1990 to 2004, a substantial number of farmers were plugged into poverty (Nuwagaba & Muhumuza, 2017). In the pre-liberalization period, farmers cooperatives used to insulate them from price volatility and hence ensured a stable flow of income, which in turn helped them alleviate poverty. In addition to price stabilization, cooperatives too, helped farmers access farm inputs and supplies at reasonable prices. However, after liberalization, this was no longer the case. Farmers had now to purchase farm requirements at high prices in the open market. The alternative to the farmer cooperatives – the National Agricultural Advisory Service (NAADS) launched in 2001 has done little if any to address the plight of the poor. It is largely focusing on training farmers and inflating administrative costs. It is plagued in massive corruption, and outright theft.

2. Employment opportunities

Persistent and increasing unemployment in the country is widen income distribution gaps. Privatization of public enterprises has not created the much-anticipated jobs. The private sector has not growth as projected, and population has surged more than the growth of jobs. This is causing unemployment and hence inequality. Youth unemployment is also exacerbating inequality. Youth account for 19.5 percent of total unemployment in the country. Out of the estimated 400,000 youth who graduate from tertiary institutions in the country, about 130,000 get absorbed into the job market, a figure which translate into 67.5 percent unemployment rate (Nuwagaba & Muhumuza, 2017). Youth unemployment is worsen by the structural segregation in the job market is real, where 50 percent of working women are engaged in low paying jobs compared to 33 percent of their counterpart – the men.40 percent of women in the country are engaged in unpaid labour mostly in the agricultural sector and house chores such as cooking, looking after children (UBOS, 2018). They spend 5 hours daily on house chores yet men only 1 hour (UBOS, 2018).

Unemployment is aggravated by inequality in renumeration. Salaries and wages are supposed to be determined by the level of education and experience. It is not the case in Uganda. In the private sector dominated by Indian, the renumeration offered to Ugandan is very low compared to what is given to Indian moreover with less education and experience. The same problem does exist in the public sector. There is gross renumeration inequality is real within organization and between organization. Wage inequality is skewed in favor of semi-independent public organizations such as Uganda Revenue Authority, Office of the Auditor General, National Social Security Fund, and Bank of Uganda. In these organizations, drivers and messengers earn more than senior public servants. In Uganda, top executives at some of these semi-independent public organization earn up to Ush. 30–40 million ($8,800–11,800) monthly, while the lowest cadres there earn about Ush. 1million ($294) (Nuwagaba & Muhumuza, 2017). By contrast, permanent secretaries heading ministries and consultant surgeons earn about Ush. 3m ($900) a month, while nurses and office messengers in other public bodies earn about Ush. 300,000 ($90) (Nuwagaba & Muhumuza, 2017). Further, there wide-ranging allegations of anomalies in the recruitment and promotion of personnel. And worse of all, some public servant for examples the members of parliament determine their own renumeration. For instance, the monthly earning of an MP in Uganda is approximately Ush. 30m ($8,800) while a secondary school teacher earns Ush. 600,000 ($180), about one-fiftieth as much (Nuwagaba & Muhumuza, 2017).

3. Regressive tax policies

Income tax has been set at 30 percent irrespective of the level of earning, which is hurting the poor earners. Foreign investors are given grace periods sometimes up to 10 years without paying taxes, in addition to not paying import taxes for equipment they import into the country to set up their businesses (Nuwagaba & Muhumuza, 2017). Such exemptions are not given to local investors, which is reducing the profitability of business on the side of locals sometimes pushing them out of business.

4. Focus of public expenditure

Like any poor country, much of the public investments in Uganda in social services like education, healthcare and other essential infrastructures are concentrated in urban centers widening the gap between rural and urban areas. In recent years, there has not significant public investments in rural electrification in an effort to extent development across the country, save the environment via reduction in use of firewood as a source of energy and reductions in the incidences of firewood and other smoke related illness. On the ground however, expansion of electrification has not benefited the poor on the following grounds. First, the initial connection costs are overpriced driving many from the national grid, second, electricity bills are very high rendering many who have struggled to pay the connection fee not to be in position to pay (Nuwagaba & Muhumuza, 2017).

While many health care facilities have been expanded and extended in the rural areas. These facilities are under staffed and they grossly lack medical supplied and as a result, 49 percent of mothers in the rural areas still delivery using traditional birth attendants in their homes (Nuwagaba & Muhumuza, 2017). Further, the country has still one of the highest maternal mortality rates globally estimated at 435 maternal death per 100,000 live birth annually (Nuwagaba & Muhumuza, 2017).

The shortage of staff particularly in rural areas is linked to poor pay, poor public services like schools, safe drinking waters, in rural areas and generally lack of incentives. These are driving away many of the potential health workers from training and from going to work in such areas.

Furthermore, the county faces bloated costs of public administration as a result of the creation of a lot of layers of local government. Public administration absorbs approximately 18 percent of total expenditure, yet the country has merely one doctor for every 24,725 people (UBS, 2018). Moreover, most of those administrative units are operating with insufficient resources which is grossly compromising their efforts to derive services to the people, particularly the poor.

The liberation policies in place since 1990s have led to substantial private investment in the social sectors especially in all levels of education and in the health sector. However, the costs of accessing education and health care in the private sector is too high. Worse, the education sector is still based on an outdated and inappropriate curriculum that is largely academic and fails to equip skills or human capital, that could expand entrepreneurism in the country (Nuwagaba & Muhumuza, 2017). This partly explains the growing unemployment amongst the youth in the country, that is widening income inequality.

5. Money value of infrastructure projects

The government is currently implementing huge infrastructural investments in the country. These includes among others: The Standard Gauge Railway (SGR) line linking the country to the Kenyan coastal city of Mombasa at a cost of $3.6bn,99 the Karuma hydroelectric dam ($1.7bn),100 an oil refinery ($9bn) and oil pipeline ($4bn)101 and roads (Nuwagaba & Muhumuza, 2017).. While these infrastructures have long-run benefits, in the short-run, they have little direct benefit to the poor, if any. Since most, if, not all of these massive investments are financed by foreign loans, the increase the debt repayment burden especially on the poor masses. Secondly, the plight of the poor is being worsen due to these investments via displacement and inadequate land compensations. Return on these projects is not visible in the short-run, and the government has been forced to borrow more to stimulate the economy which is accumulating debt, worsen repayment problem and exacerbating the cost of domestic financing due to raise in interest rate on loanable funds. Another way out to overcome the lack of short-term returns to these investments is through reduction on public expenditure on social services that directly affects the poor.

6. Land: the inequality wedge

Land is the most crucial factor in terms of livelihood particularly the poor but its distribution in Uganda is poor due to the tenure system, including: freehold, customary, leasehold and mailo tenures. These tenure systems have perpetuated cultural and historical inequalities in the distribution of this vital factor of production, privileging certain ethnicities and individuals and strengthening the exception of women[11] and children from ownership.

While land is one of the few assets directly controlled by citizens, in Uganda, ownership of this vital asset is being threaten by rampant menace of land grabbing by the public, a few political elites (mostly those close to the president) and speculators to give way to infrastructure projects, commercial agriculture and to foreign investors (Nuwagaba & Muhumuza, 2017). Land grabbing is going beyond proportion and is exacerbating asset and income inequality in the process. Northern region and the Albertine graben where oil has been discovery, leads in the grabbing incidences.

Whereas high population growth is worsening inequality in land distribution, economic factors in particular, economic growth, is playing a very big role in this inequality.

[11] In Africa and specifically in Ugandan cultural practices, female are have no share in land and other assets distribution during inheritance. This cultural bias is leaving them behind compared to their male counterpart.

7. Financial capital access

Studies have shown that easy access to credit is very crucial in overcoming poverty and inequality. However, in Uganda, access to financial services is very poor. There are only 26 commercial banks with 564 branches and 5.3 million bank accounts against an estimated population of 40 million (UBOS,2019). Worse of all, since the privatization of the only government financial institution – the Uganda Commercial Bank in 2001, and the subsequent collapse of a number of domestically owned banks since late 1990s, the banking sector has been taken over by foreign banks. This has worsened inequality in access to financial services, and income.

Foreign banks have over 50 percent share of the financial service, focus mainly on commercial while neglecting agricultural financing since it is not lucrative. Branches are concentrated in urban areas; financial infrastructure is poor in the country in general but very poor in the rural areas. Interest rates are very high ranging between 20 to 30 percent (UBOS, 2018). Bank loan guarantees demanded by financial institutions are mostly higher in value than the credit sought.

Other financial institutions focusing on offering financial services to the poor such as the numerous micro-finance institutions (MFIs), savings and credit cooperatives (SACCOs), plus, village savings and loan associations (VSLAs), are not adequately solving the inequality in financial service access either. They advance limited amounts to their poor borrowers and charge higher interests than commercial banks, citing high costs of serving scattered clients and source of their financing capital.

Only 8.3 percent of Ugandan are banked and out of these, only 12 percent have ever accessed loans in formal financial institutions. Most Ugandan are not accessing financial credits due to among others: fear of being in debt (31 percent), amount of collateral required (14 percent), lack of collateral (13 percent), and the complicated and length loan processing procedure (Nuwagaba & Muhumuza, 2017). Thus, most of the population, especially the poor, turn to informal channels spearheaded by informal money lenders to have some bit of access to credit. This exposes them to exorbitant interest rates which often drive them deep into poverty.

8. Governance

Studies have proved that governance is a crucial fact in alleviating not only poverty but also inequality. It ensures coming up with right decisions, optimal allocation of public resource, good formulation, implementation and monitoring of public projects among others.

The government of Uganda is not performing well on this vital factor. Apart from a few public institutions such as the army, police, Uganda Revenue Authority, the government seems very much reluctant to strengthen some of the most important public institutions for instance, the parliament, the judicially and the Inspector General of Government (Nuwagaba & Muhumuza, 2017). The reluctance to strengthen public institutions seems to be intentional since it is serving the larger interests of the president and ensuring his continued political stay. Important national issues in parliament are often solved through caucus of the ruling part or through outright bribing of member of parliament. Election rigging petitions, and accumulating land grabbing cases in courts of law has exposed the gross weakness in the country's judiciary system (Nuwagaba & Muhumuza, 2017). It is always in favor of the executive or those close to the ruling part, even when there is clear evidence to the contrary.

Lack of representation is also a challenge that is increasing inequality. Most of the cabinet ministers are from the western part of the country. Thus, when it comes to resource allocations, they are being made in favor of western part of the country where most of the decision markers come from. This partly explains why inequality and poverty is lower there (UBOS, 2018). Secondly, while women have good representation in both parliament and cabinet, their representation does not give them real leverage in policy making. For instance, in the 9th Parliament, they are 135 out of 386 MPs, implying 35 percent; 7 out of 31 cabinet positions (22.6 percent), 13 out of the 49 positions (26.5 percent) (). As a consequence of lack of effective representation, there is gender bias in resource allocation, exposing women to continued high maternal death rates and the laws that discriminate them in resource acquisition such as inheritance of assets from either their parents, children or husbands.

9. Corruption

Corruption is perhaps the most serious challenging facing the country, threatening its very survival as a nation, an issue that has been acknowledged by the country's strong man – president Museveni, who on many occasions. It is so deeply entrenched and possibly constituting a larger part Ugandan DNA, apparently eroding almost all public institutions like the police and the judiciary.119 There have been a few serious documented cases involving the loss of colossal sums of public fund through the embezzlement, bribery and diversion. Notable examples include but not limited to a 2013 project to install underground fiber-optic internet cables (involving USh 107.3bn), construction of the Mukono–Katosi road in 2014 (USh 165bn), a corruption and embezzlement scandal involving the Office of the Prime Minister (OPM) in 2012 (USh 50.2bn), funds embezzled from the Global Fund and Gavi in 2003 and 2006 (USh 600bn) and corruption linked to the Commonwealth Heads of Government Meeting (CHOGM) in 2007 (USh 247bn) (Nuwagaba & Muhumuza, 2017).

The country loses approximately $250m (USh 866bn) each year due to corruption; an amount that could build about 50 state-of-the-art district hospitals and 500 Health Centre IVs or finance 100 secondary schools or five universities, annually (Nuwagaba & Muhumuza, 2017).

However, the government appears to be self-satisfied on this issue and there is a deliberate lack of political will when it comes to following up those guilty of corruption. Many cases have been exposed, but relatively few prosecutions have been brought and few guilty parties sentenced. Even then, the targets for prosecution are often ‘small fish’, while those in authority – the real overseers and drivers of corruption – swim freely (Nuwagaba & Muhumuza, 2017). This lack of meaningful deterrent encourages corruption, because the perpetrators know that they are unlikely to be punished even if they are caught.

Many of those in charge of public resources have dipped their fingers into the public purse with impunity, and corruption has socio-cultural practices become a lucrative business. Other examples include massive fraud in the UNRA, a 2011 scandal involving the procurement of bicycles by the Ministry of Local Government and largescale pension fraud at the Ministry of Public Service.

The government's apparent inaction in rooting out corruption is further evidenced by the fact that recent reports by the Auditor General have not been discussed in Parliament, as required by law. Yet these reports offer an opportunity to follow up on cases of large-scale corruption and abuse of public resources. Without proper scrutiny of such evidence and without concrete action to tackle the endemic misappropriation of public resources, corruption will continue to worsen poverty and

inequality.

10. Conflict and instability

Conflict, violence and insurgency inflict direct losses and hinder development. They contribute to the breakdown of social infrastructure and forestall the public and private sector investment in basic social services. Conflict prone areas knows nothing except loss of lives and property, displacement, poverty and deprivation. They are left behind other secure areas in terms of development. The five-year civil war (1980 to 1985) devasted the so called Luwero-triangle region to the extent that until today, the region has not recovered from the effect of the war. Similarly, northern Uganda, which for 30 years has experienced insurgency and its consequences, poverty is observed everywhere compared with the rest of the country.125 Huge amount of funds have been injected in this region by both the government and her development partners such as the Northern Uganda Social Action Fund, but on the ground, there is less improvements, and so, inequality and poverty, are still the norms there. In that region, a substantial number of households are headed by women, men having perished in the civil war. The survivors particularly the women and children are severely traumatized.

Research findings on the impacts of oil on inequality are inconclusive. Some studies have shown oil to increase the divide between the rich and poor because huge income from oil normally goes to the few expatriates, politicians and elites (Collier, 1981; Fuentes-Nieva & Galasso, 2014; Oviasuyi & Uwadiae, 2010). Other studies on the other hand, have concluded that oil has the ability to reduce inequality (Goderis & Malone, 2011; Kim & Lin, 2018). In the current study, the discovery of oil is good news to the country's battle with inequality, since all the simulations we carried out reduced inequality in our model.

2.3 Africa and Her Natural Resources

Prior to looking at oil in Uganda, we give a brief overview of natural resource industry in Africa as a whole. The understanding of this industry from an African perspective can give us an insight of what will be the likely case for the new discovery in Uganda, since almost all African countries have much in common.

2.3.1 An overview

Africa, is continent comprising of 54 sovereign states. It is approximately 30.3 million Km^2, covering 6% of the earth (Sayre, 1999). It is the second largest continent and second populous on earth. It has the largest arable land mass, second largest and longest rivers (Congo and Nile respectively) and second largest tropical forest (Sayre, 1999). As of 2018, it has an estimated population of 1.2 billion, accounting for 16% of human population, and its population is the youngest of all continents averaging 19.7 (UN, 2018). It is blessed with infinity beauty, abundant flora and fauna, variety of food, ethnicities, culture, languages and above all precious minerals including oil, gas, gold, diamonds, platinum and many rare natural resources needed by the global community to power airplanes, cellphones, missiles, among others (AfDB, 2016; Sayre, 1999).

According to recent IMF report, out of the ten fastest growing economies in the world, six[12] are located in Africa (IMF, 2019). Additional, IMF forecast the continent to grow in 2019 at 6.8% exceeding the global growth average of 4.7. The continent is home to 30%, 8[13]% and 7.8% of proven world mineral, oil and gas reserves respectively (AfDB, 2016). As of 2015, natural resources in African resource-rich countries accounts for 77% of total exports, 28% of GDP and 42% of government revenue (AfDB, 2016). Africa's proven oil reserves have grown by almost 150% since 1980 – increasing from 53.4 billion barrels to 130.3 billion barrels at the end of 2012 (BP, 2012). Africa is home to five of the top 30 oil-producing countries in the world, and nearly $2 trillion of investments are expected by 2036. Given these statistical facts, the continent is of great interest to major world powers particularly China, U.S and the European Union.

For instance, by end of 2008, over 500 multinational oil companies from Europe, America, Asia, Australia were documented to be exploring and exploiting African vast hydrocarbons. Eni (Italy), with an estimated US$25 and ExxonMobil (U.S) with an estimated US$24 billion are by far the largest investors. Other companies with substantial investments in Africa's hydrocarbons includes CNODC[14], CNPC[15], ZPEP, Sinopec (China), BP[16], Savannah Petroleum, Perenko (UK), Statoil (Norway), ELF, Total

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[12]Ethiopia, Rwanda, Ghana, Côte d'Ivoire, Senegal, Benin
[13]This figure is far lower than that of Middle East which account for 62% of world oil reserves.
[14] China National Oil Development Corporation
[15] China National Offshore Petroleum Corporation
[16] British Petroleum

(France), Petronas (Malaysia), Rosneft (Russia), Chevron, Anadarko (US), Royal Dutch Shell (Netherlands) (AfDB, 2009).

The top richest countries in terms of oil reserves are Libya (which has 48.5 billion barrels worth of reserves), Nigeria (37.1 billion barrels), Algeria (12.2 billion barrels), Angola (8.2 billion barrels), Sudan/South Sudan (5.0 billion barrels[17]), Egypt (3.9 billion barrels), Gabon (2.0 billion barrels), Republic of Congo (1.6 billion barrels), Chad (1.5 billion barrels) and Equatorial Guinea (1.1 billion barrels) (BP, 2016), Others countries with proven oil reserves but less than 1 billion of barrels includes Ghana, Tunisia, Cameroon, DRC[18], Niger, Ivory Coast, South Africa, Benin, Morocco and Ethiopia (BP, 2016). Emerging countries in the hydrocarbons on the continent includes Uganda (6.5 billion barrels of oil), Kenya, Tanzania, Mozambique and Somalia(BP, 2016).The top oil producer in Africa are in ascending order; Nigeria (1,900,000 barrels/day), Angola (1,507,000 barrels/day), Algeria (1,171,000 barrels/day), Egypt (582,000 barrels/ day), Libya (528,000 barrels/day), Congo (317,000 barrels/day), Sudan and South Sudan (255,000 barrels/day), Equatorial Guinea (227,000 Barrels/Day), Gabon (210,000 Barrels/ Day) and South Africa (160,000 Barrels/ Day) (BP, 2016).

2.3.2 Challenges to Africa's Extractive Industry

Despite the abundance of natural resource like oil and gas, Africa is yet to utilize her resources in way that benefit the masses. Some of the obstacles faced by the extractive industry in Africa includes among others.

[17] Out of this South Sudan's share is 3.5 billion barrels
[18] Democratic Republic of Congo

2.3.2.1 Lack of Technology and Capital

Oil exploration and exploitation, is an exclusive affair of multinational corporations mostly from the developed world. They have monopoly over technology, and the required capital - human or otherwise. With capital and skilled manpower, they take the lions' share in the proceedings from African natural resources. Due to corruption and lack of transparency in production sharing agreements, African governments normally cede much wealth to the foreign investors in the ways the specifics of the agreements are reached at. They poorly negotiate their shares in participation, royalties, costs and production shares. Further, some lose revenue from income tax, capital gain, surface rentals and signature bonuses due to evasion and avoidance. Therefore, despite the enormous reserves, much of the revenue is pocketed by oil companies who repatriate it to develop their countries and civilizations.

2.3.2.2 Inadequate Oil Infrastructure

Africa consumes an estimated 4.1% of global oil, yet it has only 2.6% of global refinery production, which leaves the continent with a large deficit of 1.5% to be filled by imports (Priya, 2018). Despite the refining capacity being in position to meet 90% of Africa's oil demand, low through run rates keeps the production level far below capacity. The low run rates arise from a number of factors ranging from shortages of equipment and inadequate infrastructure to sabotage and civil wars. In addition to these, shortage of capital has prevented the upgrading and modernization of Africa's oldest and least sophisticated oil refinery plants (Priya, 2018). As a result, 38 out of the 54 African countries (approximately 70%) are net oil importers, including most oil-rich countries like Nigeria and Angola. Given, the infrastructural challenges, many oil-rich countries export their crude oil at lower prices only to import refined one at a higher cost which wipes away the little foreign exchange these countries would have to build their foreign reserves, sovereign fund, acquire technology, skill-up human capital and above all invest in vital sectors that could provide opportunities to the poor thereby alleviating poverty and inequality.

2.3.2.3 Rentier State production model

The abundance of natural resources has made resource-rich nations to adopt rentier state models rather than production ones in their economies. African rentier states receive much of the revenue from the external world through resource exports, pegging the survival of their political system on continued flow of accrues – the rents. In Gadhafi's Libya, Bouteflika′s Algeria, Dos Santos' Angola, Paul Biya′s Cameroon, Omar Bongo's Gabon, and Nigeria under different rulers; the abundance of oil ensured continued support to ruling elites. They used the rent to preserve traditional loyalties through generous welfare donations that gave weight to their political legitimacy. In these countries, political support is bought off through the notion of no taxation, consumption subsidies and patronage. This has detached rulers from the ruled, since there is no representation and physical legitimacy, making rulers to rule for longer periods uninterrupted. In countries like Libya, DRC, and Nigeria, where the masses have sensed appropriation of their natural resources by a few ruling elites, opposition has emerged and violent conflicts ensued. All these have exacerbated the plight of the poor in these rentier states.

2.3.2.4 Poor Mobilization of Public Revenue

Direct tax collection requires a high degree of voluntarism, efficiency and state legitimacy; issues that are fundamentally lacking in rentier states. To raise funds, rentier states rely on a combination of oil revenue and minimal taxation – mostly indirect in the form of sales tax. This explains why some oil-rich African countries raise relatively less taxes than their resource-scarce counterparts. For instance, a resource-rich country like Nigeria collected less tax revenue in relation to its size (9% of GDP in 2008) than a resource-scarce country like Burundi (16.6% of GDP in 2008) (Ndikumana & Boyce, 2012).

Further, natural resource-rich African countries have failed to mobilize enough revenue due to the severe financial hemorrhage they have endured through capital flight, corruption and tax evasion plus avoidance over the past decades. The hemorrhage seems to have increased manifold during the oil boom periods. For instance, a study by Ndikumana and Boyce (2012), documents how some oil exporting countries lost vast amount of money. In the period 1970 to 2008, Nigeria lost a staggering $296 billion to capital flight, about $71 billion went 'missing' from Angola between 1985 and 2008, since 1980s Côte d'Ivoire has lost $45 billion, the DRC ($31 billion), Cameroon ($24 billion), the Republic of Congo ($24 billion), and Sudan ($18 billion). With such stories of plunder, there is little left to alleviate poverty and all that ends up in the pockets of a few political and economic elites consequently increasing inequality.

2.3.2.5 Civil wars and Political Conflicts

African countries rich in national resources have been plunged into armed conflicts linked to scrambling for such resources (Arezki et al., 2015; Caselli et al., 2015; Ross, 2004).

DRC has never seen peace ever since her independence from Belgium due to chiefly, mineral induced conflicts (Jean-François et al., 2014). Nigeria fought a bloody civil war (commonly known as Biafra) to retain the oil-rich Niger Delta region that wanted to secede in the late 1960s. Still lawlessness characterizes that region, with numerous sabotages in the form of oil pipeline blasts and blowing of other oil infrastructure, kidnapping and murder of oil workers. Moreover, oil activities have devastated much of the environment there, destroyed livelihood and brought Shell oil company in direct confrontation with the people in the region. Angola spent three decades fighting a devastating civil war sparked by control over petroleum resources (Frynas & Wood, 2001). Sierra Leone fought a deadly civil war for control over diamonds and oil (Zack-Williams, 1999). The war caused untold suffering, destroyed infrastructure and severally retarded the economy. Sudan fought a civil war for four decades until the country was fractured into Sudan and South Sudan. South Sudan with sizable amount of oil has been in a state of civil war since its partition from Sudan. Similarly wars partly aimed at controlling resource have been witnessed in Chad and Central African Republic. Finally, the senseless fighting in Libya are partly due to control of petroleum resources. These wars have killed people, brought economies to their knees and exacerbated poverty and inequality along the way.

Because of these illustrated issues peculiar to natural resource-rich African countries, poverty and inequality is still a challenge, a bitter fact that has been noted by a number of prominent scholars (Gary & Karl, 2003; Ross, 2001, 2007; Schubert, 2006). Studies by Gary and Karl (2003) and Schubert (2006), have confirmed how oil-rich African countries notably Nigeria, Angola, Equatorial Guinea, Chad, Sudan, Gabon, and the

Republic of Congo, have more than 50% of their population living below the international poverty line of less than 2 dollars per day. Further analysis by Ndikumana and Boyce (2012), have revealed how despite the quadrupling of Nigerian oil rent from $15 billion to $58 billion, the number of poor persons in the country have increased from 80 million to 130 million in the period 1992 to 2010. The analysis too, confirmed that despite Angola having 55%, 94% and 80% of oil in GDP, export and total revenue respectively, it has extreme inequality and 70% of the population lives on less than $2 per day.

African states still at the infancy stages of oil production, like Uganda have these examples to learn from and contemplate, most significantly on how they can manage the oil industry and its revenue, in a way that can lead to development of their economies as well as lifting the standards of living of the people, without causing political conflicts, income inequality, or environmental destruction.

2.4 Oil in Uganda

The recent discovery of oil and gas in Uganda has some implications for the country of 34 million people. In this section, we narrate the developments in the oil sector, beginning with the historical journey leading to the discovery.

2.4.1 History of Oil Discovery in Uganda

The presence of sedimentary rocks containing hydrocarbons in the country's great rift valley has been known by locals since the 19th century when they came across oil seeps. Such presences were documented by Emir Pasha in 1877 and Lord Fredrick Lugard (an explorer and British colonialist) in 1890, - who declared its ownership. Formal attempts to explore petroleum in the country dates back to November 1913, when the first oil concession was given to Mr. William Brittlebank, who failed to raise fund due to the great recession then and tried to engage in oil future by offering to sale his investment for 200 British Pound in 1919, an offer which was rejected (Wayland, 1925). Between July and September 1920, new oil concessions were granted to Sir Sydney Henn, Chijoles Oil Limited, Lord Drogheda, Messrs Bird and Company and Messrs E.S, Grogan, A.F. Dudgeon, A.G Tannerhill and Owen Grant (Wayland, 1925). Less was achieved due to largely financial constraints.

Preliminary explorations revealing oil seepage are reported to have occurred between the periods 1925 to 1945. In 1925, Wayland, the then Director of the Geological Survey of Uganda, undertook a survey that affirmed the presence of oil and gas seeps, in the Albertine Graben (Kashambuzi, 2010). This caught the attention of the colonial government and the Anglo-Persian oil company which agreed to a joint venture project to prospect for and produce oil in Uganda in 1926. The plans were however shelved during the great economic depression of 1929 (Guweedeko, 2000). A South African based Anglo European investment company undertook the first drilling at Waki-B1 field in 1937 and subsequently in Kibuku and Kibiro (Kashambuzi, 2010). However, given the technology, the available resources then and the onset of the second world war, no commercially feasible discovery was made. This exploration effort nevertheless aroused the colonial government's interest in further petroleum exploration. Thus, in 1957, the Colonial Legislative Council presented and passed a petroleum Act (Kashambuzi, 2010).After independence, the new administration under President Obote revived the oil exploration process in 1962 by giving Shell company exploration rights, but Shell abandoned the project after assessing its economic viability (Guweedeko, 2011).

Generally, however, in the periods 1945 to 1980, exploration stream that had picked momentum came to a standstill. Several factors can account for the sluggishness of exploration activities then. In the early 1940s to late 1950s, Uganda's colonial ruler - Britain was pre-occupied with the World Wars (Harris et al., 1956). Secondly, Britain earmarked East African colonies for plantation farming owing to their fertile soils and ideal climatic conditions (Crush, 1995). Third, the post-independence government in the 1960s was pre-occupied with policies related to nation building notably fighting disease, ignorance and poverty; the military government that followed in the 1970s was more concerned with its own survival and the governments that replaced it in early 1980s were unstable to undertake an meaningful economic policy (Mutibwa, 1992).

Nonetheless, from 1980 up to date, there has been some form of consistent and sustained oil exploration activities. The revival of efforts to hunt oil was initiated in 1983 by the Uganda People's Congress government (UPC) (Khan, 2015). The reasons for reactivating exploration activities ranged from the higher returns from oil following the aftermath of the oil embargo of 1970s, the desperate need for funds to rehabilitate the scattered economy in the wake of the 1979 war and the urgency to procure military hardware in the ongoing civil war then (Khan, 2015).

In 1983, the UPC government acquired aeromagnetic data over the Albertine Graben Basin that, affirmed the presence of significant levels of hydrocarbons in the rocks beneath (Khan, 2015). In 1985, parliament enacted the petroleum exploration and production Act (Vokes, 2012). But then, the mid-1980s ended without noticeable exploration largely because of insufficient funding, staff inexperience and the civil war which was roaming on in the country side.

The end of the civil war in 1986 brought relative peace and political stability, giving the country an opportunity to revive oil exploration activities. Initially however, the country's new leader Museveni suspended oil discovery related activities and cancelled negotiations with oil companies for a while arguing that the country did not have the required manpower to undertake the exercise. He opted to send young Ugandan with training in geoscience in Western university to acquire the knowledge and expertise in oil activities in late 1980s. When they started returning, the petroleum exploration and production department (PEPD) was established in 1991 (Kasimbazi, 2012). In the year 1992, exploration license for the entire Albertine Graben was awarded to Petrofina company of Belgium, which exited a year later without any significant work on the ground (Tumusiime et al., 2016). This was partly due to the plunge in international oil prices in the mid-1980s.

In 1993, PEPD implemented ground surveys in the regions based on earlier aeromagnetic survey. Over 10,000 Km^2 of the Albertine Graben was geologically mapped, and 7,500-line Km^2 of gravity and magnetic data was acquired (Kasimbazi, 2012). The data was sorted, processed, examined and interpreted and later arrayed to woo potential petroleum investors to explore the possibility of hydrocarbon in the region.

However, due to the low oil prices during the period, the country had to come up with attractive contractual terms to pull international oil companies. Thus, in 1997, production and sharing agreements with substantial tax incentives was signed between Uganda government and Heritage oil and gas Limited to explore Semliki basin (EA3) (see Figure 2.1). The license given to Heritage, resulted into the acquisition of the first 170-line Km^2 of 2D seismic data in the country in 1998, with an additional 228-line Km^2 in 2001 in the area south of Lake Albert (Kasimbazi, 2012). In early 2000s, Heritage partnered with Energy Africa. They made significant drillings in (EA3)(Figure 2.1) in Semliki basin which showed high presence of oil and gas; acquired 1,589-line Km^2 of 2D seismic over Lake Albert and 390 Km^2 of 3D seismic data in Semliki basin and 2D seismic data over Kaiso-Tonya and Buhuka – Bugoma areas. In 2004, the duo won further license of Block 1 (Figure 2.1), located on the north end of Lake Albert. The second company to take benefits of the contractual incentives was Hardman Petroleum Resources in 1997. It got license to explore Northern regions of Lake Albert (EA2) (Figure 2.1) (Kasimbazi, 2012). It however temporary exited, only to resurface later in 2001, and like Heritage, it too partnered with Energy Africa to carryout seismic surveys.

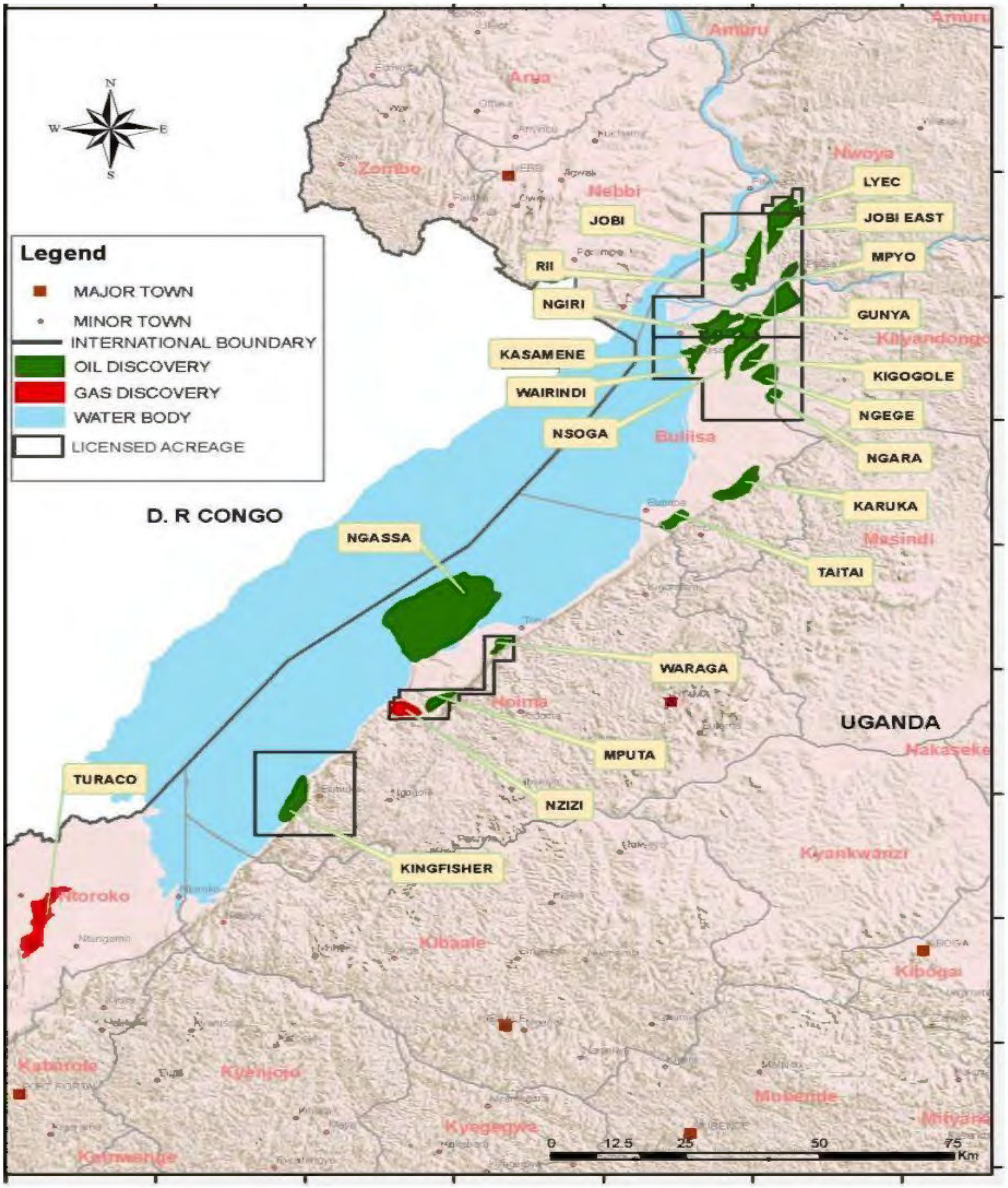
Figure 2.1: Uganda's concessions before 2012 reallocation

Source: Vokes (2012)

The activities of both Heritage and Hardman plus their partner Energy Africa in the Albertine Basin, attracted the attention of other international oil companies, during this period of dramatic rise in global oil prices. In 2005, Neptune Petroleum was licensed to explore the Rhino Camp Basin (EA5) (Figure 2.1) (Kasimbazi, 2012). In 2007, Dominion Petroleum Limited got license to explore EA4B (Figure 2.1) (Kasimbazi, 2012).

Consistent and sustained exploration efforts by the different oil companies with the passage of time, has led to the formal discovery of oil in the country. Preliminary oil finds were made by Heritage. It drilled three wells in EA3. In well Turaco 1, it found methane, which however was heavily contaminated with carbon dioxide rendering it commercially inviable. In wells, Turaco-2 andTuraco-3, the drillings shown evidences of oil and gas deposits, but then their commercial viability was not ascertained (Kashambuzi, 2010).In a major exploration breakthrough, Hardman drilled the Mputa-1 well and encountered substantial quantities of oil and gas in EA2 (northern Lake Albert) (Figure 2.2) in 2005. In 2007, in EA2 (northern Lake Albert), Tullow drilled three appraisal wells; Nzizi-1, Nzizi-2 and Mputa-3; and confirmed oil and gas discoveries in all of them. In EA3(Semliki and southern Lake Albert), flow tests in Heritage's Kingfisher well confirm commercially viable reserves (PEPD, 2019). In 2008, Tullow drilled five exploration wells in EA2 (northern Lake Albert), and encountered oil and/or gas in all of them. The wells are Taiti-1, Ngege-1, Karuka-1, Kasamene-1, Kigogole-1. In the same year, Heritage successfully detected oil and/or gas in four wells—Ngiri-1, Jobi-1, Rii-1; inEA1 (Pakwach). Furthermore, during the same period, Heritage bored two appraisal wells, Kingfisher-2/2A and Kingfisher3/3A, in EA2 and EA3 (Semliki and southern Lake Albert), and confirmed oil and/or gas in both. (PEPD, 2019). The year that followed, 2009, Tullow drilled eight exploration and appraisal wells in EA2 (northern Lake Albert). In seven of these wells namely: Mputa-5, Karuka-2, Ngassa-2, Nsoga-1, Kigogole-3, Wahrindi-1, Ngara-1, oil and/or gas was found.

Figure 2.2: Uganda's major oil discoveries

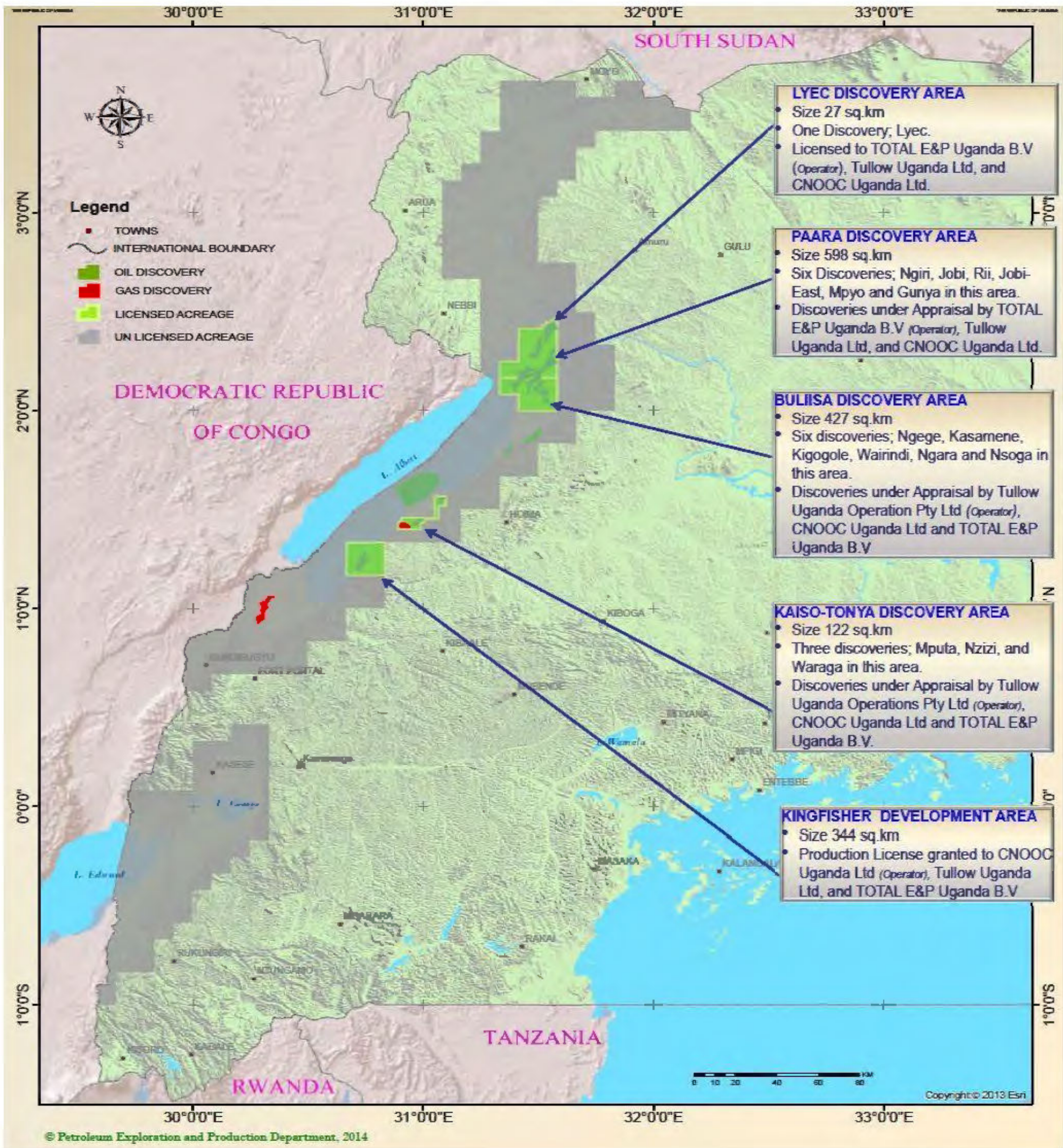


Source: Ministry of Energy and Mineral Development, Uganda

In EA5 (Rhino Camp, West Nile), Neptune are not so lucky. Its first exploration well, Iti-1, was found dry (PEPD, 2019). In 2010, Tullow completed further successful appraisal drilling in EA2 (northern Lake Albert), and affirmed oil and/or gas in eight wells, namely: Kasamene-2, Kasamene-3, Nzizi-3, Nsoga-2, Nsoga-5, Kigogole-2, Kigogole-4, Kigogole-5. During the same year, in EA1 (Pakwach), Heritage discovered oil and gas in Ngiri-2 and Mpyo-1. Neptune drills a second test well in EA5 (Rhino Camp Basin, West Nile), but it was noticed to be dry too (PEPD, 2019). By and large, by 2006, the multiple discoveries had surpassed the 750 million barrels -threshold required for commercial viability.

With these discoveries, the value of Uganda's concessions which was very beginning 1997, grew substantially. Thus, with this development, some oil companies looked forward to consolidate their investments, while others to cash in through selling their oil assets in the country. Tullow for instance, purchased Hardman Resources for US$1.1billion in 2007. This transaction gave Tullow full control of Block 2. In 2009, Heritage proposed the sale of halve of its stake in EA1 and EA3 to ENI for US$1.45 billion. However, the deal could not go on because Tullow invoked its contractual pre-emptive rights to buy the assets, giving it full operatorship of Uganda's oil-yielding concessions. In early 2010, Tullow declared its intention to sell a third of its concessions in EA1, EA2, and EA3 to Total, and the China National Offshore Oil Corporation (CNOOC). This was partly because Tullow was unable to raise the more than US$10 billion investment fund needed to develop these oilfields on its own. The transaction was valued at US$2.9 billion, a figure which allowed Tullow to recover its purchases of Heritage and Hardman Resources assets in Uganda. With these transactions, oil companies operating in the Ugandan industry were transformed from small-sized 'wildcatters' and independents to oil majors. Hence, Total and CNOOC with sizeable capital and expertise in midstream and downstream operations that Tullow lacked to captain the country towards production, were the major players.

Figure 2.3: Uganda's main discovery areas



Source: Ministry of Energy and Mineral Development, Uganda

Nevertheless, a consortium of Tullow, Total and CNOOC was somehow delayed due to partly contractual negotiations and a tax dispute. The contractual issues were resolved in

2012 with a farm down understanding in which Tullow, Total, and CNOOC agreed to hold equal stake of 33.33 per cent in each concession and divided operatorships. Henceforward, Tullow relinquished portions of its concessional areas as follows: It retained Block 2, offered Block 1 to Total and Block 3 to CNOOC. The discovery areas are shown in Figure 2.3. To the north of the concessional area, Block 1 and 2 (see Figure 2.3) consist of the Lyec, Paraa and Buliisadiscovery areas, contain an estimated 75 per cent of the oil resources inUganda; this is to say, holds more than 1 billion barrel of oil. Further south Blocks 2 - the Kaiso-Tonya and Block 3 - Kingfisher discovery areas (Figure 2.3), hold 10 per cent and 15 per cent of Uganda's oil resources respectively.

Uganda's oil production is expected to reach heights of between 200,000 and 250,000 barrels per day (bpd) based on current discoveries. Uganda has the potential to be a mid-level African producer, like present day Equatorial Guinea and Gabon. Peak production will last for an estimated ten years, while commercial production has a lifespan of three decades based on current discoveries and technology. Before production begins, however, Uganda's oilfields require extensive infrastructure improvements, particularly the upgrading of roads and airstrips in the Lake Albert region. As Ugandan oil has a high wax content, being a solid in temperatures below 35°C to 40°C, crude pipelines and storage facilities will need to be heated to reduce viscosity. In total, financing for the oilfield infrastructure and an export pipeline to the Kenyan coast will amount to between US$18 and US$22 billion.

In 2007, before commerciality threshold of 750 million barrels was reached, Tullow's Africa Managing Director Andrew Windham said that 'the objective is first oil in 2009' through an early production scheme. It was only on August 30th 2016 when energy minister Irene Muloni issued eight production licenses Tullow, Total and CNOOC which jointly own the Exploration Areas where production licenses are granted. Tullow as the operator of Exploration Area 2 was granted production licenses for Mputa – Nzizi – Waraga, Kasemene – Wahrindi, Kigogole – Ngara Nsoga and Ngege fields; while Total was awarded production licenses for Ngiri, Jobi – Rii and Gunya in Exploration Area 1. With these and other licenses to be issued in the future, the country expects oil production plateau to be reached between five and seven years.

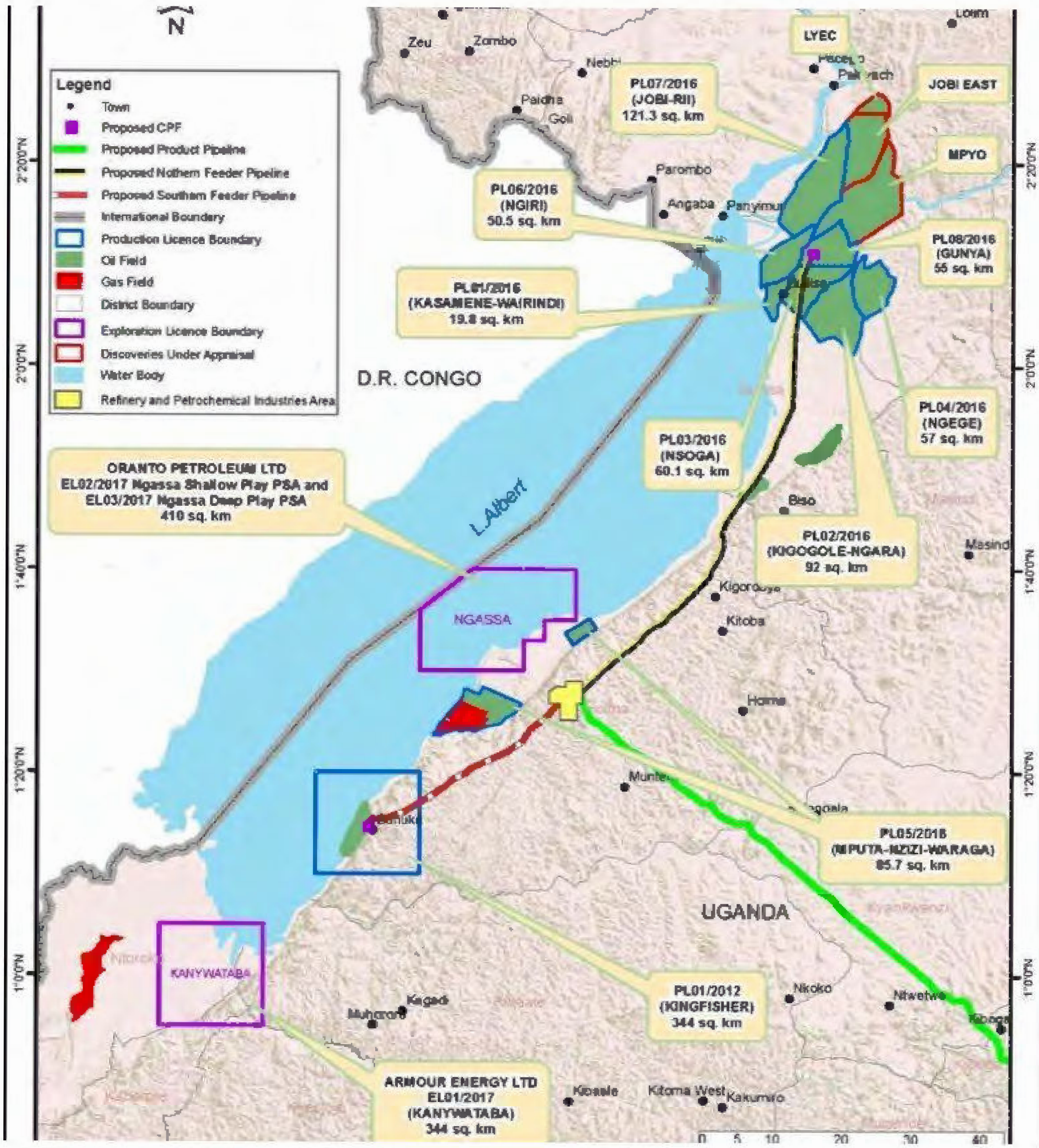
Lower international oil prices since mid-2014, has however delayed the advancement of the country's oil industry. Ernest Rubondo, Acting Director of the Petroleum Directorate, has suggested the breakeven price per barrel for development plans to be in the range of US$50 and US$60 (Patey, 2015). However, analysts have suggested a US$75-barrel price, citing transportation costs of US$15 per barrel and lifting costs of US$2per barrel, for the net present value of the investment to be positive (Patey, 2015). But the ultimate oil price when Uganda is ready to produce is unknown; international oil companies will determine their involvement in high-level investments based on their own forecasts. They may need to vary their original valuations with the given volatility in oil prices in the years to come. Once production does begin, a discount to Brent should be expected for Ugandan oil in the initial years of exportation as world refineries adjust to its specific heavy and waxy qualities.

The scale of Uganda's oil resources is neither transformative for the global oil industry, nor the African oil scene, where reserves and exports come predominantly from two large producer countries, Nigeria and Angola. But oil is significant in meeting the domestic needs and generating export revenues for the Ugandan economy. In all likelihood, Uganda will not become a petrostate, but, conditional upon global oil prices, it will most likely experience a modest oil boom, where petrodollars represent a substantial, but not overwhelming, part of government earnings.

New discoveries and oil price trends will dictate the impact of oil in the long run. Forecasts that peg oil prices at $75, see peak oil production generating annual revenues of over $2 billion, a result in which oil would make up 15 per cent of total GDP and nearly double government revenues (Patey, 2015). But if lower oil prices persist at under $50 per barrel, then oil revenues will decrease by one third of these predictions.

There has been little new investment coming into Uganda's oil industry in recent years. The moratorium on new exploration licenses until 2015 and the failure to award production licenses has stalled progress. After completing appraisal work, and still waiting to finalize their production licenses, Tullow and Total have cut their workforce, and demobilized and dispatched oil rigs elsewhere. A Final Investment Decision (FID) was launched in 2014.In that year, the first round of competitive licenses bidding were set in motion to explore oil and gas in different prospecting blocks: Ngassa, Karuka and Taitai (565Km^2), Ngaji (895Km^2), Mvule (344Km^2),Turaco (425Km^2) ,and Kanywantaba (344Km^2) (see Figure 2.4)(Musisi, 2016).However, it was characterized by lack of interest on the part of major international oil companies. Australian Armour Energy and Nigerian OrantoPetroleum emerged as the top bidders for the Kanywatabaarea and Ngassablock (see Figure 2.4).Most companies avoided bidding for Ngajidue to its geographical location in Queen Elizabeth national park and lake Edward (Musisi, 2016).

Figure 2.4: Uganda's New concessions as per 2016



With the gradual increase in world oil prices, the government has been encouraged to launch a second round of competitive exploration in May 2019. The exploration Blocks on offer include: Block 01 Avivi (1026Km^2), Block 02 Omuka(750Km^2), Block 03 Kasuruban(1285Km^2), Block 04 Turaco (637Km^2) and Block 05 Ngaji(1230Km^2)

located both off and onshore of Lake Albert (see Figure 2.4) (PEPD, 2019). Three prominent oil companies are taking part in this exploration bidding round namely China National Offshore Oil Corporation, Total, and Tullow. Another round will be announced soon.

2.4.2 Oil Infrastructure Development

After the discovery, the government has embarked on developing infrastructures aimed at facilitating its marketing. Oil refinery and pipelines have emerged as the most prominent infrastructure warranting urgent development before commercial production and marketing resumes (Vokes, 2012).

2.4.2.1 Oil Refinery

The government intends to establish a refinery to process its crude before selling it. This requirement for the refinery is premised on the following grounds: First, the government wants to use part of the oil for domestic consumption needs so as to save her scarce foreign exchange (Vokes, 2012). Uganda consumes an estimated 11,000 barrels of oil per day, accounting for 22 percent of the total annual import bill (UBOS, 2017). With increase in population, income, and electricity generation, the requirement for oil is likely to grow overtime and likewise its percentage in imports (UBOS, 2017). Offsetting the domestic market requirement given the conservative estimate of 30,000 barrels per day, a lot of oil will be available for export to earn the government foreign exchange. Secondly, a refinery is meant to produce the much-needed oil byproducts for the economy. Third, a refinery is expected to create thousands of the much-required jobs in the economy (Kjær, 2013). Fourth, it will provide refined oil to export to the regional and the world markets. Fifth, it is going to earn income by offering refining services to other regional countries, particularly South Sudan (Vokes, 2012).

The refinery is to be built by a Russian consortium Rostec (as developer and coordinator) in partnership with Tatneft (as engineer) and VTB (As financer), on a 29 Km^2 land near Kaiso-Tonya oil well in Kabaale township, Buseruka sub-county, Hoima district, on the Eastern shores of lake Albert; 60 km west of Hoima town, and 260 Km northwest of Kampala city (Figure 2.4). The cost of the refinery is estimated to be between US$3 to US$4 billion, where the investor(s) will contribute 60 percent and the remainder will be financed by East African governments on equal shares, with Uganda making up for any short fall. Kenya has already agreed to purchase 2.5 share, while Rwanda and Burundi have also expressed their willingness but Tanzania is still waiting for the developments on the ground before any commitment. The construction will be done in two phases: The first phase is estimated to have a production capacity of 30,000 barrels per day, and the second one, a doubled capacity (Kjær, 2013). Over 700 oil wells are earmarked to be developed by Tullow Oil (UK), Total (France) and China National Offshore Petroleum Corporation, to provide the crude oil to the refinery. The refinery is planned to produce gasoline, kerosene, diesel, aviation fuel, liquefied petroleum gas and heavy oil products.

2.4.2.2 Oil Pipeline

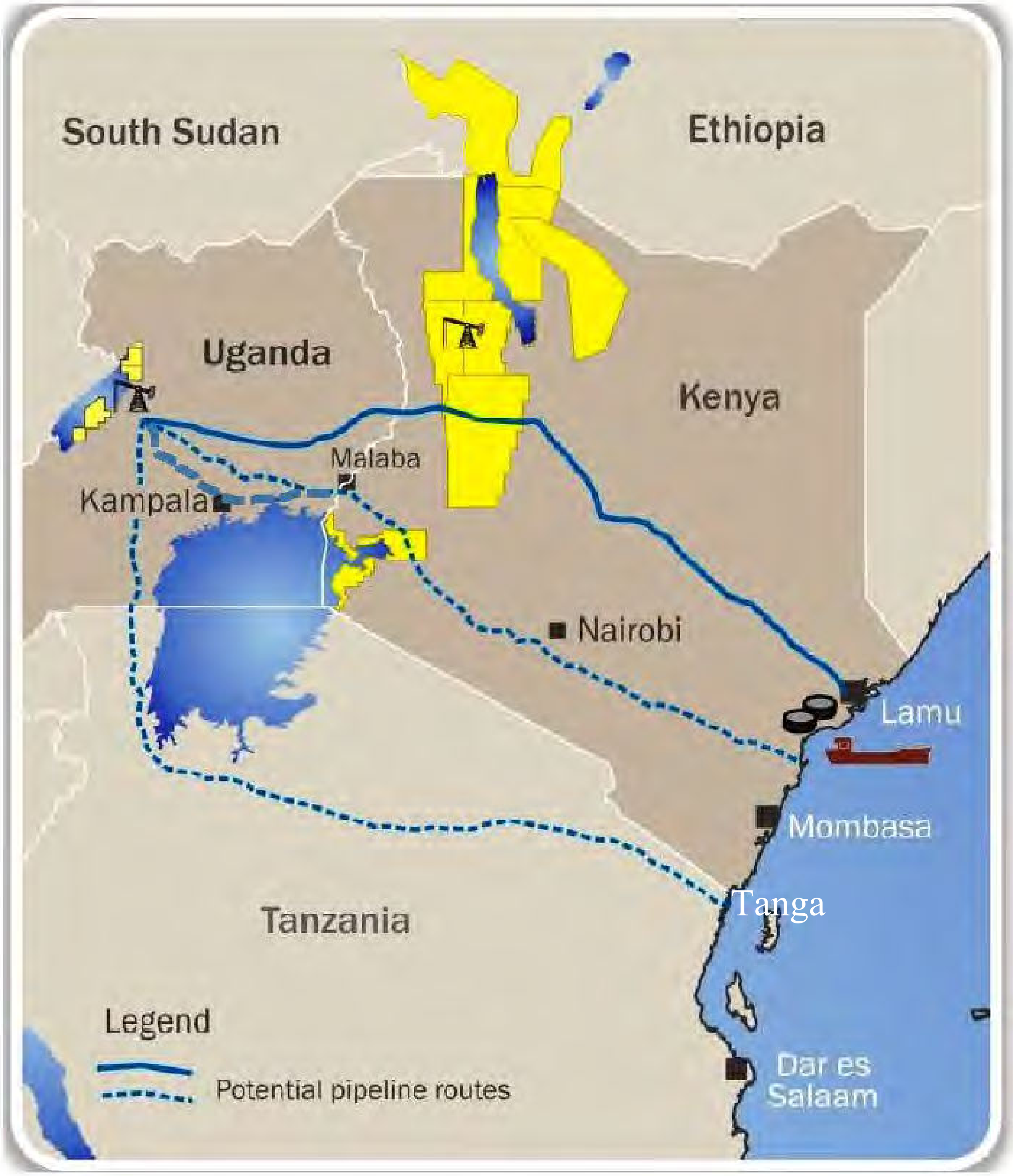
The second reason for the delay in oil production is, the pipeline to feed the domestic and the international markets. Domestically, first and foremost, the country requires a network of pipelines to transport oil from the different wells to the refinery. These refinery feeder pipeline includes: the 97-kilometer from Buliisa oil fields, the 50-

kilometer from Kingfisher and another from Kaiso-Tonya (see Figure 2.4). The construction and development of these pipelines will be facilitated by the oil companies. These three fields will act as central processing facilities (CPFs), where impurities will be removed from oil (see Figure 2.4) (MEMD,2015: Goffe, Valeriya, 2013). Another pipeline of 205 kilometers will be required to transport excess crude from the fields to the storage facility to be set up in Buloba a few kilometers to Kampala city (Figure 2.4). As of writing this study, no serious work on domestic pipelines is on the ground.

There are three alternative routes to serve the international market (Watkin, 2016) and as seen in Figure 2.5. The northern route from Hoima in western Uganda to the Kenyan coastal town of Lamuvia Turkan. The southern route also commences from the same place to the Tanzanian coastal town of Tanga. And the central route passing through southern Kenya to Malindi.

The northern route has approximately 1,120 Km, and is estimated to cost US$ 4.5 billion in construction, the southern one is about 1,410 Km, with a cost roughly US$ 4 billion, while the central alternative cost to the tune of US$ 5.6 billion (Figure 2.5). Uganda being a landlocked country, a pipeline network is necessity to reduce the cost of transporting oil by road or railway.

Figure 2.5: Alternate Pipelines under Consideration



Source: MoEMD (2016)

The final decision regarding the best alternative route is nevertheless a contentious one among the three states. The real effective decision has however to emerge from investors who are to fund part of this vital infrastructure. The key investors on the other hand differ in their interests and consequently on which route to opt for; Tullow prefers the Northern route while Total desires the southern route. Tullow's preference is based on its investments in Kenyan oil explorations in Turkan region whereas Total on the other hand, has oil & gas related investments in Tanzania (MBendi,2015).

Disregarding the interests of the key investors, the general and technical problem of the pipeline is the nature of Uganda's oil, - it is waxed thus requires continuous warming for it to flow smoothly, which presents an added cost (Patey, 2015). There are two specific challenges regarding the Kenyan route; first, insecurity in northern Kenya due to the prolonged civil war in Somalia. Secondly, the lukewarm relationship between Uganda and Kenya due to politics and rivalry (Watkin, 2016). The issue with the Tanzanian route is that it is very long compared to the Kenyan one. Despite all the listed interests and challenges, in March 2016, East African heads of state resolved to go ahead with the southern route. However, until to date, 2019, there is nothing on the ground, worse of all, Total has pulled out of the pipeline deal.

2.4.3 The Local Community and Oil Discovery

The oil belt lies within the great western rift valley, comprising of western and parts of northern Uganda. The region lies in the great western rift valley that stretches from Ethiopian rift to Albertine rift in western Uganda. It passes through Lake Albert, Lake George, Kazinga Channel and Albert Nile (Kasimbazi, 2012). In addition, the region is endowed with wild-life and forest reserves such as Bwindi impenetrable forest, Kibaale Forest National Park, Lake Mburo National Park, Mount Rwenzori National Park, Murchison Fall National Park, Mgahunga Gorilla National Park and Queen Elizabeth National Park (Kasimbazi, 2012). According to the latest government statistics, 75 percent of adults in the area are literate, the population living below poverty line is 10.3 percent and poor persons are 0.6 million, of whom 9.2 percent are chronically poor (UBOS, 2017). In the period 2011/12 to 2013/14, 24.1 percent moved out of poverty, 6.6 percent slipped into poverty and 60.1 remained non-poor in the region (UBOS, 2017). In this section, we discuss some of the benefits to the area and its population with the new wealth, with specific reference to the issues below:

2.4.3.1 Local Community Income and Welfare Prospects

The local communities expect to earn a living from oil related activities in two ways; first, through employment and second, through business opportunities associated with the oil industry.

1. Employment

The local population in the oil rich region is expected to be employed in the various oil activities going on in their area. The different oil activities with potential employment generation to people living in the region are exploration, oil refinery and pipeline construction and operations, in addition to the development of oil plus non-oil infrastructures. More jobs are expected directly from the oil companies and indirectly through contractors. The exact figure of employment of locals is difficult to ascertain given the numerous on-going activities. However, it is safe to say that the number of people employed in highly paying jobs is very small. This is so because, the oil industry requires highly skilled manpower which, may be rare not only in the oil region but the country at large. Hence, much of the highly manpower has and will continue to be solicited from abroad. Nevertheless, a majority of the locals are employed as causal laborers in the industry from where they are deriving some income (Bategeka et al., 2009; Van-Alstine et al., 2011). Local leaders in the community are being employed as public relationship officers, while other locals are being employed in the community facilities being built by oil companies and in the ongoing exploration activities (Bategeka et al., 2009).

2. Business opportunities

Another area where local communities are benefitting is in terms of generating and expanding business opportunities. Some farmers are supplying oil workers with food, local businesses are supplying essential items, trucks, tractors and other accessories (Bategeka et al., 2009).However, most of the profitable businesses requiring huge capital have been awarded to foreign companies and some well national from parts of the country notably, the capital city Kampala, something which is causing some conflict (Veit, Excell, & Zomer, 2011). It is however a fact that, some equipment required in the industry are very expensive requiring businesses with substantial funds and skills in case of repairing both of which most locals and Ugandan lack.

At worse, oil activities are bringing to the region businesses that were once taboos. There are higher incidences of sex workers including underage girls serving the sexual needs of oil workers from within and outside Uganda (Ogwang et al., 2018). This is likely to erode the social norms of the community, increase unwanted pregnancies, school dropout, HIV/AIDS, and other sexually transmitted diseases.

3. Community Social Responsibility Projects

Typically, in areas with natural resources, there are efforts by the government and the companies exploiting such resources to give back to the community. The government has argued oil companies to give back to the people in the oil region (Van-Alstine et al., 2014). In the Albertine region, some element of community social responsibility is going on in one form or another, for instance:

a. Education – Health Facilities

Educational and health facilities have been built by oil companies. The major educational facility built in the area is the Kigumba petroleum institute, apparently training Ugandan to work in the oil sector (Van-Alstine et al., 2011). Heritage oil and gas company has built primary schools in Buhuka and other places, Tullow has constructed about four schools, around five healthy facilities in addition to renovating, existing ones (Van-Alstine et al., 2011). Similarly, other oil companies operating in the Basin are building and equipping schools and hospitals (Van-Alstine et al., 2011). However, due to lack of coordination with government, in some of these facilities, teachers and medical personnel are absent, an issue requiring urgent attention (Van-Alstine et al., 2011).

b. Water Supply

Oil companies are helping the community improve and increase safe water supply by building boreholes and renovating existing sources. In Buliisa alone, 16 boreholes have so far been dug and are operational (Van-Alstine et al., 2011), with similar projects on going across the region. The company has also created a functional team to secure the lakes across the oil belt from exploration related pollution (Van-Alstine et al., 2011).

c. Micro-credit

Oil companies have set up small, medium and social firms to improve the livelihood of the community. These firms are generating income to the local through producing and selling local handcrafts and other products from cottage industries to oil workers, tourists and others (Van-Alstine et al., 2011).

d. Environmental – Agricultural programmes

Environmental programmes implemented by oil companies in the basin includes tree planting (Van-Alstine et al., 2011). The companies are proving experts and extension work to help local farmers boost productivity of their farm output in order to serve the increasing demand from the oil sector in the area.

Well as oil exploration is helping the local community in one way or another to improve their livelihood as elaborated above, it is too early to make meaningful conclusions. In oil and other natural resource rich African countries, the people living in the areas where the resources are explored and exploited live in a deep state of chronic squalor and abject poverty. The exploration and exploitation of these resources is in most cases a curse to them. The activities related to these resources tend to generate certain political, ecological and socio-political conditions that create abject poverty, misery and backwardness in the community. Such communities are characterized by insecurity, regress and injustices. Resource exploitation tends to destroy the traditional way of livelihood due to environmental degradation caused by occasional spillage and continuous drilling. In the Albertine basin, the major activities of locals before the oil discovery has been farming, fishing and tourism. In the event of serious environmental pollution, these activities are likely to be affected greatly. Revenue sharing is also a contentious issue between the central government and the local administration and communities. Often in areas where natural resources are exploited, communities there are marginalized in as far as revenue sharing is concerned, leaving them backward in terms of development. Such marginalization creates tension between the government and the local communities that often degenerates into armed conflicts, with untold consequences.

2.5 Summary

The economy of Uganda has come a long way. From the upheavals of the late 1960s to mid-1980s, it picked up and grew rapidly for almost three decades. From the average annual growth rates of 7% in the 1990s, it has slowed down averaging 4% since 2008. Investments particularly by foreigners are increasing annually but the level of savings is still low. The country has had a long trade deficit since her independence. Remittances are increasing particularly by migrant workers in the West and the Gulf countries. However, corruption, low tax base, budgetary deficit and increasing debts remains big threats to the economy. The discovery of oil in 2007 brings with it some hope on the part of the government which hopes to use proceeding from it to solve some of the challenges facing the economy, including among others poverty and income distribution. Already, on the ground in areas where oil has been discovered, both the government and oil companies are building infrastructure for the oil industry and the community such as roads, schools and health facilities. However, the issues of land compensation and grabbing, rent sharing, corruption in the sector, environmental degradation and wild life disruption remains contentious.

Chapter 3

Literature Review

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Following the pattern of discussion in Chapter 2 that centered on the performance of Ugandan economy in the wake of oil discovery, this chapter reviews the literature thematically putting in view the issues to be examined in the current study. The literature covers natural resources with special emphasis on oil and gas. The review commences with a general impact notably on economic growth, Dutch diseases syndrome and poverty/ inequality. This is followed by the impacts as per our objectives, this is to say, production, absorption and export. Finally, there is a conclusion.

3.1 General Impacts of Natural Resources on the economy: A General Debate

There is inclusive empirical literature vis-à-vis the role of natural resource in the economy as a whole and households in particular. This inclusiveness yields three distinct groups of researchers. The first group, support the theme that natural resources have a positive relationship with the economy. The proponents of this relationship include (Isham, Woolcock, Pritchett, & Busby, 2005; Sarraf & Jiwanji, 2001; Torvik, 2009). They have advanced their position using different statistical techniques and examples of resource rich-economies in both developing and developed economies like Botswana, Indonesia, Norway, USA and Canada. The second group of authors contend that, the abundance of natural resources has an inverse relation with economic growth and development. Prominent among the proponents of inverse growth and development include (Gylfason, 2001b; Gylfason & Zoega, 2006; Sachs & Warner, 1997; Sachs & Warner, 1999). They lament the insignificant, negative growth in much of the resource rich economies, significant poverty and inequality, and other side effects of these resources. Finally, there are those researchers in the middle between the positive and negative impact of natural resources on the economy. Noticeable among these authors include (Mehlum et al., 2006; Snyder, 2006). They argue that natural resources per se have no problem, and that the trouble lies with mismanagement of the proceedings, bad politics and misuse. A general consensus regarding the literature of natural resource impacts is that, they are inconclusive and inconsistent, producing positive, negative and neutral relationships on the economy and its agents. First, we present the positive impacts of natural resources on growth.

3.1.1 Natural Resources and Positive Economic Growth

There are numerous studies which have empirically established a significant and positive relationship between natural resources and per capita GDP growth (Sarraf & Jiwanji, 2001; Torvik, 2009). In addition to empirical analysis, there has been an observed experience of positive economic growth in economies like Indonesia, Botswana and Norway (Isham et al., 2005; Warr, 1986) since the discovery of oil and diamonds. They argue that natural resources attract the much-needed foreign capital, technology, government revenue, employment to the locals and the trickle-down effects on other sectors. These researchers provide illustrations and examples of natural resources like oil transforming once backward economies into modern economies, citing oil-rich Gulf countries and diamond-rich Botswana (Acemoglu et al., 2003; Netton, 1986). The proponents of the positive role of natural resources in the economy castigates the extensively used per capita GDP growth as a proxy for evaluating growth in natural resource (oil) rich economies, portraying it as a flawed measure of performance over time pointing to the very fact that less developed countries that commence exporting oil would obviously end up with high ratios of GDP per capita and, consequently, distort the statistics significantly (Alexeev & Conrad, 2009). They partially agree with the conclusion that, oil producing nations have the tendency to develop slowly in the long run but place the blame on the traditionally slow growth of oil output, thus asserting the conclusion that oil has a positive impact on per capita GDP (Alexeev & Conrad, 2009).

3.1.2 Natural Resources and the Negative Economic Growth

The second set of researchers have found a negative or /and insignificant relationship of resource abundance and the economy (Gylfason & Zoega, 2006; Sachs & Warner, 1997; Stijins, 2005). These researchers are drawn largely from development, economics and political science fields. They contend that the abundance of oil and other natural resources, impedes economic growth. measured by either GDP growth or GDP per capita and consequently development. Apart from the inverse relationship to growth, countries particularly oil exporting ones are performing poorly on many other economic indicators compared to net oil importers (Gary & Karl, 2003). The negative growths and general socio-economic performance in natural resource abundance economies have led to the development of rich vocabulary such as the "paradox of plenty", "resource curse", "flawed prosperity", "Dutch Disease", "devil's excrement", "economic indigestion", and "banyan tree problem" (Tsalik & Ebel, 2003). The curse occurs in different ways: First, slow, negative or insignificant growth in natural resources abundant economies is caused by the antagonistic consequence of these resources on governance quality and politics

(Ross, 2001). Second, these resources crowds out vital sectors thus adversely destroying engines of growth (Gylfason, 2012; Karl, 2007; Ross, 2003; Sachs & Warner, 2001). Third, the inverse relationship between resources from nature and growth emanates from the deterioration in the terms of trade, characteristic of these economies (Backus & Crucini, 2000; Bleaney & Greenaway, 1993; Grilli & Yang, 1988; Mork, 1989). Forth, the abundance of natural resources increases economic growth volatility, hence reducing average long-term growth therein (Easterly et al., 2001; Ferderer, 1997; Herrera & Pesavento, 2009; Kneller & Young, 2001). Fifth, natural resource economies are associated with higher incidences of poverty which is detrimental to the health of the economy (Aaron, 2005; Collier, 1987; Hodges, 2001). Sixth, natural resource rich economies have tendencies of higher incidences of inequality that is harmful to the economy (Charrad, 2009; Schubert, 2006). Seventh, Dutch Disease (Struthers, 1990; Usui, 1997). Eighty, un-executable fiscal policy in short run (Barnett & Ossowski, 2003; Lopez-Murphy & Villafuerte, 2010; Luciani, 1994). Lastly, they enhance the chances of civil war, political and social instability, consequently hurting growth in the long run (Collier & Willem Gunning, 2005; Le Billon, 2013; Lei & Michaels, 2014; Themnér & Wallensteen, 2015).

Resource curse is an old phenomenon. It has existed in different forms and shapes through ages. In history, nations with abundant resources have performed poorly in comparison to those with insufficient or no natural resources. For instance, the seventeenth century Spain had enormous amount accumulations of gold, silver and other resources from her colonies but underperformed economically in comparison to resource poor Netherland then (Schubert, 2006, p. 3). Similarly, the nineteenth and twentieth centuries Switzerland

and Japan with deficient resources outperformed Russia with vast amount of oil, gas, and other natural resources (Schubert, 2006, p. 3). In the twentieth century, Asian Tigers with limited natural resources have outperformed resource rich Argentina, Mexico, Nigeria, Angola, Democratic Republic of Congo, Equatorial New guinea, Venezuela and Gabon in overall development (Schubert, 2006, p. 3).

Contempt to the empirical evidence and historical facts about resource curse, recent studies are bidding interesting contests to conventional insight. Some for example, highlight that quantitative results on natural resources are subtle to the technique employed (Alexeev & Conrad, 2009; Brunnschweiler, 2008; Gylfason, 2012; Stijins, 2005). Pioneer studies were typically based on model misspecification in which they used primary commodities either as shares of GDP or export to measure resource abundance. These variables are proxies are for resource dependence which can be endogenous in growth regressions, consequently leading to either negative or insignificant results. Recent studies using correct resource abundance proxies such as mineral assets or and natural capital, are generating the opposite of the earlier studies. Thenceforth, this drives us to the next group of researchers in section 3.1.3.

3.1.3 Natural Resources and Elusive Economic Growth

The last group of scholars, view natural resources as having mixed role in the economy depending on fundamental circumstances. First, the fundamentals of economic growth has much to do with the quality of economic, resource and institutional management (Gylfason, 2001b; Mehlum et al., 2006). Second, the curse of resources results from the intensity of ethnicity in the country. In countries which are ethnically homogenous, it is a blessing while in fractional societies it's a curse (Hodler, 2006).Third, the nature of democratization in natural resource state determines the direction of growth. Democracy embedded in resilient checks and balances of polity, enhances growth and the one without, reduces it (Collier & Hoeffler, 2009).Finally, the extent of democratic institutions strength greatly affects the quality of governance to fight corruption in natural resource economics (Bhattacharyya & Hodler, 2010)

3.2 Natural Resources (Oil) and the Poor

Poverty is having insufficient funds to cater for the basic needs. World Bank report 2000 goes beyond describing poverty as the number of persons living on less than $1.90 per day. According to World-Bank (2000), poverty is multidimensional. It is hunger and powerlessness, lack of shelter, medical care, access to school, jobs, safe drinking water, representation and freedom. Uganda has no formal poverty line measure, and hence adopts the international standard yardstick of $1.90 per day or less. Inequality on the other hand is a broader concept than poverty. While poverty looks at a portion of the persons living at less than $1.90 per day, inequality is defined over the entire population (Haughton & Khandker, 2009).Inequality looks at the differences amongst people or sub groups of people in their social status, wealth or opportunity in the entire population. Using inequality index, it shows how a smaller portion of the population earns bigger portion of income while the bigger portion of population, earns significantly less, living at the poverty, lacking access to basic social services such as decent sanitation, clean drinking water, elementary schools, and health care (Schubert 2006). Despite the various efforts directed at making poverty and inequality history, these menaces in their different forms and dimensions have existed since the origin of mankind, and have become bridges connecting one generation to another.

3.2.1 Natural Resources, Poverty and Inequality: Theory and Transmission Mechanisms

Natural resources abundance particularly oil and gas do affect household poverty and inequality differently in different economies. In some cases, it reduces and in other cases, it exacerbates poverty and inequality. The impacts depend mostly on how these resources affects the wider economic and non-economic variables and thus, the concept transmission mechanism.

3.2.1.1 Natural resources and the reductions in poverty-inequality

A number of mechanisms have been identified explaining how natural resources reduce poverty and inequality, a few of them are discussed in this section.

1. Historical Analogy

The World Bank and other advocates of natural resources role in reducing poverty base their reasoning on historical analogy. They argue that, in history natural resources have served as a viable route to national development in Australia, Canada, and the United States, and hence, by extension it can play an equally similar role in the contemporary resource rich developing countries. For clarification, De Ferranti et al. (2002, p. 4), articulates how for over a century, mining drove the industrialization and economic growth of Canada, Australia and the united States. Thus, based on the historical long-term relationship between natural resources and economic growth, the proponents of natural resources contents that poor countries with natural resources can alleviate poverty given that relationship.

There are, however, a number of problems with this analogy. First, it lack the theoretical analysis or factual data in its support (Power, 2002, p. 10). Second, those countries contrast substantially with the contemporary resource-rich poorer countries. They had strong institutions prior to their mining revolution. Their well-developed legal, political and financial system helped them maximize the benefits of those resources. Third, they developed in an economic environment in which transportation costs and trade barriers were much higher than todays. This enabled the physical availability of mineral resources in the economy which helped to introduce new industries or technologies; which is not the case today (Sachs & Warner, 1995, p. 3). Today, primary raw materials can be transported cost-effectively globally, this has destroyed the links between mining and other sectors of the local economy that often existed historically and supported extensive economic development(Power, 2002, p. 32). The evaluation of the role of the historical analogy requires some adequate time. Our model is static; therefore, it was not possible to trace out as to whether history could repeat its self in Uganda.

2. Economic Growth

The direct relationship between natural resource to economic growth creates opportunities that households including the poor take advantage of thereby reducing poverty and narrowing the gap between the rich and poor (Weber-Fahr, 2002, p. 13).

The causal logic is natural resource extraction → economic growth → business opportunities → poverty + inequality reduction.

In essence, economic growth implies an expansion in the supply side of the economy. This generates employment in the economy which raises incomes. It has been observed however that, in resource-rich economies, growth is at times negative or insignificant. Worse still, some of these economies are highly indebted. These issues reduce the effectiveness of these economies to reduce poverty and inequality (Ross, 2001, p. 9; Salim, 2003).Economic growth both in terms of sectoral growth and GDP growth did explain the impact of oil discovery on poverty and the pattern of income distribution in our analysis. Overall, the economy grew and as such, poverty and inequality reduced.

3. Revenue Generation

Natural resource-rich countries generate huge amount of revenue from oil windfall(Gelb, 1988). If some of this revenue is used to finance education, health and other social sectors, it can directly improve the livelihood and access by the poor (Neary & Van Wijnbergen, 1986). It can also indirectly reduce poverty and inequality if used to finance infrastructural projects that leads to economic growth and generate jobs (Weber-Fahr et al., 2001).

The causal logic is natural resource extraction → fiscal revenue → social + infrastructure financing → economic growth + jobs creation →poverty + inequality reduction.

The amount of fiscal revenue from natural resources however, vary widely depending on the resources involved, the commercial attractiveness of the reserves, the national regulatory framework and the global commodity prices (Van der Ploeg & Venables, 2012). Moreover, there are challenges of managing natural resources' fiscal revenue including pre-existing politics and institutional strength (Van der Ploeg & Venables, 2012). And worse still, the recommendations of international financial institutions like the World Bank to host countries to reduce royalties, corporate tax and import tariffs on capital equipment meant for the mining sector negatively affects revenue generations by poor resource-rich economies (Campbell et al., 2003). In the current study, government revenue did increase as a result of the discovery and so did its expenditure, notably on social services like education and health. However, we did not disaggregate our data to incorporate infrastructural expenditures and investments by government. Therefore, we are not certain as to whether infrastructure investments did play a role in reducing poverty and inequality. That scope is left for future research.

4. Employment Creation

Extractive industries create are associated with both direct and indirect jobs creation to many people in mineral rich nations (Gamu et al., 2015). With jobs, incomes of households improve thereby overcoming poverty and inequality.

The causal logic therefore is Natural resource extractive → job creation → income generation → poverty + inequality reduction.

While it is certainly true that the extractive sector employs workers in poor countries, it is equally true that this sector is capital-intensive and hence, generates few jobs particularly for the poor (Lal & Myint, 1998). The poor do not often have the skill required in this sector, and for that, most of the job opportunities are offered to the highly skilled expatriates (Lal & Myint, 1998). Moreover, the actual number of jobs created in comparison to the size of revenue generated is quite small. An analysis of the World Bank Group-supported gold mines in Mali found the Sadiola gold mine to have created one mining job for every $700,000 invested and the Rand gold mine to generating just a single job for every $1.23 million invested (Pegg, 2003, p. 20). Given the invested funds, the number of jobs that could be created if invested in either the agriculture or services or manufacturing sectors, would certainly be far much bigger.

5. Creation of upstream and downstream industries

Scholars have suggested that resource extraction can indirectly contribute to poverty reduction by leading to the growth of upstream and downstream businesses (Yotopoulos & Nugent, 1973). Upstream industries in the hydro-carbonate value chain includes that industries dealing in exploration, development and extraction. On the other hand, downstream refers to those industries or businesses that work on the post production such as refining and marketing The abundance of natural resources can lead to the emergence of upstream industries that can get sub contracts in exploration, supply and maintenance of equipment exploration, drilling and extraction Similarly, profits from mineral resource extraction can be re-invested in downstream processing industries that add value to the oil or minerals before they were exported(Ross, 2001, p. 6). The growth of these industries generates opportunities that leads to increase in jobs, output and national income thereby contributing to a lowering of poverty and inequality.

The causal logic here is thus resource extraction → development of upstream + downstream industries→ jobs creation + economic growth + tax revenues → poverty reduction.

There are, however, a number of problems with this logic. First, there is no guarantee that whatever spillover benefits produced by mining investments will benefit local households. In some of the extractive industries projects, supplies and processing is done outside the host economy or undertaken by foreign entities (World-Bank, 2003, p. 27). Taking Chad- Cameroon pipeline for example, World-Bank (2002), found that much of the supplies such as food, catering and transport were simply imported. This was because of the tight specifications and the incapacity of the locals to meet those specifications (World-Bank, 2002, p. 87).

6. Infrastructural Development

With natural resources extraction comes infrastructure upgrading or development, which can contribute to economic growth. Infrastructures like roads have double dividend, on one hand, they help in transporting heavy equipment to and from the mines and on the other hand, they help farmers to transport their produces to the market easily, besides creating wealth along the villages they pass. This can improve the health of the economy thereby alleviating poverty and inequality.

The causal logic here is thus mineral extraction → infrastructure improvements → expanded economic opportunities → poverty + inequality reduction.

The nature and quality of these infrastructure improvements, however, often leaves much to be desired. These road networks usually connect places of interest to natural resources extracting companies by-passing local villages which are in much need of roads (Frynas, 2001, p. 48).They too ignore development of other vital infrastructures like electricity, communication systems and piped water in natural resource-rich communities (Frynas, 2001). This in a way, compromises the effectiveness of infrastructure development on poverty and income distribution.

7. Technology Transfer

Natural resource extraction in developing countries can indirectly lead to poverty reduction through technology transfers. The support for this argument is based on the historical development of UK and US. For instance, De Ferranti et al. (2002, p. 4), notes how mining gave the US a national learning experience that led to building a strong technological system which provided a foundation to the development of modern manufacturing.

The causal logic here is thus, resource extraction → technological developments → expanded economic opportunities → poverty + poverty reduction.

Power (2002), however submits that, this link between mining and technological development has apparently been severed given the overwhelming control of technical knowledge by the global extraction companies. He further argues that, the possibility of national learning is not possible to day because majority of extraction companies operating in poor developing countries are not indigenous but rather transnational offering little if any learning experiences to local households and businesses (Power, 2002, p. 27). Even where some form of technological diffusion takes place through mining investments, this does not necessarily make those investments well suited to promote poverty reduction through technological development (FriendsoftheEarth, 2002, p. 8).

3.2.1.2 Natural Resources, and Poverty – Inequality Exacerbation

We identify several mechanisms possibly linking extractive industries to poverty and inequality exacerbation in this section.

1. Economic underperformance

The tendency of national resource-rich economies to exhibit negative or stagnant growth performance relative to resource-poor ones is well documented (Auty, 1994, 2001; Ross, 2001; Sachs & Warner, 2001; Weber-Fahr, 2002). Natural resource abundance and/or dependence causes Dutch disease and economic shocks that places structural limitations on the economy (underperformance) which in turn, increases incidences of poverty and widens the income gaps in the population.

The causal logic here is thus resource extraction →Dutch disease + economic shocks→economic underperformance → poverty + inequality increase.

Dutch Disease and heightened vulnerability to economic shocks are the mechanisms explaining why poor resource-rich economies experience negative growth and, consequently, less positioned to reduce both poverty and inequality. In our analysis, we evaluated this mechanism and found underperformance in some sectors and macroeconomic variables. This could have reduced the overall impacts of oil boom on poverty and inequality in our study.

2. Inter-sectoral mobility

In natural resource framework, inter-sectoral mobility may refer to the ease unemployed labour resulting from the crowding out of non-oil sectors such as agriculture and manufacturing to get re-employment. Extractive and other high-tech industries normally have high barriers to labour mobility into them due to the requirement of high skills that most displaced labour from other sectors do not often possess. Hence, this may increase unemployment or underemployment exposing households to higher risks of poverty and widening the gaps between the haves and have-not.

The causal logic here is thus resource extraction →crowding out some non-oil sectors→ unemployment → poverty + inequality increase.

Generally, extractive industries may worsen the plight of the poor through displaced labour as a result of job cuts resulting from shrinking of some sectors.Our model was structure in a way that allowed factor mobility of which labour was part. Therefore, immobility of labour did not arise in explaining the mild impact of oil on households.

3. Exacerbation of inequality

Extractive industries can exacerbate poverty through their effects on the distribution of wealth and power. Mineral rents can generate ''horizontal'' and ''vertical' 'inequality (Ross, 2007). Horizontally, governments in producing regions may refuse to share the fiscal revenues generated by extraction with other poorer jurisdictions that may depend on transfer payments. Vertically, there could be inequality in the distribution of wealth amongst citizens. Several processes could plausibly explain the linkage between extractive industries and inequality. First, the crowding out of some sectors that creates unemployment (Ross, 2007: 241). Second, high rent encourages corruption that causes a few to be very rich (Ross, 2001, 2012).

The causal logic here is thus resource extraction →crowding out some non-oil sectors + corruption → inequality → poverty + inequality exacerbation.

These among others can exacerbate inequality and magnify existing entrenched inequalities. The results of our study however show a reduction in inequality, possibly that is one of the reasons why, poverty reduced.

4. **Employment volatility**

Extractive industries can exacerbate local poverty in producing communities through the periodic suspension of operations during bust periods as commodity prices fall below sustainable operating prices. Following sharp declines, companies may decide that certain operations should be suspended, negatively affecting both direct and indirect employment.

The causal logic here is thus resource extraction →operations suspensions → job cuts → poverty + inequality exacerbation.

Such studies, in turn, can help illuminate appropriate policy responses with respect to how best to promote diversification and human capital accumulation so that producing regions are more resilient in the face of price fluctuations.

5. **Environmental and social impacts**

Extractive industries can aggravate poverty via their effects on the environment, human health and social capital in affected communities (Dudka & Adriano, 1997; O'Rourke & Connolly, 2003). Populations at the country-side particularly the peasant and indigenous groups – who live in close vicinity to mining operations can be especially susceptible to extractive industry-related environmental degradation, as such populations may directly derive their livelihood from the continued sustainability of the environment. If appropriate mitigation actions are not undertaken, extractive industries can have devastating environmental and human health effects that further impoverish these populations. For example, air pollution and toxic waste from smelting can increase the incidence of respiratory illness. Acid rock drainage and cyanide leakage from mining operations can pollute groundwater, rivers, and soils, thereby reducing soil fertility and increasing livestock mortality.

The causal logic here is thus resource extraction →increase expenditure on health + farming → reduces income → poverty + inequality exacerbation.

Extractive industries can have a range of additional adverse social effects. It has long been noted that mining induced displacement and resettlement can contribute to the further impoverishment of already poor populations when subsistence communities are forced to live on less fertile soils (Downing, 2002; Pegg, 2003); these concerns continue to be ever-more pressing. Extractive industries can radically alter the social milieu of affected communities. For example, the influx of seasonal/migrant workers can sometimes create new demands and opportunities for sex work; and changing patterns of mining-related migration have been associated with increases in the spread of infectious diseases such as HIV/AIDS (Rees et al., 2010). Additionally, higher wages received by those employed in extractive industries can increase the cost of living, making it harder for non-mining households to afford basic goods and services.

3.2.2 Natural Resources, Poverty and Inequality: Empirical Evidences

The relationship between natural resources on one hand and poverty and inequality on the other is a complex and dynamic one. Literally, abundance of natural resources in an economy has to be accompanied with reductions in poverty and inequality. However, observations and empirical studies of natural resources impacts are inconclusive on the relationship. Some studies assert that abundance of natural resources does help in reducing poverty and in improving income distribution. They base their conclusions on the fact that natural resources offer employment to households thereby driving them out of poverty and inequality. Additionally, the government generates revenue from oil and oil related activities that it directs on poverty alleviation projects. Moreover, the oil companies' offers a lot of opportunities such as employment, contracts and direct monetary and nonmonetary assistance to the populace, aimed at improving their livelihood. On the other hand, some authors have empirically noted negative relations between natural resources and household poverty and income distribution. That is, the more the concentration of natural resources, the more the poverty and suffering. This, is a result of a number of factors including: First and foremost, the Dutch disease. Depending on the initial impacts of the discovery and management of natural resources, vital sectors of the economy particularly those employing the poor are crowded out thus worsening their plight. Second, natural resource rich economies tend to have either negative or insignificant economic growth. Hence, such an outcome tends to drive people in those economies into poverty. Third, natural resource economies are characterized by high incidences of corruption, authoritarianism, rent-seeking, civil wars, property grabbing, or/ and unfair compensation; which diverts, misallocates and destroys the wealth effects of these vital resources. Finally, the environmental impacts of natural resources such as degradation, causes natural hazards and disasters that destroy the livelihood of people thereby pushing them into poverty. A detailed analysis of empirical studies however, depict that impacts of natural resources depends simply on the management and institutional strength of the economy in question. In this section, we review the impacts on natural resources on households; the basis of our study.

3.2.2.1 Impacts of Natural Resources on Poverty

The link between natural resources and poverty is complex, dynamic, and inconclusive. Combining theory and empirical evidences, the review by Humphrey et al. (1993) is arguably the most important effort to date to advance our understanding of poverty in resource-dependent communities. In the review, the state of poverty in resource-rich economies tended to correlate with the resources' impacts on economic growth, democracy and to an extent employment. In economies where these resources increased growth rates, created employment and political hygiene, poverty declined considerably and where otherwise, it persisted, or at worst increased. Another review by Gamu et al. (2015), brought to our attention the impacts as well as the mechanisms of extractive industry's link to the poor. According to this review, poverty reduced where extractive industries increased growth, employment and linkage industries. On the contrary, it increased whenever, these industries reduced growth, increased inequality, employment volatility, rent-seeking and corruption. The results of the studies varied based on resource extraction mode, type of studies, specific linkages and methodology. With regards to mode, studies noted industrial mining to exacerbate poverty while artisanal mining reduced it. Poverty increase in most cross-national statistical studies and ethnographic local case studies particularly when relative deprivation and longer-term impacts were taken into account; while sub-national census-based studies tended to show lower poverty levels in areas with extractive sector activities. A review of thirteen specific linkages between extractive industries and poverty, highlighted the importance of governance institutions and the limited effects of corporate social responsibility activities. Methodologically, the review pointed to the dominance of industrial mining-related data in cross-national and sub-national studies and the overlooked effects of artisanal and small-scale mining on poverty reduction at analytical scales larger than community-level. Thus, these findings call for more efforts to better understand the impact of natural resources on economic agents, including households.

1. Natural Resources, poverty existence and persistence

Adding to our understanding of poverty in resource-rich countries, studies of (Brabant & Gramling, 1997; Peluso et al., 1994; West, 1994), provides us the reasons for the existence and persistence of poverty in these economies. In their study, Peluso et al. (1994), used two theories to explain poverty in resource economies. First these authors argued that poverty is as a result of capitalist theories. The basis of their argument is that the changes in the extraction industry from use of labor to capital, squeezes profits in non-extractive sectors and increases capital mobility out of these sectors leading to a vicious cycle of poverty. The second theory used in the analysis was the international colonialism. They argued that poverty is persistent due to the unequal exchange, the clash between traditional and secular cultures, as well as the control of public agencies by powerful private interests. Using a dynamic model, Brabant and Gramling (1997), concluded that poverty existed in resource-rich communities due to economic cycles. The analysis revealed variations in poverty as emanating from the causal factors during the resource developmental cycles. Another account for poverty in resource producing communities is given by West (1994). In his comparative analysis of the roles of large-scale interest groups that dominate public natural resources bureaucracies, he found the dominance of public agencies in natural resources management led to the creation and persistence of poverty.

2. Natural Resources and Growth

Studies have generally evaluated the impact of natural resources on economic growth. For instance, the study of (Sarraf & Jiwanji, 2001), describes how the discovery of massive diamonds in Botswana increased economic growth. An IMF study by Iimi (2006), also found Botswana to have had a strong economic growth before the diversification drive from diamonds dependence. Since 1980s, the country grew at an average rate of 7.4% of which 40% was contributed by diamond mining. The driving force was found to be sound macroeconomic policies and excellent management of windfall. Chambers and Guo (2009), using panel data and cross-country growth regression, found natural resource utilization to also increase economic growth. Despite the large volumes of studies articulating the positive and/ or negative impacts of natural resources on growth, few have linked such effects on poverty. The study of Davis (2009), came up with a general conclusion. In his investigation of 88 countries in the period 1956 to 1999, he simply contended that growth in natural rich economies is more likely to be pro-poor than that in non-extractive economies. However, in a subsequent study using panel data rather than cross-sectional data with another scholar, Davis and Cordano (2013), found no statistically significant correlations between natural resources extraction and the level of poverty in mineral and energy economies. The study used a panel data comprising of over 57 developed and developing countries. Therefore, the results contradict the perceived wisdom that extractive activity is pro-poor or anti-poor. Their findings resonate with those of Loayza and Raddatz (2010) who observed neither positive nor negative effects of mining sector growth from a sample of 51 countries, attributing the ambiguity in the results to the frequently low labour intensity and economic linkages of mining industries. By and large, there is no clear conclusions regarding the association of natural resource, growth and poverty. Well as natural resources places structural limitations that depress macroeconomic performance, this cannot solely explain the relationship between resource abundance and growth. Other factors such as domestic institutions and policies of government comes in between to moderate this relation and consequently the role that economic growth play to alleviate poverty.

3. Natural Resources and Fiscal Policy

The nature of fiscal policy in resource rich economies have also been linked to the extent this resource affect poverty. For instance, in their World Bank study of mining and poverty, Weber-Fahr et al. (2001), noted revenue from mining to indirectly reduce poverty. According to these authors, if governments utilize mining revenues to finance infrastructural projects, jobs are generated, economic growth increases and eventually poverty slash. To them, the variations in fiscal revenues due to the differences in type of resources, their reserves, and management, greatly affected the extent to which poverty reduces. Similarly, Warr et al. (2012), using a multi-sector and multi-household CGE to analyze the effects of natural resources revenue expenditures on poverty incidence in Laos, arrived at the same conclusion. Their simulations showed the direct distribution of marginal expenditures to households to reduce poverty, more so, in rural areas. Furthermore, studies by Bulte et al. (2005) and Daniele (2011), too found fiscal revenues from extractive industries to alleviate poverty. However, they concluded that the extent of the alleviation depends on the government injection of a significant amount of resource revenues in programmes that stimulate human capital. The study of Wiebelt, Schweikert, et al. (2011), too clarify the role of the government in the allocation of extractive industry revenue to overcome poverty. In their study, they found government targeted investment of oil revenues on infrastructure with a bias on rural and agriculture to cut poverty. Equally, the study of Hinojosa (2011) on minerals and poverty in Peru and Bolivia found government domestic institutions to be crucial in reducing poverty. He noted the absence of strong domestic institutions, technical expertise and capacity to limit both fiscal transfer implementation and poverty reduction. Using survey data and administrative records Caselli and Michaels (2013),too emphasis the role of institutions in the effective fiscal transfers of oil proceedings. In their study in Brazil, they observed lower improvements in household income and public goods than expected from reported high spending due partly embezzlement and bribery by public officials. Aside from the institutional challenges, some prior studies notably by Gylfason (2001a) and Ross (2001) have noted resource-rich low and middle-income countries to systematically underinvested in the social sectors especially education and health care that could potentially contribute to poverty reduction. Overall, studies on natural resources fiscal transfers and poverty reduction agree on the importance of the capacity and willingness of governments in effectively implementing the transfers. Methodologically, these studies put much emphasis on the sub-national level; there is no combining of qualitative and quantitative techniques and the role of international financial institutions such as World Bank that normally influence fiscal allocations in many countries. These are important in aiding policymakers understand the circumstances under which resource fiscal mechanisms are most likely to bear sustainable solutions to poverty reduction.

4. Natural Resources and employment

The impacts of the extractive sector on employment has been suggested to reduce poverty. Some scholars claim that the incomes from mining are higher than those from other sectors (Weber-Fahr et al., 2001). Others continue the claim by contending that the higher incomes from the extraction can accord children of employees a chance to better schooling and consequently much higher intergenerational earnings (Jensan et al., 2012). A reasonable number of studies have confirmed the potential of natural resources to decrease poverty. Hilson et al. (2013), for example found wage earnings from gold mines in rural Northern Ghana to have helped the poor in the village of Kui to earn higher incomes that subsequently enabled them to diversify their livelihoods. Equally, Eleanor et al. (2009) found individuals who worked in mines in Northern Tanzania to experience less poverty than those in other occupations in the locality. Krishna (2004), while investigating the impacts of mining in India concluded that non-agricultural sources of income, especially mining income, were an important factor for households in the rural areas to escape poverty. Additionally, studies of Heemskerk (2003) and Jenkins (2014), found particularly artisan mining to help poor women gain independent income, that enabled them to mitigate their plight. Well as those studies point to the fact that natural resources created more employment which boosted household incomes which subsequently put a break on poverty, other studies indicate a contrary direction. Deaton and Niman (2012), for insistence found the impact of natural resources on employment and poverty to relatively depend on time lag. Using panel data and decomposing the effect of an increase in a sector's employment share to identify immediate and lag effect on poverty rates in Appalachian counties of the United States, the authors had mixed results.

A boost in mining increased employment and reduced poverty in the intermediate period but in the long run, it increased. The influence of time lag on the impact of natural resources on employment and poverty is also noticed in the work of Freudenburg and Gramling (1994). In their study, they concluded that in the long-term, there is decline in extractive related employment due to the lower jobs created, high volatility of natural resources markets which surged poverty. Perdue and Pavela (2012), too found mining to reduce employment and increase poverty in their socio-economic analysis of mining in USA. In the analysis, mining communities had higher unemployment and poverty levels than non-mining communities, due to increased mechanization of coal mining. Similarly, the studies of Van-Alstine and Afionis (2013), on the challenges of mineral led development in Zambia and Ackah-Baidoo (2013), on oil and community grievances in Western Ghana, found copper and oil activities to worsen unemployment and consequently poverty.

5. Natural Resources and Upstream- Downstream Industries

Some scholars are of the view that natural resources do help to develop upstream and downstream industries. In a comparative study of seven Sub-Saharan African countries for example, Morris et al. (2012) found extractive companies to establish upstream. They noted corporation involved in exploration outsourcing domestic firms with superior local knowledge to explore the presence of minerals. They too noted some form of downstream linkage in the form of procurement of local goods and services such as security, accommodation, transport/logistics, and maintenance/repair. Similarly, Aragón and Rud (2013), found extractive industries to develop downstream industries in Northern Peru. Utilizing annual household data from 1997 to 2006, they found minerals to increase the demand for local inputs. The study of Wilson (2012), similarly point to the expansion of downstream industries and by the copper industry and the impact on poverty. The study observed that the surge in copper prices on the world market boosted the local economy that generated significant employments which reduced trade in sex and poverty in Zambia's copper belt.

6. Natural Resources and Private Investment

The empirical literature confirms no systematic and clear poverty reduction effect of private investment by extractive industries in public goods infrastructure. For example, Frynas (2005) highlights that many of Royal Dutch Shell's road building projects in the Niger Delta by-pass the villages that would benefit the most from them. On the other hand, in a case study of the *Yanacocha* mine in Peru's Cajamarca region, Bury (2005) found that several rural communities surrounding the mine reported increased access to economic resources; some respondents reported improved access to quality roads, safe drinking water, and agricultural markets. However, while this study provides some evidence that mining industries can contribute to poverty reduction through private investments in public goods, the results should be interpreted with caution as only the communities closest to the mine reported these benefits

7. Natural Resources and the Dutch Disease

Natural resource rich economies have been noted to underperform economically due to partly the Dutch disease of economic violability. The discovery or boom in the natural resources affect the real exchange rates which in turn affects differently the output of the different sectors that might be tradable or non-tradable, agriculture or manufacturing.

Some expands which others contract. For instance, an earlier study by Harberger (1983), set simple neo-classical, small- open-economy model with tradable, non-tradable goods and oil. With a fixed exchange rate regime, the results that emerged from comparative static computable general equilibrium, showed that a rise in the world oil price caused a rise in the price levels of non-tradable. The results of the dynamic version of the model however, showed the prices of non-tradable overshooting substantially before reaching their final equilibrium. The degree of overshooting was however reduced dramatically by the simple expedient that saw an increase in spending generated by the added revenues taking place gradually through time, rather than precipitously. Thus, the rise in the domestic price level caused by an oil shock was limited essentially to the amount dictated by the degree of appreciation of the real exchange rate necessary to restore equilibrium. From the findings, there is need to manage oil revenue in order to reduce its side effects on the economy, particularly the poor.

Benjamin et al. (1989) found that oil boom compresses the agriculture sector while expanding the manufacturing sector. The study used CGE model in examining the effect of oil boom on Cameroon. The incorporation of imperfect substitutability between imported and domestic goods altered the results from the typical Dutch disease syndrome. Given the fact that the poor in developing countries earn their livelihood through agriculture, the results thereby imply that the welfare of the poor are hurt in case of natural resource boom.

The findings of Fardmanesh (1990), echoes that of (Benjamin et al., 1989). Using CGE model designed for Dutch Disease, he explored the role of trade terms of a small oil exporting country on manufacturing and agriculture sectors. The analysis, focused on the spending and world price effects on the structure of the economy. Agriculture was reduced by the two effects; however, world prices mitigated the negative consequences of the spending on manufacturing, hence expanded it. Further analysis showed that in the long run world prices determined both the price on non-tradable and capital. In addition, it reaffirmed that world price effects were the single most cause of deterioration in agricultural output. In order to overcome the adverse effects on vital sectors like agriculture, the government in an oil exporting country needs to come up with mechanism to protect such sectors that are pro-poor.

The study of Fardmanesh (1990) is similar to the study of Fardmanesh (1991), in terms of analysis and results. Like in his study a year before, Fardmanesh (1991) examined the impacts of spending and world price of oil on the economies of Nigeria, Algeria, Ecuador and Venezuela for the period 1966 to 1986. In the analysis, the study employed a reduced form of Dutch disease models. It was discovered that surge in world prices of oil, contracted agriculture and non-traded sectors. Further analysis depicted increased oil revenue spending to expanding the manufacturing sector. These results call for direct public intervention in agriculture to help the poor who are largely employed in this sector.

Furthermore, Struthers (1990), looked at how spending Nigerian revenue from oil could affect the non-oil sectors using series of 1960 to 1986. The analysis centered on the impacts of appreciation in exchange rate on tradable and non-tradable. The results showed declining real producer prices, inadequate public investment and overvaluation causing sharp deterioration in agriculture output. While on the other hand, increasing high real exchange rate increased manufacturing output. Thus, countries like Uganda needs to intervene in protecting the agriculture sector while expanding manufacturing to overcome poverty and inequality.

Likewise, the study by Feltenstein (1992), reinforced the Dutch effect of natural resource boom. Using a two-period general equilibrium model, he evaluated the policies affecting agricultural migration and exports in Mexico for the period 1986 to1987. Increases in oil prices appreciated the real exchange rate and altered the prices of agricultural products triggering migration from agriculture. In the short run, fiscal policy like value-added subsidies to agriculture, partially negated the effects of oil price increase on agricultural exports. Such a finding is a challenge to an economy like Uganda which is predominantly agricultural.

Similarly, the study of Faff and Brailsford (1999), witnessed contraction and expansion of the different sectors in Australia. The study was modelled on the sensitivity of Australian industry equity returns to an oil price factor over the period 1983–1996. The findings from the augmented market model, detected the level of generality of an oil price factor past market influence. Further, oil price sensitivity in the oil and gas and diversified resources industries were significantly positive. Finally, oil price sensitivity in the paper and packaging and transport industries was significantly negative. From a general point of view, the findings had endurance long-term effects, even though a number of firms passed on changes in oil price to customers or mitigated the risk by hedging. These findings have great implication for policies aimed at helping the poor in the economy.

Contrary to foregoing studies that found positive and negative impact of natural resources (oil) boom on the different sectors in the economy, the study of Buiter and Purvis (1980), found only negative effect. In their study, they examined the impacts of monetary disinflation, increase in world oil price, and domestic oil discovery on de-industrialization in an open economy. Their analysis incorporated different speeds of adjustment in goods and asset markets; domestic goods prices responded sluggishly to excess demand and exchange rate adjusting quickly the price of imported goods. Monetary disinflation on the other hand, reduced real balances, generated higher real interest rates, but lowered nominal exchange rate. All these adjustments in the short-run, initiated a real appreciation and a deterioration in domestic manufacturing output. Correspondingly and surprisingly, the increase in world oil prices weakened net export. For the poor to benefit, macroeconomic policies to stabilize exchange rate must be in place.

Equally, Bruno and Sachs (1982), analyzed the effects of locally produced natural resource on the economy. The model extended the primary static computable general equilibrium analyses by allowing for: short-run capital specificity and long-run capital mobility; international capital flows and far-sighted inter-temporal optimizing behavior by households and firms. The results confirmed the compression of non-oil tradable sector; however, it was noticed that international capital mobility proceeded till the relative price increase of non-traded goods was eliminated completely. Such an adverse impact on non-oil sector has great bearing on the poor.

Similar negative impacts of oil on economic agents were found in the study of Looney (1991), while examining the industrial development of Kuwait in light of adjustments in real exchange rate and the relative inflation rates (Dutch Disease). The analysis resulted into the compression of the country's industrial sector particularly in the period before the oil price decline in 1982 and before the 1990 Iraq invasion of Kuwait. Hence, the results suggest that in the wake of oil price fluctuations, the exporting country cannot overcome the Dutch Disease by devaluation, which can complicate the country's poverty alleviation efforts.

While investigating the perennial stagnation in the non-oil economy, Budina et al. (2007), found similar negative impact of oil boom on manufacturing and agriculture sectors. In the analysis, there was an indication that extreme volatility of expenditure rather than Dutch Disease effects caused the disappointing non-oil growth record. Fiscal policies failed to smooth highly volatile oil income; contrarily, government expenditure was more volatile than oil income. Econometric results showed debt overhanging, causing volatility of expenditure and the voracity effects exacerbating expenditure volatility prior to 1984. Thus, oil abundance provides fiscal policy challenges with differing effects to the poor.

The findings of Merlevede et al. (2009), on Russian economy resonates the prior study. The study performed simulations of the impact of oil prices, exchange rate, private sector confidence and fiscal policy on the economic performance of Russia. A reduction in the price of oil compressed Russian economy. The compression of the economy was mitigated by the stabilization brought about by the Oil Stabilization Fund and the Dutch disease effect. Thus, Russian fiscal policies were seen as tempering economic fluctuations caused by oil price shocks. Given the nature and behavior of oil prices in the international market, there are concerns of contracting the economy and its impact on household.

The study of Beverelli et al. (2011), equally mirrors the previous in outcomes and conclusions. The study constructed a theoretical model to describe how countries experiencing discovery of natural resources can escape Dutch Disease. The focal point of the study was the impact of real exchange rate appreciation on manufacturing industries that use oil more intensively. The findings found Dutch disease effect associated with discoveries of natural resources (namely oil) to dampen in countries specializing in resource-intensive manufacturing industries. With abundant labour resources used in manufacturing, this finding has greater bearing for Uganda, particularly in her efforts to fight poverty.

The study of Looney (1990), is slightly different from the previous ones in the sense that the appreciation of real exchange rates as a result of oil shocks gave way to positive and negative effects on the economic sectors, as a result of incorporating control variables. The focus of analysis was the effects of Dutch Disease via exchange rate appreciation on the industrial development of Saudi Arabia. The analysis compared the effects of exchange appreciation on manufacturing and other major sectors. Controlling for overall growth the rate of expected inflation, anticipated government expenditures and developments in the oil sector, the presence of the Dutch Disease effect was noticed in the economy of Saudi Arabia.

The study of Usui (1996), provides a case in which boom in oil export expanded the economic sectors, a diversion from prior and mainstream studies on Dutch Disease effects. The study evaluated the effects of the devaluation of exchange rate and budget surpluses accumulation on the tradable in Mexico and Indonesia using a simple general equilibrium model. The results indicated that exchange rate adjustment had a significant impact on the expansion of tradable sectors, especially the manufacturing, via reversing the real exchange rate. While, officially maintaining the balanced budget principle, the government exercised delicate operations whereby the budget surpluses were covertly accumulated as government deposits. Such operations were executed as a necessary demand management policy that ensured persistent devaluation effect. These policy adjustments helped Indonesia to escape the Dutch Disease that could have been imminent due to the boom. Mexico on the other hand, experienced Dutch disease with her manufacturing sector contracting. This was predominantly due to the macro-economic mismanagement. The findings therefore have great implications for some nascent oil economies like Uganda, if it is to overcome Dutch Disease with its adverse impacts on households.

In the same way, Torvik (2001), using a learning by doing and the Dutch disease model, found similar positive results of resource boom on economic sectors. The study discovered foreign exchange gifts depreciating real exchange rate in the long run. This was majorly due to the change in relative productivity between the tradable and non-tradable. Contrary to standard Dutch disease models, there was increase in both productivity and production. Thus, from the study, we can safely conclude that exchange rate gift is one way to avoid Dutch disease even in the context of oil that generates massive foreign currency which appreciates foreign exchange.

Equally the analysis of Davis (1995), regarding the Dutch disease effects in a booming minerals sector had unclear results. The study findings had little corroborating evidence of Dutch disease effect on economic and development performances. By implication, the findings suggest that mineral resources (oil included) does not affect the sectoral structure of an economy, in our case, household, something contrary to Dutch disease literature.

The analysis of Olomola and Adejumo (2006), to a greater extent can be viewed as having produced neutral results about the impacts of Dutch Disease on output. The study examined the effect of oil price shock on output, inflation, the real exchange rate and money supply in Nigeria using Vector Auto-Regression and quarterly data for the period 1970 - 2003. In the results, oil price shock significantly affected real exchange rate but had no effect on inflation and output. However, oil price shocks, significantly influenced real exchange rates. Thus, it is clear that upward trends in the prices of oil contributes to wealth effect, real exchange rate appreciations, contracting of tradable and consequently Dutch Disease, with antagonistic effects on the economy's poor.

Similarly, Égert and Leonard (2008), explored evidence of Dutch disease in Kazakh economy, using a monetary econometric model. The model evaluated the effects of fluctuations in the prices of oil on the manufacturing sector and long-term growth prospects. The results were perverse. Manufacturing was not affected by the perverse effects of oil price increases from 1996 to 2005. However, the increase in the oil price and revenue was attributed to effective real exchange rate appreciation linked to oil sector with manufacturing sector remaining statistically insignificant.

In Conclusions, from the review of the impacts of natural resources boom on the different sectors and activities in the economy, the results are inconclusive. In some studies, the booms contracts and expands the different sectors at the same time, in others contract the activities, in others expands and while in others yields ambiguous relations depending on some underlying factors. In view of the current study looking at the impacts of oil on poverty and inequality, contraction of sectoral activities hurts the poor while expansion benefits them. In the review, we have noted how natural resources tend to contract agriculture and non-tradable sectors. This is bad for developing countries like Uganda whose population mostly derive their livelihood from these sectors. Overall, natural resource (oil) boom exacerbates poverty and inequality via its impact on the sectoral activities, particularly the agriculture sector.

3.2.2.2 Impacts of Natural Resources on Inequality

Ross (2001) study on extractive industry and the poor provides a thorough impacts of natural resources on the poor. The study found natural resources dependent nations to exhibit the following characteristics: First, they have exceptionally low overall living standards — lower than expected given their per capita incomes. Second, have higher poverty rates. Third, tended to suffer from exceptionally high rates of child mortality. Fourth, were associated with high rates of child malnutrition; low spending levels on healthcare; low enrollment rates in primary and secondary schools; and low rates of adult literacy and finally, had higher income inequality.

A number of studies investigating the impacts of fiscal policy and natural resources found these resources to reducing inequality. For instance, the study of Moradi (2009),found oil revenue increases to reducing inequality in Iran. The study used Error Correction Model (ECM), Co-integration test and ARDL bounds technique on the country's data for the period 1968-2005.The results of both models confirmed that increases in oil revenue increased GDP and reduced inequality – measured by Gini coefficient. Another study by Oviasuyi and Omoregie (2016), examining the impacts of oil revenue on inequality, using the same Error Correction Model but on Nigerian time series data for the period 1990 to 2014, found similar results. However, corruption in the country undermined the extent of the reduction. Further, the analysis by Howie and Atakhanova (2014), increased government transfers financed by resource income on inequality within Kazakhstan regions, came to the same conclusion. The study used a detailed household-level data across the entire income distribution and within the top and bottom halves of the income distribution. The results from the regression analysis indicated that expenditures of resource income lowered inequality after controlling for the effect of changing labor income, institutional quality, education levels, and public health care spending. Additionally, it found the quality of institutions to be an important equalizing factor for the lower income households in urban areas, but not in rural areas. Further analysis from this study found public health programs to decrease overall inequality in the rural areas; however, they did not affect the bottom half of the income distribution. However the study of Loayza and Rigolini (2016), though focusing on fiscal policy, did find mining increasing income gaps in Peru. The empirical results found allocating a half of revenue from mining on the poor to increasing per capita consumption, reducing poverty but increasing inequality in mining districts. The main explanation given for this dual effect of mining was that the mines attracted an influx of better educated immigrants.

Substantial number of scholars on natural resources impacts have come to a conclusion that these resources explain increases in inequality in resource producing countries in one way or another. A study by Leamer et al. (1999), on natural resources abundance and inequality in South America and Asia found larger inequalities in Latin American than East Asia. The study used standard trade theory and cross-sectional methods in the empirical analysis. The scholars attributed the income disparities between these two regions on the fact that the abundance of large natural resources reserves in South

America depressed workers' incentive to accumulate the required high skills which delayed industrialization and where it merged, it was mostly capital intensive; which increased inequality. Similarly, Buccellato and Mickiewicz (2009), found similarly findings on his study of the impact of oil and gas abundance on inequality in Russia. In his empirical analysis, there was clear evidence of hydrocarbons abundance increasing the gaps between rich and poor in the producing regions. Natural resources abundance and inequality increase was also noticed by Carmignani (2013). The results from his systems of equations showed resources abundance to increasing income inequality within the country. Further analysis showed natural resources not to only have increased inequality but also the quality of institutions which consequently reduced human development and per capita income. The increase in inequality is also identified by De Wit and Crookes (2013). Using both quantitative and qualitative techniques, the authors natural resources boom in the form of price increases increased inequality, inflation and poverty in Nigeria. Despite that, the study found the country being a big oil producer and export to have benefited greatly from the higher oil prices that generated significant revenues to spend on subsides especially fuel and other social works. Smith and Wills (2018), using both surge in oil prices and new discovery equally came to the same conclusions. The analysis was based on counting the number of people living in darkness at night. It did so by combining high-resolution satellite data on night-time lights and population globally from 2000-2013. The researchers justified the use of this measure due to its 83% accuracy in identifying households above or below the poverty line. While the analysis found both high oil prices and new discoveries to have increased illumination and GDP nationally, inequality increased between urban and rural areas as much of the consumptions were limited to towns and cities. The analysis of. Buccellato' and Alessandrini (2009), ended up with the same conclusions regarding natural resources and inequality. Their empirical study based on an unbalanced panel of 122 countries over the period 1980-2004 examined the impacts of natural resources particularly ores and metals on inequality dynamics. The results from their regression suggested that the abundance of ores and the metals significantly enhanced inequality within countries and their export widens the gap between the rich and poor households.

In our review of natural resources and inequality, we find the study of Kim and Lin (2018), to have established that these resources reduce inequality. The study used common correlated effects pooled mean group methodology to examine the cross-country heterogeneity and cross-section dependence in the analysis. The results that emerged from the empirical study found oil abundance and dependence to reduce income inequality. They attributed this reduction to the oil booms that improved education attainment and health status.

Other studies show natural resources to either reducing or increasing inequality depending on certain factors. For example, the study of Goderis and Malone (2011), on natural resources' impacts on inequality, found the disparity in incomes to have fallen immediately after the boom but in the long run, it increased. The authors used a large pull of data for 90 countries between 1965 and 1999 to analyze the time natural resources can take to have an effect on inequality. Thus, the results suggest that once the initial effects of the boom disappear and uncertainty about future commodity prices sets in, inequality increases in the long run. Similarly, mixed impacts of natural resources were established by Parcero and Papyrakis (2016). In their analysis of inequality and natural resources using Heckman selection models on Standardized World Income Inequality Database, they found oil to reduce income inequality in poor countries but to increasing it in very oil-rich economies. Equally, Fum and Hodler (2010), has similar inconclusive results. In their study using baseline regression, found natural resources abundance to increase income inequality in ethnically polarized societies, but reduced it in ethnically homogeneous societies.

In conclusion therefore, we find the literature on the impacts of natural resources on inequality to be inconclusive hence warranting continuous studies in order to understand their real impacts on households. In the review, we have noted how natural resources abundance, dependence, booms and fiscal policies have inconclusive findings. This has motivated us to add to the building body of literature in this direction.

3.3 The impacts of Oil Production, Absorption and Export

In this section, we look at the impacts as per our study objectives. Production, absorption and export truly represent discovery. Discovery of a resource like petroleum can only derives its economic value when it is removed from the ground, processed and distributed to the final user. This is what we vaguely call production. Locally, what is produced and processed is either consumed by the public, private sector or used as an intermediate good in furthering more production. This is to say, absorbed. Particularly for petroleum, a substantial amount of it is sold abroad to earn the country foreign exchange. The review is as follow:

3.3.1 Oil production

A vast literature on oil extraction mostly examines its impacts on the environment, largely missing out household poverty and income distribution. For instance, a study on oil extraction by Ikelegbe (2005), in Nigeria's Niger Delta, made some useful conclusions regarding the impacts of oil exploration and production on the environment and communities. First, it argued that excessive exploration and production of oil from the region; polluted land, water, flora and fauna on a massive scale, consequently decimating the resources on which the population in the region survived. Secondly, it concluded that the precious land on which the population derived their livelihood was lost to exploration, pipeline network and oil spillage thus devastating their livelihood. Thirdly, oil extraction activities polluted the region's water bodies thus detrimental to the populace. Fourthly, oil activities in the Niger Delta has totally devastated the local economy, aggravated poverty, unemployment, hunger, fueled anger, bitterness, and frustration. Finally, the distance between the majority poor and unemployed people and the supper rich oil company executives and expatriate workers widened. While this study comprehensively addressed the main theme of our study, but it is simply a qualitative analysis which did not employ any quantitative technique to verify those impacts. It simply re-explained and described secondary and primary data to come up with conclusions.

Davies and Kingston (1992), on the other hand confined themselves on production impacts on the environment particularly the diverse marine fauna in the North Sea. They concluded that oil discharges destroyed the marine fauna and fish in the vicinity but was not explicit on the effects on households. Similarly, O'Rourke and Connolly (2003), study using environmental justice framework examined oil production and consumption impacts on the environment and social aspects. The authors concluded that the production and use of oil had wide negative impacts on the environment and consequently, communities, but did not go in details to specify the social effects. Wake (2005), extended the work on oil impacts on the environment by incorporating oil refineries. The investigation established that oil refinery effluent intoxicated the environment. Much as the findings has great implication on where to locate refineries, it did not hint on the direct effect of such locational decisions on household livelihood.

Similarly, the work of Arora and Lieskovsky (2014), evaluated in general the economic impacts of the natural gas production using a Structural Vector Auto-regression framework. They find evidence that increased supply lowered the real prices of gas which consequently had a positive impact on the manufacturing industry. This could be good for an economy like Uganda which is facing bottlenecks in manufacturing related to high costs of inputs particularly energy that is raising the overall cost of production.

An empirical study by Black et al. (2005), examined the role of boom and busts in the Appalachia coal industry focusing on county employment. They find small multiplier effects: that is, for each ten jobs brought on board in the mining industry, 1.74 jobs in the local-goods sector are generated, and for a bust, 3.5 local jobs vanish for every ten mining jobs. This finding shows the limits of oil in generating and consolidating the much need employment especially in developing countries with higher unemployment.

Other studies on oil extraction focus on production peaks, their impacts and mitigations. For example, Hirsch et al. (2005), studied peaks in oil production. The study analyzed the impacts plus a variety of mitigation policies and resolved that peaking increases prices of oil and their volatility, with negative economic, political and social consequences and that prompt action is required to prevent future shortfalls and economic disruptions. However, they do not mention the effects of production on poverty or household income or vice versa. Holland (2008), modelled oil production peaks and identified four potential sources to increase production including surge in demand, cost reductions via technological breakthrough, cost reduction by exploration, and increasing production from additional site exploration and development. The author did not provide a wedge on how an increase in production could affect households.

Most economic models of depletable resources do not seem to offer additional insight because they do not explicitly generate the effects of production on household income. For example, the seminal model of Hotelling (1931), predicts that (net) prices should grow at the rate of interest and that production should steadily decline over time. Extensions of this model for uncertainty, limited capacity, set-up costs, different grades of ore, and increasing costs with cumulative extraction, also leaves out the impact on households. This raises a number of questions particularly for emerging oil producing countries like Uganda. What effects will oil production have on households? Will fluctuations in production have a different effect? This study responds to these questions using (CGE) modelling. Unlike other models mostly econometrics, this model has the ability to accommodate scenarios that can capture and answer such questions at a go.

In a nutshell, the impacts of oil production on the economy are diverse and thus provides room to continue exploring further impacts of the spillover of such impacts on economic agents particularly households.

3.3.2 Oil Absorption

According to Vines (2017), Absorption in economic terms refers to all total demand for marketable goods and services by agents in the economy. It includes total consumption and Investment (private and public). Thus, in reviewing literature on absorption, we sub-divide in accordance to this definition.

3.3.2.1 Energy Consumption and Economic Growth

Studies of the impact of oil consumption have mostly focused on economic growth and the environment, largely missing out household. The large volume of studies linking between consumption of oil and economic growth have resulted into different policy inferences and testable hypotheses. The first hypothesis states that oil consumption is a necessity for economic growth given its role as a direct input in the production process and an indirect input one as a complement of labor and capital inputs (Ebohon, 1996; Toman & Jemelkova, 2003). Henceforth, a unidirectional Granger causality running from oil consumption to GDP suggests the economy is dependent on oil. This calls for policies that can stimulate its consumption in order to stimulate economic growth.

The second hypothesis, the "Conservation" denotes that policies designed to conserve oil such as green gas emission reduction, adversely affect real GDP (Mehrara, 2007). This hypothesis is affirmed if a surge in GDP Granger-causes an increase in oil consumption. The third one, the "neutrality" hypothesis views oil as a small component of real GDP and therefore its consumption should not have a significant impact on economic growth (Asafu-Adjaye, 2000). In this instance, oil conservation policies may not adversely impact real GDP. Defense for this hypothesis is given by the absence of Granger-causality between oil consumption and real GDP. The fourth, the “feedback” hypothesis presumes a bidirectional association between oil consumption and economic growth. This hypothesis proposes that oil consumption and real GDP are interdependent and hence serve as complements to each other. In this case, fluctuations in oil consumption result in fluctuations in real GDP, and vice versa. Support for this hypothesis lay in the bi-directional granger-causality between oil consumption and real GDP.

Nevertheless, the empirical literature on the linkage between these two variables is inconsistent across countries and methodology. For example, Kraft and Kraft (1978), found a robust unidirectional causality running from GNP to oil consumption utilizing series data for USA for the period 1947 to 1974. This implies that economic activities may stimulus oil consumption, but, gross oil consumption has no causal impact on the degree of economic activities. Similarly, Abosedra and Baghestani (1989), used direct Granger test and came to a firm conclusion that for the periods 1947 to 1972, 1947 to 1974, 1947 to 1979 and 1947 to 1987, there was causality but this time running from oil consumption to economic growth. These two studies show that either oil can stimulate growth and vice versa at a time.

In some study, a bidirectional causality tween economic growth and energy consumption was discovered. Erol and Yu (1987) for example applying Gross National Product and oil consumption for the period 1952 to 1982 in the analysis of Canada, France, UK, Italy and West Germany, found a bidirectional causality. In the study, there was a bidirectional causality for Japan, and West German. Oil consumption induces gross national product and real gross national product stimulated oil consumption in these economies. However, no such causality was established for France and UK. Hence, consumption and growth can stimulate each other simultaneously but, in some cases, they are both muted.

Similarly, Nachane et al. (1988) employing the Engle-Granger co-integration approach, found long run bidirectional linkage between oil consumption and economic growth for eleven developing countries and five developed countries. Using same approach, Glasure and Lee (1998), found similar causality like that previous author for South Korea and Singapore. Thus, this reemphasize the mutual relationship between growth and consumption irrespective of the level of economic development of a country.

Correspondingly, studies employing similar techniques–co-integration and granger causality- and data of almost same period for different countries found a bidirectional causality between growth and oil consumption. Cheng (1999), analyzed Indian data for the period 1952 to 1995, Chang and Wong (2001), Singapore's dataset for the years 1975 to 1995, and Aqeel and Butt (2001) Pakistan's panel data for the periods 1955 to 1996. They found that economic growth Granger causes oil consumption and vice versa in their respective studies. This shows how growth requires consumption to fuel it and how consumption needs growth for its augmentation, which is good for the poor.

The work of Glasure (2002) yield same conclusions. He employed a five variable Vector Error Correction Procedure to analyze causality between economic growth and oil consumption in Korea, coming to the same conclusion of causality relation. Government expenditure was used as a measure for government activity, money supply measured monetary policy and oil prices were added to explain the causality utilizing data for the time period 1961 to 1990. Structural breaks of two oil price shocks were incorporated in the model as dummies. He found bidirectional causality with oil prices having the biggest influence on oil growth and consumption. Well as prices surge consumption and growth, it often hurts poor masses with meagre resources.

Equally, the reexamination of the link between oil consumption and gross domestic product in the ten top emerging markets by Soytas and Sari (2003) found a bidirectional relationship. There was an observed bidirectional causality for Argentina and causality flowing from gross domestic product to oil consumption in Italy and Korea and from energy consumption to gross domestic product in Turkey, France, Germany and Japan. This implies that oil conservation is detrimental to economic growth in the latter four countries but not in the former. In economies like Uganda, conservation may not be a priority and hence, a full bidirectional causality is possible.

Other studies however, discovered no relationship between oil consumption and growth. For example, Akarca and Long (1980), using the Sim's technique for oil and Gross National Product challenged Kraft et al. (1978), result; they utilized data for the USA for the period 1950-1970, detected no causal connection between oil consumption and GNP. Employing the same method, Cheng, et al. (1997), noticed no causality between growth and energy consumption for Taiwan. Therefore, the results seem to be influenced by the type of technique and the database.

A study by Eden and Jin (1992), that used monthly data of United States for the 1990-1994 also found no any evidence of co-integration between oil and GNP. In their conclusion, they opined that energy consumption restrictions were not harmful to USA's economic growth and that conservation has no strong effect on employment. In our study, we have nothing to do with conservation effects but rather full exploitation.

Other authors found contradictory results in the same work. For example, (Cheng, 1997), applied cointegration and Hsiao's version of Granger causality in his study of Brazil, Mexico, and Venezuela. The study finds no causal linkages between energy consumption and economic growth for both Mexico and Venezuela using the multivariate models. However, capital is found to negatively, though weakly, cause economic growth for both Mexico and Venezuela. Additionally, energy is found to cause economic growth for Brazil. In sum, the study detects no consistent causal patterns between energy and economic growth based on the causality tests from these countries. Henceforth, this shows how the technique employed heavily influences results in empirical studies.

Likewise, Zou and Chau (2006), detected no cointegration between oil consumption and GDP, in China for the period of 1953-2002. However, additional analysis aimed at understanding the impact of the 1984 Chinese liberalization policies - where they introduced two separate periods in the model ;1953-1984 and 1985-2002, found cointegration between oil consumption and GDP for both periods. In the former periods, they found no causality between oil consumption and GDP in the short run; on the contrary, they found bidirectional causality in the long run. In the latter periods; in short run they found unidirectional causality from oil consumption to GDP; conversely, in the long run there was bidirectional causality like in the former. Our model is static but we are anticipating a bidirectional causality contrary to this finding.

Asafu-Adjaye (2000), also provides a case of mixed results. He analyzed the causality between energy consumption, income and price for Indonesia, India, Thailand, and Philippine; with a Granger technique for panels data for the period between 1971 to 1995. The study found variations in causality for the different economies. There was a unidirectional causality from oil consumption to income in Indonesia and India whereas a bidirectional causality between energy consumption and income was found in Thailand and Philippine. We are yet to see how oil consumption will affect growth and consequently household income and its dispersion.

Mixed results are also found in (Masih & Masih, 1996, 1997, 1998), used the Johansen method to study oil use and economic growth in numerous Asian economies. In Masih and Masih (1996), they found a long run oil income relationship for India, Pakistan and Indonesia but no long run relationship for Malaysia, Singapore and the Philippines. Masih and Masih (1997) used income, oil consumption and oil prices for Korea for the period 1955 to 1991 and for Taiwan for the period 1952 to 1992. They found bidirectional causality. On the other hand, Masih and Masih (1998), found a relationship but no evidence of directions for Thailand and Sri Lanka. The lack of solid conclusions in these studies reinforces the very need to continue exploring the linkage between these two important variables and their overall impact on economic agents

The work of Eden and Hwang (1984), affirmed the lack of any causality between oil consumption and Gross National Product over the sample period 1947 to 1979 for the United States. However, further examination using the same dataset discovered unidirectional causality being driven from Gross National Product to oil consumption for the period in question. The difference in the results therefore points to the difference in the specification of the model.

Mixture in the results were encountered by Yu and Choi (1985). In the analysis, the results showed that there was no causality for the USA, UK and Poland; but there appeared unidirectional causality drawing from GNP to oil consumption for South Korea and from oil consumption to GNP in the Philippines. This tempts us to conclude that the type of results depends on regional factors, where countries in Europe had different findings from those in East Asia.

Reddy and Yanagida (1998), study had different conclusions from others. In their analysis of oil consumption and economic activities in Fiji, they concluded that total oil use in the commercial sector was sharply reduced as a result of structural changes in the economy and an increase in the efficiency of energy use. The result shows how efficiency and adoption of energy saving production techniques can influence oil consumption.

3.3.2.2 Energy Consumption and the Environment

The impact of oil use on other variables rather than economic growth has been noted in literature. The environment has emerged as the most affected entity by oil and other natural resources. In almost all the studies, there is an inverse relationship between oil and the environment. For instance, Lin and Chang (1997), focused the impacts of oil consumption industries on environmental quality and inter-industry relationships using input–output model in Taiwan. The results indicated that fuel oil used in the transport sector and Petro- chemical industry had an adverse impact on the environment. The deterioration of the environment due to energy consumption has also been established by

Wang (2010). In his study in China, he found that surge in oil consumption deteriorated the quality of the environment and exacerbated public health. The growth in the consumption of oil in the study was attributed to increase in population, economic growth and technological advancement. Similar findings were found by Alkhathlan and Javid (2015). Using a structural time series method, he analyzed the impact of oil consumption on the environment. He found a significant positive relationship between carbon emission from the transport sector and environmental degradation. Equally, Arouri et al. (2012), established that, in the long-run oil consumption has a positively significant effect on Carbon Dioxide emissions however their study found a poor evidence in support of the Environmental Kuznets Curve hypothesis for 12 North African and Middle East Countries. Further, the results of their study propose these countries not to forfeiture economic growth to cut their emission levels since they may attain emissions cuts in the long run without adverse effects via energy conservation. Economic growth fueled by oil is good but its impact on the environment needs to be mitigated if household are to fully benefit. Combining in the analysis surge in energy consumption, economic growth and population density, the study of Nasreen et al. (2017), also, arrived at the same conclusions. Using a multivariate technique, they noted that increases in energy consumption on the in South Asia over the period 1980–2012, degraded the quality of the environment in the long-run. By and large, the deterioration in the quality of the environmental has detrimental impacts on human beings and other living things. For instance, the pollution of the different environmental media such as air, soil and water bodies, hurts households particularly the poor. It increases their medical bills, affects their productivity due to pollution related diseases and decimates the sources of their livelihood in terms of crop failure, lower fish catch and contaminated water.

However, this adverse impact of oil consumption on the environment is being tackled globally by the international community and the different governments in one way or another. Regulations are in place to abate pollution and abatement costs or taxes have been adopted in different countries (Tietenberg & Lewis, 2016). These are having a positive impact on regulating pollution. In some countries, the governments are increasing taxes on oil consumption to reduce its consumptions. Oil is also being replaced as a source of energy for instance in electricity production and in the transport sector through new technologies such as electric vehicles, and other hybrid vehicles and use conservation technologies (Ceseña et al., 2013). Investments in renewable energy is surging and a transition into the renewable sources is happening.

3.3.2.3 Impacts of Oil Investments

Most of the studies on oil and gas investment are on the unconventional shale in the United States of America where a lot of money has been injected in new technology to make it possible to drill it from the ground. There are a number of reports particularly on Marcellus gas and oil in Pennsylvania. We look at a few of these reports. A report by Considine et al. (2014), highlighted the economic impacts of developing the Marcellus gas. The findings were that investment in that industry yielded $2.3 billion in value added, US$240 million in taxes and more than 29,000 jobs during 2008. It forecasted a much higher figure in 2009 US$3.8 billion in output, US$400 million in taxes and more than 48,000 jobs. Another report by Higginbotham et al. (2010), investigated the impacts of the oil and gas industry and the development of the Marcellus gas in West Virginia. The findings show that an estimated 10,000 jobs were created earning workers US$550 in the county. Additionally, the impacts on the entire state was significant: oil and gas investments generated about US$2.3 billion business worth, US$12 billion of output, 24,000 jobs, US$65 and US$88 million income and property taxes for the state respectively. Further, the report by Kevin (2017), investigated the potential benefit to the economy of investing in Appalachian Petro-chemical sector. The report found that an initial capital investment of US$35.8 billion in this industry generated in 2016, 28.4 billion output, 100,818 jobs, $6.2 billion payroll, $2.9 billion federal and state taxes. These reports show the immense benefits of oil and gas absorption on the economy as a whole and households in particular. In advanced economies like UAS, on average, the benefits tend to be even distributed amongst the population. However, in the case of poor countries like Uganda, it might not be the case. First of all, majority, if not all investors in extractive sectors are foreigners from advanced economies with huge capital and most of the jobs that are generated during these massive investments go to again foreigners with the required skills that locals in poor countries lack. Thus, the economic benefits that accompany oil and gas investments may not have substantial impacts on poverty and inequality in poor countries.

Aside from reports and surveys, studies using statistical tools have also been used to investigate oil investments. Using treatment-effect design, Weber (2012), estimated the impacts of investment in oil and gas production in a county covered by shale deposits in Texas, Wyoming and Colorado. He used data from Bureau of Economic Analysis (BEA) and USA Energy Information Agency (EIA) for the period 1998 to 2008. He noted that a substantial investment in production generated modest employment and incomes for households. Specifically, an injection of million dollars into the production generated 2.35 jobs, and annually increased employment by 1.5%. In a follow-up study, Weber (2014), examines the possibility that the unconventional gas boom might lead to a resource curse in rural counties with an expanded dataset from 1998 to 2011. He finds that an additional 22 billion cubic feet of gas production creates 18.5 jobs in each county. He, however, did not find any evidence of a resource curse in the augmented production of petroleum. Both manufacturing and the level of education remained stable during the analysis. These empirical findings reinforce the findings and conclusions those of the reports discussed earlier. They highlight the very fact that oil investments could reduce poverty and inequality via employment generation and consolidation and boosting of public revenue that can be used by the government to tackle these socio-economic menaces.

The analysis of Weinstein and Partridge (2019), employing an innovative technique - difference-in-differences, compared the growth in income per capita and employment focusing on areas that are drilling shale and those that are not doing so in Pennsylvania in the period 2005 vs. 2009. In their analysis, they came up with same conclusions regarding effects investments in oil and gas on income and employment. In their findings, there were positive impacts on income per capita for shale counties in south and north were noted. However, significantly positive impacts on employment were detected only in the counties located in the south. In their further analysis done by comparing shale counties and all the counties in the state, the results showed shale counties having significant income per capita gains, while the effects on employment were insignificant.

This variation could have been as a result of geographical spillovers associated with petroleum extraction, such that what are regarded control groups might in fact be experiencing a treatment effect, which may tend to downplay the treatment effect in the counties where the drilling is taking place. Thus, from the study, we not that the economic benefits of petroleum investments are not limited to the area where production is going on but it spread far beyond.

In a follow up work, Weinstein (2014), equally focused on the role of oil and gas on employment. She analyzes county annual data in 48 states in the period 2001 to 2011 from U.S Census Bureau, Bureau of Labor Statistics, BAE and EIA with difference- in-difference technique. She finds small growth in employment and earnings with the latter doubling than the former. Employment was estimated at 1.3. This demonstrates how oil is not necessarily a magic bullet in creating substantial jobs required in poor countries with massive unemployment problems and raising earnings of the poor. Hence, this may leave the poor in the same state even with oil discovery.

Outside U.S, – in Canada, Marchand (2012), investigated the impact of additional investment in energy on Canadian labour market across sectors, with more less the same conclusions. The results show both indirect and direct impacts on income and employment within and without the extractive industry. The local job multipliers point to the creation of reasonable number of jobs within the extraction sector, whereas fewer jobs were created in the non-energy sectors in the communities. For each ten extraction jobs created, there is roughly three, two, four and a half jobs created in construction, retail and services respectively. Manufacturing is not crowded out. Therefore, the result of this point to three issues: Investments in the extractive sector creates jobs not only in that sector but also in other sectors. More so, it does not contract other sectors, henceforth, consolidates jobs and income in other sectors. This could in the process have a powerful impact on income distribution and poverty reduction.

Munasib and Rickman (2015), study of the impacts of investment in the production of oil and gas in the Bakken, Marcellus and Fayetteville using the synthetic control method, expands the number of variables in the analysis but still arriving at the same conclusions on employment and income. They used three datasets: U.S. Bureau of Economic Analysis, 2013, U.S. Census Bureau 2013 and U.S. Department of Agriculture, Economic Research Service, 2013. In the results, it was found that employment, per capita income, and population increased in the states involved. These impacts had spillover effects on other states too. Another important aspect of the study is the very fact that poverty was noted to have reduced. Hence, the study helps us understand how petroleum investments have far wider socio-economic impacts on the economy.

In the same token, Hartley et al. (2015), studies the impact of both conventional and unconventional gas and oil on the local employment in Texas using dynamic panel model on count monthly panel data for the period 2001 to 2011. They employ first-difference and GMM methodology. Without cross-county spillovers, the authors find increases in short term jobs in each of the 54 counties, where within county employment impacts happening mostly in months zero, one, five, and six. With spillovers, employment effects in the long-run are higher than without. For oil to be very benefit, an adequate time lag is needed, issues that are always addressed in dynamic CGE models.

Equally, Lee (2015), estimates the economic benefits of oil and gas using a dynamic spatial model for counties in Texas using annual data for the period 2009 to 2014, ending up with same conclusions regarding employment. He finds minimal multiplier effect on local incomes and employment. Economic impacts were significant for gas than oil extraction. The study however is silent as to why gas is more beneficial to the economy than oil. Unlike oil which is used in automobiles which are out of reach of the poor, gas is widely used as cooking fuel by all including the poor, thus it has a strong ability to improve the welfare of all household brackets.

Wrenn, Kelsey, and Jaenicke (2015), analysis of petroleum investments and employment in Pennsylvania using county data incorporated residents and nonresidents. With a combined data set of both residents, the gains in employment is modest, however, using data for only residents, the results are halved. This drives us to conclude that there was a spillover effect on petroleum beyond the sites where drillings were taking place. Oil wealth is beneficial to the entire community in one way or another irrespective of how far they are from the producing areas.

A comprehensive study by Feyrer, Mansur, and Sacerdote (2017), examines the impact of boom in shale production using dynamic statistical model. It was discovered that for every million-dollar investment in the new production technology “hydro fracturing” generated US$80,000 wage income in addition to US$132,000 business income and royalty within a county. Within 100 miles, the impacts were even greater. Income from wages totaled US$ 257,000, and revenue from royalty and business amounted to US$286,000. Approximately, two-thirds of the income from wage increase remained for two years. This reinforces the previous finding that talked of benefits spreading far and beyond.

Further study by Brown (2015), on the role of energy investment on employment had results reflective on those in earlier literature. The study examined the impact of increased investment in petroleum drilling and exploration at the time when oil prices were falling prices utilizing monthly rig counts data in Kansas City. He finds a unit rig increase contributed 28 jobs in the same month, 94 after six months, and 171 in the long run. The finding suggests that oil rich economies needs to continue investing in the sector even when prices are decreasing to create jobs.

Paredes et al. (2015), work on the impact of investing in new technology to boost shale oil and gas production on employment and income, using annual panel data for Pennsylvania – 2004 to 2011; generated contradicting results due to differences in models. The first model – the propensity score matching observed no impact of fracking on either employment or income. The second approach - a panel-fixed effect regression, found statistically significant employment effects in six out of seven alternative specifications and only a single significant income effect. Put differently, the income spillover effects in the Marcellus appear to be minimum, and our opinion is that there is small incentive to incur current or potential future costs which might be linked with this activity.

Rapid investment in the development of petroleum is associated with adverse effects on the natural environment which usually tend offset the economic gains, both to the well-being of residents and economic growth via negative feedback consequences on migration and tourism. Numerous probable risks to the local communities have been named in the literature (Harrisons, 1983; Kelly et al., 1985; Lipscomb et al., 2012; Rahm, 2011):ground water contamination, spills, reduction in ambient quality (air, water and land) due to fumes and dust, earthquake frequency, pipeline safety and placement and water depletion used in extraction.

While the foregoing author found not impact in the first model, studies on petroleum investment and housing value show outright negative impacts. A case in point is the study of Gopalakrishnan and Klaiber (2013). In their investigation of property values in areas in the midst of shale petroleum exploration in Washington County, Pennsylvania in the period 2008 to 2010, the authors found a negative effect. Utilizing contingent valuation surveys in Texas and Florida, Throupe et al. (2013) reinforced the inverse relation thesis between petroleum and housing. The results that emerged found oil fracking decreasing in bid values for homes in the vicinity, while those far away were less affected. In the study of Muehlenbachs et al. (2015), the impacts depended on the sources of water of property in the vicinity of petroleum activities. For homes deriving their fresh water from the ground, exploration had a negative effect, while those that had their water from pipes– the values had small positive effects. These side effects are worse in developing countries particularly in areas populated by the poor without.

3.3.3 Oil Export

Oil exports are by large affected by world price fluctuations (Adelman, 2002; Backus & Crucini, 2000; Birouke & Zewdu, 2012). It is also affected to a less extent by production and distribution disruptions (Kilian & Park, 2009). Oil exports are sometimes used as tools to achieve certain political objectives. This comes in the form of embargo like that in 1970s and 1980s or sanctions like that imposed on Saddam Hussein's Iraq and Ayatollah's Iran by U.S and the International Community. Studied on the impact of oil export majorly focus on economic growth and general economic outlook of the economy. A pioneering work on the impact of oil export by Looney (1984), examined the quadrupling of oil prices in late 1973 on Saudi economy. The study concluded that oil export rapidly improved the country's terms of trade, increase the proportion of oil receipts in national income, the balance of payments receipts, and the fiscal budget. In the short-run, all these developments led to rapid improvement in all segments of the economy. This therefore show how exporting oil can help in overcoming poverty and its cousin inequality.

Similarly, Heidarian and Green (1989), examined the impact of oil export on the economy of Algeria using Keynesian econometric model. In its conclusion, the study showed how oil export had a positive impact on most major economic sectors. Improvements in oil exports, ceteris paribus, led to elastic increases in luxury imports and domestic consumption, and inelastic increases in domestic investment. Overall, the finding is useful in helping us figure out how oil can improve the lives of the poor.

Likewise, Adedokun (2012), studied the impact of oil export on economy focusing on economic growth of the Nigerian economy. The results from the empirical analysis suggests that an increase in oil export has a positive impact on growth in the short and long run. Thus, by implication, the results hints that exporting of oil is good to households at all time.

The study of Karamelikli et al. (2017) and Parvin and Tang (2014), studied looked at the impacts of oil and non-oil exports on the economy of OPEC and Iran respectively. The former concluded that oil export had a positive impact on GDP and a negative on non-oil exports. The latter study contradicted the former suggesting that oil export has an inverse relation with economic growth. The shrinking of non-oil exports is bad news since in most developing countries, the bulk of their exports are traditionally agricultural products which is undertaken by majorly the poor. Thus, the finding points out to the fact that oil can harm the poor by its killing of their main source of livelihood.

Incorporating the level of corruption in the model Junior (2015), study on oil export in Nigeria concluded that oil had a significant positive impact on the economy while corruption had a negative one. The finding is good and at the same time bad for developing countries like Uganda. Good in the sense that the expansion of the economy as a result of exporting oil generates the necessary resources to tackle a wide range of socio-economic challenges. Bad given the fact that most least developed nations are prone to higher levels of corruption, which in this result was detrimental to the economy.

Studying the same economy, Peter (2010), incorporated external debt in the analysis of oil export. The econometric results concluded that surge in oil export has a positive impact on the country's external debt which inversely affects economic growth. This finding is in line with what actual happens to most oil rich nations. They have the tendency of increasing borrowing basing on future oil revenue which increases public debt.

In a nutshell, well as oil exports are prone to fluctuations in prices, they have tremendous impact on the economy with potential benefits to households.

3.4 Economic growth, poverty and income distribution

In our study, the impacts of oil discovery on household poverty and inequality are viewed via economic growth, and thus, the very need to review literatures formulating the triangle of these three issues. From a policy perspective, the focus of the pro-poor growth strategy should not necessarily focus solely on economic growth but rather could also be blended with an active policy of income distribution. Nevertheless, there may be a trade-off. In case, to a greater extent speedy cut in poverty can be accomplished via decreases in inequalities, then distributional policy carries a greater priority; however, in case greater levels of inequality seem to ensure rapid growth leading to quicker poverty reduction, then we may as well tolerate inequalities. Thus, the link between growth and inequality are important from a policy perspective.

In his celebrated article, Kuznets (1955), examined the relationship between per capita incomes and inequality in a cross section of countries. He found that there was an inverted-U pattern; that is, inequality first increased, and later decreased; with increase in per capita income. He attributed that pattern to the structural change in a dual economy setting, in which labour was shifted from a poor and relatively undifferentiated traditional sector, to a more productive and more differentiated, modern sector.

Kuznets' inverted-U has been subjected to numerous tests since then. Deininger and Squire (1998),for example, offer the broadest attempt to date to test the Kuznets' hypothesis. The quality of their data set was better than that of earlier researchers, and moreover, it had fairly comparable data for several points in time for individual countries. Most importantly, they were in position to analyze income changes among the poor, this is, the bottom quintiles. In their results, they found no proof of an inverted pattern for individual countries. In many cases, in reality, it was difficult to come up with any substantial change in income distribution during recent decades. They further examined whether there was a link from rapid growth to raising inequality, and once more, they did not find any orderly evidence favoring such a relationship. Rapid growth was linked to growing inequality, as often as it was associated with falling inequality, or without any change at all. Their results resonate those of an earlier study by Ravallion and Chen (1997), who did not find any systematic relationship between the rate of growth and inequality.

The impact of growth on the poor evidently rest on how the gains are disseminated across the population. By looking at the growth and income shares of different groups, Deininger and Squire (1998), analyzed how initial inequality and concurrent changes in inequality influence poverty. In their analysis, they found the bottom 20 per cent (poor) not only to suffer from growth reducing effects of inequality, but also benefited from measures that stimulated growth. Similar strong relationship of growth reducing poverty were found earlier by Ravallion and Chen (1997). In their study, they distributed the observations into four quadrants in accordance with the direction of changes in mean consumption and poverty rate. What emerged was the fact that almost all observations fell either in the quadrants with rising poverty and falling mean income or in the quadrant with falling poverty and rising mean incomes. Such findings render us to safely conclude that empirically, on average, there a strong link from per capita income growth to poverty reduction[19].To an extent, these studies are demonstrating that the policies which promote growth do not, generally, exacerbate inequality to a level that can undo the poverty-reducing effect of growth. However, they largely portray cross-country cases that may not necessarily apply to an individual country.

Despite the strong relationship running from GDP growth to poverty reduction in some of the studies, countries with initially severe inequality might lag behind in their reducing poverty efforts. While pioneering models, particularly the Harrod–Domar model, forecasted greater inequality to lead to higher growth rates, during the 1990s, the effects worked in the opposite direction. A number of empirical studies during this period from both developed and less-developed countries, confirmed the inverse impact of inequality on growth. Prominent studies that have been cited to have established such a relationship includes the works of Persson and Tabellini (1994), and that of Alesina and Rodrik (1994). However, in all, there has been cross country data limitations. These authors and others at large, interpreted their results in a political economy perspective, arguing that when inequality is high, normally median voters push for distortionary (high) taxes on the better-off, that has disincentive effects on savings and efforts, which consequently reduce growth. However, additional tests of this proposition have hurled some question on its validity, and moreover, the grounds for disincentive effects of taxation is so far reasonably weak. Another probable channel from inequality to growth could be through social conflicts. Alesina and Perotti (1996) reasoned that inequality bleeds political instability, which in the process hinders efficiency and investment levels, and

[19]Other studies supporting positive average effects of growth on poverty are Anand and Ravallion (1993), Ravallion and Datt (1994),Bell and Rich (1994) , Ravallion (2001), and Dollar and Kraay (2002).

accordingly, growth. It has also been contended that instability diminishes the capability of governments to handle external shocks (Rodrik 1997).

Deininger and Squire (1998), tested the link from inequality to growth, but found no stable relationship between the level of initial income inequality and growth. They nonetheless, found that high inequality in the distribution of land (asset distribution), had a significant negative effect on future growth[20].They based their conclusions on credit rationing, in circumstances where investments are indivisible. From a logical point of view, even in cases such as investments in future profitable projects like child education and other investment, the poor are traditionally left out due to basically lack of collateral for loans. Lack of assets also typically reduce likelihoods to participate in the political process, and hence access to resources. It has been observed however that once economies become to a larger extent rich, this nexus between high inequality and low growth disappears. Therefore, low initial inequality has a double benefit for the poor, on one hand, it increases overall growth, and on the other hand, it increases the income generating opportunities. Other policy variables, however, affect poverty normally via their effect on investment, and investment in new assets appears to be more effective compared to redistribution of existing ones. For instance, land reform policies to alleviate poverty that reduce overall investments may pause challenges in the long-run to the economy. Birdsall et al. (1995) found that the low inequality of income in East Asia contributed to its fast growth. In addition, policies that reduced poverty and income

[20] Studies by Birdsall and Londoño (1997) and Deininger and Olinto (2000), also established an inverse relationship between initial distribution of assets and growth.

inequality, in particular, basic education and measures augmenting labour demand, too, stimulated growth.

The debate about the empirical link between growth and inequality, however, seems to be endless. Forbes (2000) uses a unique method that enables fixed country effects to estimate how inequality in a country effects its growth. Contrary to earlier studies, she finds a robust and significant positive relation between income inequality and growth. Obviously, further research on this issue is warranted for the development community to figure out how this relationship looks like.

Nevertheless, there are indications suggesting a negative effect from high inequality to low growth, in particular when assets are distributed unequal. Countries with initially severe inequality of land and consumption, may be less successful at reducing poverty, because a given growth rate leads to slower poverty reduction, at the same time as the uneven distribution of land leads to slower growth. It is however, not safe to generalize the impact of a change in the pattern of distribution upon growth. Other factors of which includes political, social and the method by which the distribution of assets is adjusted, do have a bearing on growth and thus has to be evaluated.

3.5 The poverty impact of economic policies

Hitherto, we have evaluated the interlinkages between growth, income distribution, and poverty. Our next task is the evaluate development strategies or policies that can simultaneously lead to high and sustained growth rates, equitable distribution, and a rapid reduction of poverty. While there seem to be a consensus suggesting that countries with more equal distribution grow more quickly, agreements are too emerging proposing that economic policy can compensate for unequal initial income distribution. The challenge now in the development community is thus to come up with a set of policy instruments to deliver both growth and equity.

Despite the few studies examining these issues, Lundberg and Squire (1999) contend that financial depth, openness, and land redistribution come out as policies that steadily spur growth. With the probable exclusion of openness, all these policies equally benefit equality. While studying growth, inequality and poverty, Lal and Myint (1996), found that experiences differ a lot among countries, and that variations in performance are mainly due to differences in policies. However, it is rather difficult to come across any systematic evidence with regard to the effects of macroeconomic policies on poverty (Paul Cashin et al., 2001).The same is true for indicators of growth stimulating polices for which significant correlations between growth and inequality across countries have seldomly been found (Ravallion, 2001). In spite of that, understanding policies and development strategies that have been successful in reducing poverty can act as a guide to other countries. From this background, we review a few policy-oriented areas below.

3.5.1 Sectoral growth pattern

Much as economic growth is essential to reduce poverty, the orientation of the growth process is as well, crucial. A critical question then follows, what sectors should be given more preference in a poverty-oriented growth strategy. The dual economy models of Lewis (1954) and Fei and Ranis (1964) provided a pioneering attempt to understand the role of inter-sectoral linkages, considered vital when devising development strategies. In the 1960s and 1970s, those strategies centered on the expansion of industrial activities, with the aim of increasing agricultural products demand. For this to be realized, a good number of developing countries introduced trade barriers to promote domestic industrialization. While Asian countries were able come up with a competitive industry and reduce protection, their African counterpart, performed poorly in this regard. The success of some countries in Asia especially the so-called Asian Tigers rested on two factors, successful land reforms and well-developed agricultural sector. The import substitution policy in much of Africa, unfortunately, did not contribute to the development of a globally competitive industry and rather had a shocking effect on agricultural production. In most countries, agricultural production was taxed via high trade barriers and direct export taxes. Farmers were compelled to sell their produce at artificially low prices and agricultural production slugged. Thus, this dismal performance greatly affected export revenues, employment and poverty, in both rural and urban areas. With agriculture underperformance, agricultural income deteriorated forcing large numbers of people to migrate to urban areas in search of jobs, where a majority of them ended up in the informal sector or in outright open unemployment. This contributed to surge in poverty both in urban and rural areas.

With the introduction of economic reforms that came to be popularly referred to as "the structural adjustment programmes" in 1980s, mostly advocated for by the World Bank, a shift in emphasis emerged. These reforms were premised on incentives to support the agricultural sector with the objective of boosting agricultural production thereby reduce poverty in rural areas. To achieve this then, producer prices were increased, however, currently, additional reforms of the rural environment have turned out to be essential to increase growth in agriculture in a sustainable way. Hence, surge in agricultural production can promote domestic industry. Thus, while earlier periods prioritized backward linkages, the priority today is on forward linkages (Bigsten & Collier, 1995).

Although those earlier models assumed a simplistic view of various aspects of dualism, fresh studies in this area are offering some interesting developments. For instance, Thorbecke and Stiefel (1999) expand the standard dualistic framework into a dual - dual framework, that distinguishes today's formal and informal sector activities in both rural and urban areas. Their framework show that shifts in population between socio-economic groups is a prominent factor in explaining changes in poverty.

In an extensive dualistic framework, Bourguignon and Morrison (1992) found that the degree of economic dualism is a main factor in accounting for the differences in income distribution across developing countries: enhanced agricultural growth is the most efficient mode of alleviating both inequality and poverty. Similarly, results emerging from India, obtained by tracing the evolution of poverty through thirty-five household surveys conducted between 1951 and 1991, suggest that agricultural growth counted more than growth in manufacturing for poverty reduction (Ravallion & Datt, 1996). Likewise, Mellor (1999), reasons that, despite the prominence of manufacturing growth in term of overall growth of an economy, agricultural growth is more crucial when it comes to employment growth and poverty reduction.

However, examinations of linkages have traditionally centered on the production side of the economy. Studies of rural economies on the other hand, propose that the primary inter-sectoral linkages are to be encountered on the consumption side. Hence, according to rural development studies, changes in poverty heavily depend on how the poor masses in rural areas spend increments in their income (Delgado et al., 1998; Haggblade et al., 1989). Still, extra attention needs to be paid to inter-sectoral dynamics, particularly in sub-Saharan African economies (Blunch & Verner, 1999).

3.5.2. The Role of the Public Sector

Redistribution policy is complicated politically. For, asset redistribution typically has costs in terms of lost growth, hence there is an equity - growth trade-off. Normally, this arise from efficiency and output losses from one-off redistribution, or through the impact on investment incentives. Redistribution, therefore, inevitably raises complex questions of political, social, and economic importance. As a result of this, governments in least developing countries usually prefer a less dirigiste approach and instead use changes in tax policies and public expenditures. More often, governments come up with measures that can achieve a balance between having immediate effects on poverty and supporting processes that bring continuing and sustainable poverty alleviation in the longer term.

Although many developing countries have attempted to allocate public expenditures towards projects, which would reduce both inequalities and poverty, the outcome has always been, a total failure. One reason for the disappointing results is the inability to integrate policy, planning, and budgeting. In many countries, policy-formulation, planning, and budgeting take place independently of each other. Planning is typically limited to investment projects, which in several poor developing countries pertain to a series of international donor-funded activities. Capital expenditures, are, thus, already largely accounted for through the planning process, and large portions of recurrent expenditures are simply committed to the wage bill. For this reason, annual budgeting is reduced to allocating resources thinly across donor and domestically funded ‘investment’ projects, and to the non-wage portion of the recurrent budget.

Given the ineffective decision-making processes characterizing most least developed countries, policy-formulation, and planning are also disconnected from each other, and likewise, from budgeting, and above all, they are not constrained by resource availability or by strategic priorities. Overall, this may lead to a massive mismatch, between what is promised through government policies, and what is affordable. The annual budgeting process, therefore, becomes more about scrambling to keep things afloat, rather than allocating resources on the basis of clear policy choices to achieve strategic objectives. It is, thus, vital to reform the public sector, in addition to, the forms of foreign aid.

A tool that is now extensively used in modern budgeting, is the medium- term expenditure framework (MTEF) within which ministers are given greater obligation for resource allocation decisions as well as resource use(World-Bank, 1998).The MTEF comprises of a top-down resource envelope, a bottom-up estimate of the current and medium-term costs of prevailing policy, and, finally, the matching of these costs with available resources. The matching of costs should usually arise in the framework of the annual budget process, which should center on the necessity for policy alteration to incorporate changing macroeconomic conditions, as well as on alterations in strategic priorities of the government. The MTEF offers an effective instrument for attaining a more efficient use of public resources. As the introduction of MTEFs is relatively new, few comparative studies of literal MTEFs has been carried out. However, a study by Le Houerou and Taliercio (2002), found that MTEF reforms have ignored initial country conditions in basic views of budget management and have not given ample attention to the institutional and political issues of the reform process.

The efficiency and composition of government expenditures are vital determinants of growth and poverty. Normally, fiscal reforms produces three distinguishable impacts from the reallocation of public expenditures. First, changes in both relative prices and factor-incomes, produces changes in income distribution and poverty. Second, the composition of public expenditures impacts sectoral productivity, and consequently, demand for labour and income of household. Third, alterations in public services supply, for instance education and health care have an impact on household's likelihoods to obtain human capital.

In case of changes in relative prices and factor incomes following cuts in government recurrent expenditures, this hurts urban households severely, owing to the urban bias of government employment. Relatively, usually rural households benefit from the ensuing alterations in relative prices (Dorosh, 1996; Dorosh et al., 1996; Dorosh & Lundberg, 1996). However, in poor countries, mostly in sub-Saharan Africa, political constraints induce governments to decrease capital expenditures, rather than trimming public employees. While this has often protected urban households from short-term income losses, it has often had long-term negative consequence on the poor rural households. In this regard, Ghana offers a good example. With decline in public investment in both agriculture and rural infrastructure, the country experienced significant negative long-term effects on agriculture production. Hence, despite rural population benefits from a real depreciation of the exchange rate in the short-run, Dorosh and Lundberg (1996), argues that these benefits are wore way in the long-run in case public investment is not maintained at a realistic level

Investment is another crucial determinant of economic growth. However, well-thought-out public interventions often turn out to be unproductive the more numerous they become. For instance, capital expenditures, traditionally assumed to be the crucial component of development, have been excessive in a number of developing countries, making them unproductive at the margin (Devarajan et al., 1996). Tanzania offers a good case for illustration. In their study, Kweka and Morrissey (2000), found an inverse relationship between public investment expenditure and economic growth in the period 1965–96. Therefore, a shake-out of unproductive public investments could boost overall productivity of investment. It is equally true, however, that a disproportionate shake-out could have a side-effect of depressing the productivity of private investment (Toye, 2000). A case in point, inadequate infrastructure and insufficient public services in Uganda substantially decreased investments of private firms (Reinikka & Svensson, 2000). Cameroon offers another case study. The reduction of public investment particularly in agriculture and infrastructure, produced a negative impact on agricultural activities and the poor households in rural regions. The policy implication from these two cases is that if a reasonable share of the private sector's costs emanant from poorly functioning public sector, private sector response to economic reform is expected to remain little.

A reallocation of government expenditures may similarly impact on the supply of health and education services, nevertheless this does not inevitably hurt the poor. In his study of Latin America, Lloyd-Sherlock (2000) contends that, the scale and overall allocation patterns, of government social spending did not benefit the poor. Notwithstanding the high level of spending by governments in this part of the world, large segments of low-income groups were left out from numerous areas of public welfare. The consequences of entitlement limitations are reinforced by severe difficulties of access and quality for apparently universal services. Empirical results from a handful of African countries equally show that spending on social services, especially education as well as health care, is not targeted well, to the poorest households (Castro-Leal et al., 1999; Sahn & Younger, 1999). Whereas subsidies to primary education are an exception, they however seem inequitable when judged against the numbers of school-age children in the poorest groups. Therefore, reallocation of public expenditures is not sufficient and this calls for the realignment of policies in line with a sound understanding of the factors that regulate household decisions about health care and schooling, and of the ways by which subsidized services can lead to better outcomes for the poor.

Studies are available depicting health to improves with higher per capita incomes. For instance, Kakwani (1993) explored the relationship between income levels and welfare indicators notably life expectancy at birth, infant mortality rate and literacy. He found a strong and significant relationship, particularly in the poorer countries. Higher incomes enhanced the indicators at a decreasing rate. Anand and Ravallion (1993) also found a significant relationship between national income and life expectancy as well as mortality indicators. Pritchett and Summers (1996) and Filmer and Pritchett (1999) found a highly significant effect running from income to a wide range of health indicators.

Nevertheless, there have been cases in poor countries where structural adjustment loans have led to growth that did not yield any significantly positive effect on health indicators.

From here, we can safely say that the relationship is rather complicated and interwoven. While economic growth has been observed to improve the health of the population, the degree of the improvement rest on, among others, the character of the growth process. A process that leads to reductions in poverty as well as to improvements in the provision of health services, is most likely to have a positive effect on health indicators. In addition, particularly bearing in mind the irreversible effects of not making such investments (Appleton and Teal 1999), points out that, the long-term intergenerational effects of health care and education are vital reasons for promoting social sector investments, in the face of tight current fiscal constraints.

Provision of public services in most countries is inhibited by low levels of public revenue, which in principle, could, be resolved by higher levels of taxation. However, in some countries, rapidly increased taxation poses unbearable constraint on private investment, and thus impact negatively on future growth, and henceforth on revenue collection. In their study of Uganda's taxation, Chen and Reinikka (1999)came up with two reasons explaining why the increase in taxes reduce investment and future growth. First, the formal-enterprise sector in Uganda though represents a small portion of output, it has a high proportion with regards to effective tax-base. Second, limited access to bank-financing and high interest rates indicates that investment in the country is largely financed by retained earnings.

Moreover, in cases where governments turn to distortionary taxes as fiscal instrument, Devarajan et al. (1998), argues that, the method of intervention matters a lot if any benefits are to be realized. They hence suggest that, any government interventions to correct externalities should prioritize subsidization over public provision. Even under the extreme assumption where public and private sectors are at equal terms of efficiency, we normally observe financing costs of public programmes by distortionary taxes usually outbalance the benefits of internalizing the positive externality. Further, in some countries, government spending is growth-enhancing while in others is growth-impeding, due to variation in the relative importance of both distortionary taxation and the externality being internalized.

While the allocation of public expenditure in terms of equity and poverty is very essential, a pro-poor strategy would correspondingly necessitate measures targeted directly at the poor. Considerable outcome of alleviate poverty efforts, depends largely on the type of targeting-mechanism employed. Normally, the objective in targeting ensures that a poor household's income is raised up to the forecasted poverty line. If there was certainty in measuring the income of the poor and identifying them, in principle, coming up a perfectly targeted policy would be possible. However, it is uncertain, and the costs involved in obtaining accurate figures and information, would be high, in any case. An alternative is universal targeting, where information costs are reduced to a minimum. The weakness with this type of targeting, nevertheless, is that it would likewise benefit those who are actually not poor. Moreover, universal subsidies, intended to benefit the entire population, have turned out to be inefficient, distortionary, and fiscally unsustainable. However, some form of leakage might be necessary for the political sustainability of the programme (de Donder & Hindricks, 1998; Gelbach & Pritchett, 1997). By and large, both perfect and universal targeting have high costs in one way or another. To mitigate information costs, indicator targeting has been recommended as an estimate to perfect targeting. Indicator targeting rests on establishing transfers on the basis of easily noticeable characteristic, such as age, sex, size of land-holding, region of residence and so forth, rather than, income or consumption. For instance, transfers can be targeted to specific socio-economic groups or regions encompassing large numbers of poor households (Thorbecke & Berrian, 1992).

Another approach is self-targeting, which is formulated in such a manner that exclusively members of the target group feel worthy to partake. For example, public employment schemes utilize work requirements to aid screen out the non-poor; subsidy programmes back items that poor masses consume; and other measures bank on waiting time, stigma, and lower packaging quality of goods and services, to discourage usage by the non-poor (van de Walle, 1998). Self-targeted schemes too, bears the additional advantage of decreasing incentives towards corruption and favoritism. Ferreira and de Barros (1999)suggest that a fundamental issue to the success of a self-targeted incentive scheme is the wage rate. A relatively low wage rate in a way, can be an effective targeting device.

Other costs also need to be considered when a targeting scheme is implemented. Chia et al. (1994) argue that two effects have been largely ignored in the traditional analysis: the first relate to leakages associated with the financing scheme, and the second relate to the impact of indirect effects, through changes in relative prices. For example, in the case of Côte d'Ivoire, the amount of transfers in a universal targeting that would be thought to eliminate poverty in a partial context, would in fact reduce total poverty by only 7 percentage points, when indirect effects are considered. Thus, neglecting indirect effects can lead to the misallocation of resources directed at poverty alleviation.

In a nutshell therefore, there are at least two central issues that ought to be looked at: First, enhanced public service delivery is critical in stimulating economic growth and reducing poverty. Second, tax policies need to be reformulated, to simultaneously meet an increasing demand for public services and provide an enabling environment for private sector development.

3.5.3. Pro-Poor Growth and Human Capital

Human-capital accumulation has been a prominent factor in accounting for differences in growth rates and distribution across countries. Since the beginning of the 1970s, investing in education has been stressed in the development literature. While there is large volume of literature regarding the effects of the expansion of education on growth, little work has been dedicated on its impacts on income distribution.173 When the economy is growing slowly, a rapid increase in the supply of medium-skilled workers, reduces the relative wage rate of that class of workers(Appleton et al., 1999). In this case, an inverted-U relationship between income equality and average years of schooling can be achieved (Cornia & Court, 2001).This therefore calls for the matching of labour supply with labour demand in an economy which consequently depends on economic growth. When a majority of the population are illiterate, the few literates are likely to get very high salaries. But as more literate population enter the labour market, income inequality starts declining.

A change in the literacy level of a population certainly stimulates changes in many dimensions of socio-economic behavior, with powerful secondary impacts on growth, distribution and poverty. Labour force participation, household formation, migration, and fertility are all areas where education plays a major role, and where changes are likely to affect the development path of the economy. Thus, there is a dynamic, and intergenerational, dimension in the effects of education that must be taken into account.

Bourguignon et al. (1998) provide aground-breaking methodological framework that relates observed changes in the distribution of personal income and earnings attributes to education-based changes in the socio-demographic structure of the population, to changes in labour force participation and occupational choice behavior, and finally to changes in the structure of individual earnings as a result of changes in the labour market.

Examination of the Taiwanese experience Bourguignon et al. (2001)offers a number of important insights. Numerous factors affected the distribution of income, but they tended to offset each other. First, increased returns to schooling took place despite a striking surge in the supply of educated workers, and this led to increased inequality. This effect, nevertheless, was more than counterbalanced by other predispositions, such as a change in participation behavior and the expansion of education, which equalized the distribution of schooling, and thus of earnings. All in all, this gave rise to a substantial cut in inequality of individual earnings.

Brazil, which has undergone through significant structural changes,174 is yet another interesting case, the population rose by 47 per cent in the period 1976 and 1996, and turned more urban. Average education grew from 3.2 to 5.3 years of schooling. The sectoral composition of the labour force changed, away from agriculture and manufacturing, towards services. The degree of formalization of the labour force declined substantially: the proportion of formal workers was almost halved, from just under 60 per cent to just over 30 per cent of all workers. And yet, despite the macroeconomic turmoil and continuing structural changes, little changed in Brazilian income distribution between 1976 and 1996.

The Brazilian experience bear a resemblance to the Taiwanese case study, with distributional steadiness again contradicting a number of powerful, and frequently countervailing, changes: returns to education in the labour markets; the distribution of educational endowments in the population; the pattern of occupational choices; and the demographic structure resulting from household fertility choices. Two precise puzzles in the evolution of Brazil's urban income distribution are: First, the combination of growth in mean incomes and stable or slightly falling inequality, on one hand, and rising extreme poverty on the other; and Second, what explains the stability in inequality and poverty, in the face of falling rates of return to schooling and experience? Results emerging from micro-modelling study show that the first puzzle appears to have been triggered by outcomes associated to participation decisions and occupational choices, in combination with deteriorations in the labour market returns to education and experience. The second puzzle looks to be an outcome of difficult climbs on a slippery slope. Individuals had to acquire approximately 2 years of schooling, and considerably decrease fertility, to counteract declining returns in both the formal labour market and self-employment. The results of these studies prove obviously that the distributional outcome is an outcome of a complex of frequently countervailing forces.

3.6 Summary

It is noted that countries that have been successful in achieving high growth rates have succeeded in reducing poverty. However, the strength of growth in reducing poverty, is subject to what happens to income distribution - there is no constant relationship between growth and changes in inequality. Countries differ in their development strategies, but the preferred strategies are those which yield more favorable distributional outcomes with given growth. Countries that have simultaneously achieved rapid growth and improved income distribution, alleviated poverty the fastest. However, where policies meant to achieved equity have had a negative side-effect on growth, the poverty alleviation impact has been insignificant or outrightly, negative. Therefore, there may be a conflict between short-term distributional measures and immediate poverty alleviation on one hand, and long-term growth-supporting measures and long-term poverty alleviation, on the other. However, there may equally be win-win situations, where a policy for equity has a good effect on growth. Generally, those policies have accumulated the assets of the poor, and assisted boost the demand for those assets. This has meant, for instance, expansion of education (accumulating assets), and measures that surge the average prices of agricultural products and the wages of unskilled labour (boosting demand). Along with measures to ensure long-term growth of the incomes of poor households, there should also be transfer schemes that assist households to deal with risk, which is high for many poor groups. Attempt should be made to formulate schemes that can mitigate risk without having high costs in terms of reduced growth.

From these reviews, we are certain to the very fact without growth in per capita incomes, poverty will persevere in poor countries, bridging one generation to another. Governments commitments on making poverty history must, therefore, make an atmosphere that is favorable to growth. This implies microeconomic policy meant create well-functioning markets, macroeconomic policy directed at stability, and trade openness. Government has to accept charge of accumulating human capital through education, and the generation of a growth enhancing social infrastructure. For all these efforts to be effective, the government must build good institutions, and deliver good governance. The manner in which the interaction between civil society and the government is played out will have foremost consequences for the growth outcome. This therefore calls for understanding the nature of domestic politics if any successful economic reform is to be realized. Something that often appears in evaluations of the Asian success reports is the feeling of "shared growth", which proposes that, for the masses to participate actively, they must experience the fruits of growth. However, it is not only the average citizens who must be included, the elite welding power must too permit contending groups to move on, as well as letting new competitors to get into the political arena. For shared growth to take place, it calls for a bureaucracy of high quality, which is adequately insulated from the countless pressure groups. This has not so far come out in greater Africa. Poverty can be curtailed if there is significant economic growth. Growth can be significant if the policy and institutional environment is okay. The miserable growth rates that define Africa are not inevitable. But some facets of the environment are difficult to alter, and some politicians may be averse to alter them. It is, hence, mostly in the political and social arenas that poverty alleviation results will be decided.

3.7 Conclusions

From the review we can deduct that the impact of petroleum discovery on the economy are inconclusive but wild. With disregard to the structural and economic policy differences, the inconclusiveness in the results of the different studies can be accounted for in the following ways: First, the variables used, second, the time period, third, counties, countries or regions covered and forth, the methodology employed. Some studies pointed out how natural resources abundance was accompanied with positive economic growth and tremendous socio-economic benefits. In others, oil and other natural resources had negative or insignificant impact on growth. In some of the literature, we see how oil and gas crowding out important sectors in the economy like manufacturing and non-oil export. An issue in natural resource literature which has been termed as "Dutch Disease". The little work on the nexus between petroleum abundance and poverty or inequality is equally inconsistent; alleviating in some increasing in others. Petroleum production, consumption, investment and export has equally varying impacts in literature on the economy and its constituents. These range from increasing the economy's output, employment, wage income and government revenue (in form of taxes and royalty). In some instances, production, absorption and export has been noticed have a negative impact on vital economic indicators and the natural environment. Thus, from the literatures, we see that studies on the impact of petroleum on the economy is still warranted. Largely, because they are inconclusive and to some extent, they hardly simultaneously tackle the link between petroleum and household income distribution and poverty, the main theme of this study.

3.8 Research gaps and the contributions of the current study

We have been motivated by the research gaps in the studies that has so far been undertaken on the newly discovered oil in the country notably Ogwang et al. (2018), that focused on the impact of oil on livelihood of the local communities, Olanya (2015), the possible resource curse, Vokes (2012), the politics of oil and Wiebelt, Pauw, et al. (2011), the impact of oil revenue on agriculture development and poverty reduction. While the study of Ogwang et al. (2018) and Wiebelt, Pauw, et al. (2011), hinted at what we are investigating, we go in depth in our analysis. Ogwang et al. (2018), examined oil exploration and extraction impacts, and Wiebelt, Pauw, et al. (2011), oil revenue impacts. We divert from these studies looking not only extraction (production), but also incorporate absorption and export in our analysis. Further, we focus on both poverty and inequality not general like Ogwang et al. (2018), or partial like Wiebelt, Pauw, et al. (2011), who looked at poverty. Additional motivation has come from the gaps in studies on impacts of natural resources on poverty and inequality. With respect to impacts on poverty, some studies have carried out a general impact of all natural resources (Freudenburg & Gramling, 1994; Ite, 2005; Nord, 1994; West, 1994), others have focused on extractive industries (Brabant & Gramling, 1997; Gamu et al., 2015; Ross, 2001, 2003), others on the mining sector (Davis & Cordano, 2013; Deaton & Niman, 2012; Eleanor et al., 2009; Ge & Lei, 2013; Heemskerk, 2003; Hinojosa, 2011; Peluso et al., 1994; Weber-Fahr et al., 2001), and others laid emphasis on oil (Caselli & Michaels, 2013; Gary & Karl, 2003; Idemudia, 2009). Studies in the review that have examine the impacts on inequality, many have been general examining natural resources in general (Buccellato' & Alessandrini, 2009; Fum & Hodler, 2010; Goderis & Malone, 2011; Leamer et al., 1999),others have focused on oil (Kim & Lin, 2018; Moradi, 2009; Oviasuyi & Omoregie, 2016; Parcero & Papyrakis, 2016) and some few on mining (Loayza & Rigolini, 2016).The current study pioneers work on the extent and nature of oil impacts on households in the context of poverty, inequality and welfare. Unlike the studies in the review, we explore the role of production, absorption and export of oil on households. We decompose poverty and inequality so as to understand the extent of the impacts. Unlike in other studies, we go further to look at the impact of oil on household welfare in various dimensions.

Chapter 4

Theoretical and Conceptual Framework

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In the proceeding chapter, we looked at the various empirical studies related to oil in light of the study objectives. In this chapter, we elaborate different theories of the three aspects whose impacts on household will be assessed: First, we introduce how oil is discovered, then we develop the conceptional framework and later present and discuss the various theories related to our objectives.

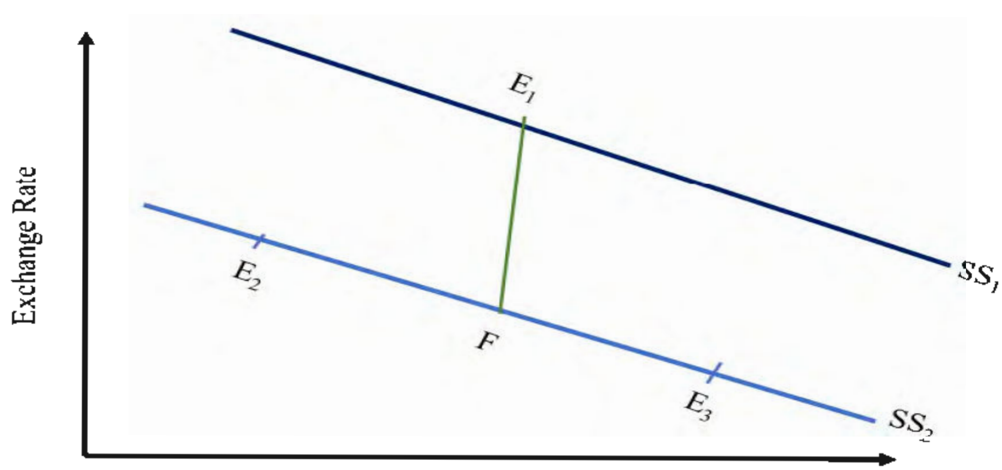
4.0 Introduction to oil discovery

Oil discovery is not new. It has existed through ages. The first oil discovery was made in 600 BC by the Chinese. However, the existing oil economy started with the discoveries of oil in Pennsylvania in 1859 and Texas in 1901. Later on, discoveries were made in the different parts of the world, particularly in the Middle-east, Latin America and Eastern European at the beginning of the 19th. Some of these discoveries were made unexpectedly (unanticipated), while others were expected (anticipated). The way natural resources are discovered has a greater bearing on the economy. A discussion of the impacts of the nature of the discovery is presented in this section.

4.4.1 Unanticipated Discovery of Oil

In this type of discovery, a natural resource is found by accident. Prior to that, there are no clues as to whether such a resource exists. The well documented case of oil that was discovered unexpectedly is that of the Comodoro Rivadavia in Argentina in 1907 (Link, 1952). Following the defeat in the second Boer war, six hundred Afrikaner families were resettled around Comodoro Rivadavia in Argentina in 1903. The settlers faced shortage of water. In 1907, while drilling for water underneath, they struck oil. From an economic point of, unanticipated discovery of oil is associated with a chain of effects on the economy. With it, demand for money surges wealth effect thus, reducing the prices (Dornbusch, 1973). The reduction in prices successfully raises the value of real balances thusly injecting reasonable liquidity in the economic system to restore money market equilibrium at E_2(Figure 4.1). There is a sudden drop in exchange rate from E_1 to F, leading to an overshooting[21] of exchange rate, driving the economy towards E_2consequently recession is sparked off characterized with high unemployment and falling output.

Figure 0.1: Unanticipated Discovery of Oil



Source: Murshed (1997)

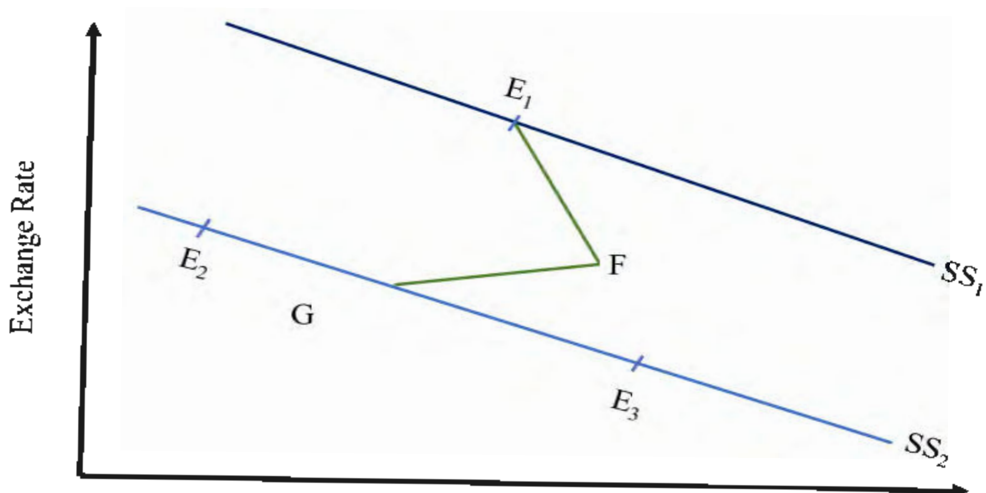
[21] A gradual and stead rise in exchange rate.

The plug of the economy into recession however, depends on the strength of the wealth effect on money demand (Murshed, 1997). If it is weak or absent, exchange rate overshooting won't occur, thus, the economy will be driven towards E_3 from where it will gradually appreciate after point F; and if strong, the economy will remain on at point E_2(Murshed, 1997). In a nutshell, there will be real exchange rate appreciation, with output shifting from traded to non-traded and total output returns to the natural rate in the long-run.

4.4.2 Anticipated Petroleum Discovery

With an anticipated discovery, there clues with regards to the presence of oil underneath, however, the established of its commercial viability is done through exploration. The impact of this form of discovery is a bit different from the prior case. When a discovery is expected at time $(t-1)$, this leads to recession in the economy irrespective of the wealth effects, as shown in Figure 4.4. The exchange rate initially jumps from E_1 to F at time $(t-1)$, from where it gradually moves towards G, where it arrives at time (t) when the discovery is realized. The movement of exchange rate from F to G, is associated with falling price level (recession), because, the appreciation of exchange rate at F depresses demand despite the arrival of revenue, henceforth inducing recession. Murshed (1997), proposes two destinations for the economy depends on the wealth effects. That is, the economy settles either at E_2, in case of wealth effect or E_2, in the absence of wealth effect.

Figure 0.1: Anticipated Oil Discovery



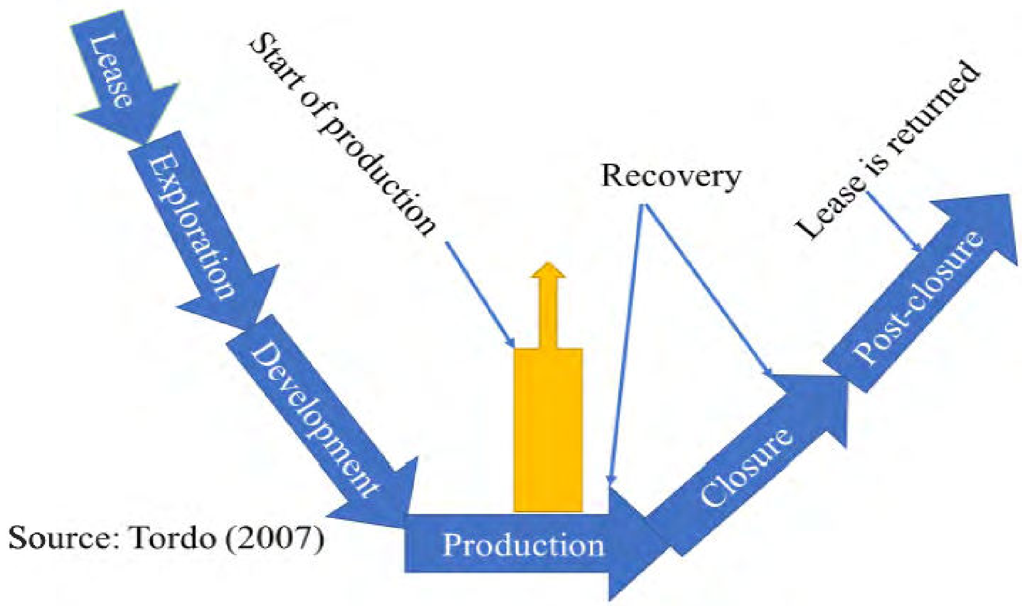
Source: Murshed (1997)

The real wealth effect of the discovery in the country is realized when the resource is extracted and consumed. The anticipated discovery goes into a number of stages. In the next section we describe the most prominent stages, popularly referred to as discovery circles.

4.2 The Discovery Circle

A lot of resources, human, physical and time are devoted in the process of searching for natural resources like oil. It is a long-term effort requiring huge capital outlay. The cycles of the discovery are illustrated in Figure 4.3.

Figure 0.3: Petroleum Cycle



4.2.1 Licensing

To ascertain the presence of oil, a host government issues licenses to individual or consortium of oil company aimed at exploring and developing fields without transferring ownership. Mostly in much poor countries, owing to lack of financial resources, physical capital and skilled manpower; licenses are issued to international oil entities. Thus, this places locals in these countries at a disadvantage in terms of harvesting income from oil.

4.2.2 Exploration

After securing the rights through license, oil companies initiates geophysical and geological surveys (Tordo, 2007). The results from the initial surveys are processed and interpreted and used in exploratory drilling. Subject to the physical geography, preliminary drillings are performed (Tordo, 2007). During this stage, sophisticated capital equipment is used by expatriate skilled manpower and the local labour mostly concentrate on manual tasks. Hence, in this stage, domestic households in developing countries without huge capital investment, and labour skills earns less compared to foreigners from middle and developed economies. The knowledge and skills required during exploration, also prevents many poor households from participating, and all these compromises their efforts to alleviate poverty and inequality.

4.2.3 Appraisal

The certainty of oil underneath a given geographical location is ascertained through exploration. Consequently, the certainty of oil in a given location leads to the drilling of delineation wells to ascertain the commercial worthy, potential production mechanism, and nature of structure holding it. This is followed by explorative development planning and feasibility studies to appraise the development costs. All these activities are majorly performed by technical expatriates with little input of locals, thus creating a big disparity in earnings.

4.2.4 Development

If the results from the appraisal of wells are promising, development planning begins utilizing the available environmental and geotechnical data of a given site. A development plan is formulated and approved paving way for contractors to tender their bids. This is followed by an in-depth environmental impact assessment that pave way to the construction of drilling tunnels, production, transportation and storage facilities. All these developmental processes require a reasonable number of labour of different skills and capital.

4.2.5 Production

In this stage, the facilities are commissioned, wells are further developed and production commences. To guarantee continued productivity of wells, efforts are made periodically that at a later time may include secondary and/or tertiary recovery. Labour is required both local and expatriate, giving some locals a mean to generate income.

4.2.6 Abandonment

When oil in a particular field is depleted, a decision is made for abandonment. For a successful removal, operators generally begin planning one or two years prior to the planned date of decommissioning or earlier depending on the complexity of the operation. Well abandonment needs to be done properly to offset the negative effect of oil and gas on the environment such as soil, water and air pollution. Where abandonment is improperly done, it might cause an environmental disaster that might affect the health of the population particularly the poor. This can exacerbate their plight via poor health and increased costs of health care.

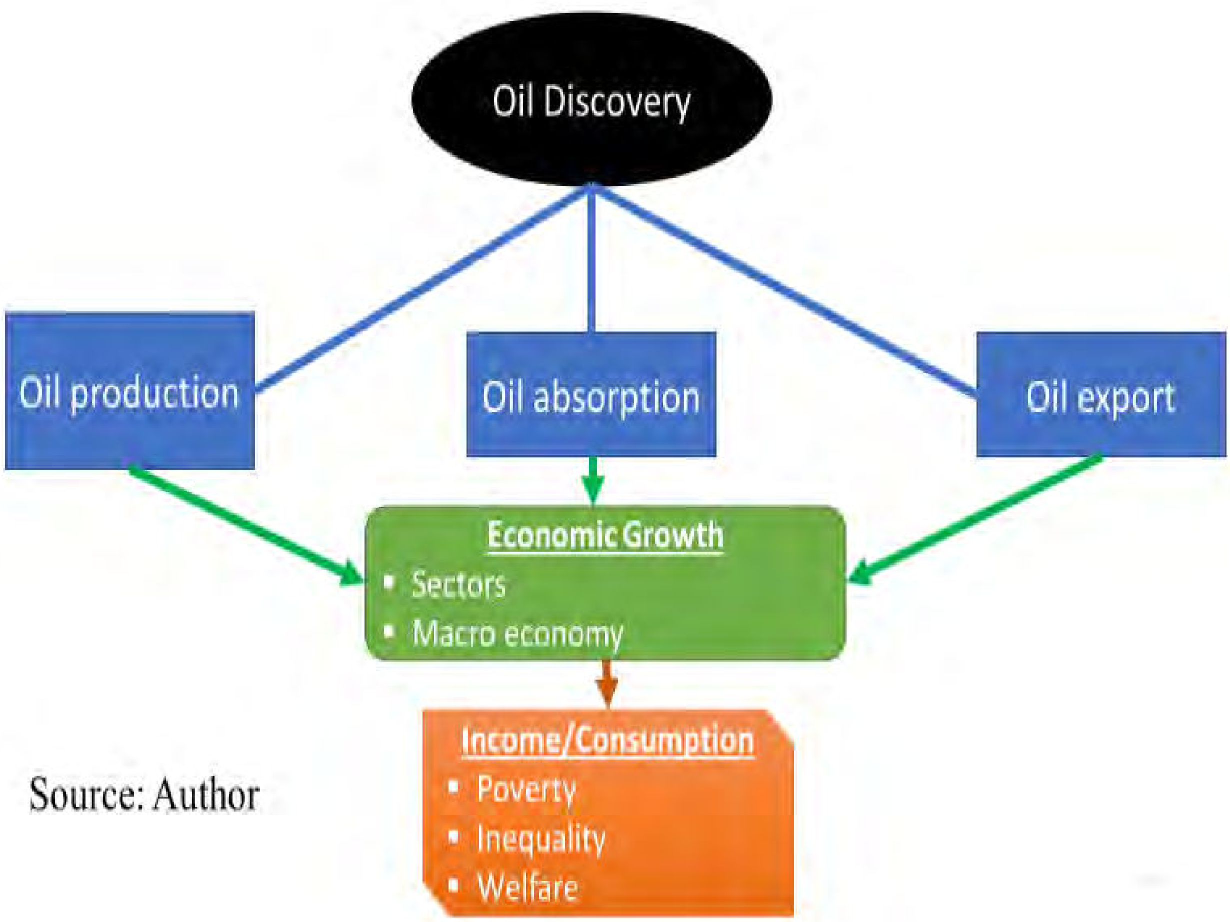
4.3 Conceptual and Analytical Framework

The framework is based on the study objectives, that is, the impacts of oil production, absorption and export on households. The process of oil production includes its extraction from the ground to its refining in the refinery. These processes require factors of production. During extraction, limited amount of labour is required mostly to operate the different capital equipment used. All the different methods used such as the traditional drilling in conventional extraction and perforating and fracturing in unconventional extraction, require a limited amount of labour to operate but substantial amount of capital, with unconventional technique demanding much more. The amount of capital and the sophistication of labour skills depends equally on whether the oil is onshore or offshore. Offshore oil and gas resources require more specialized equipment that raises capital investment. While the oil discovered in Uganda is to use conventional technique of extraction, it is found both on and offshore. The second process - oil refining too requires more capital than labour. Generally, apart from the proportion of labour requirement in oil production being low, a reasonable proportion of labour in developing countries is either unskilled or semi-skilled. Further, the relevancy of labour in oil production is being threatened by advances in production techniques that are cost effective. Moreover, much of the capital in the oil sector particularly in the developing countries is owned by foreigners from the developed world. All these facts and realities, depresses the impacts of oil on households in least developed countries.

Global oil absorption (consumption) is increasing steadily due to increases in its demand. Demand for oil is increasing in the global manufacturing, transportation, population and incomes. The increase in oil demand necessitates an equal increase in its supply, which is creating a bi-directional causality running from demand to supply and vice versa. In the midst of that causality, increases in oil demand is increasing the expenditures directed at its consumption on one hand but on the other, it is increasing earnings from it via the demand for factors of production aimed at ensuring increasing supply.

Although the number of countries endowed with oil and gas resources are increasing with the passage of time due to the intensification in exploration given advances in technology among others, a good number of countries largely lack these crucial resources, driving contemporary economies. This raises the very need for importation (for those lacking) and exportation by those abundant in oil and gas resources. Increases in oil importation is basically a function of global increases in oil consumption (demand) – that is characterizing the world today – a phenomenon similar to foregoing discussion on oil absorption. The increases in global consumption of oil necessitates increases in its exportation, which creates a vicious circle of demand and supply, with their associated effects on incomes and expenditures of economic agents such as households. An illustration of the impact of oil production, absorption and exports as elaborated is condensed in Figure 4.1.

Figure 0.2: Illustration of the channels of oil effects on households



Source: Author

4.1.1 Oil Production (SIM1)

While in its environmental media – onshore or off shore, oil is as good as useless to the economy particularly – the economic agents including households. It gains a wealth value once extracted from its environmental media and much more value once refined. As already mentioned, oil production makes use of the different factors of production. These productive factors are owned by economic agents notably households. In the social accounting matrix used in this study, these factors include five different types of labour, capital and land. To analyze the impact of production, we introduce a shock in the production share parameter ad_A in equation 6.9 in chapter 6, here renamed (4.1) for conceptualization purpose. The share parameter and other parameters are specified with respect to oil as see below.

$$\mathrm{QA}_{\mathrm{A-PETR}} = \mathrm{ad}_{\mathrm{A-PETR}} \prod_{\mathrm{f}} \mathrm{QF}_{\mathrm{f}_{\mathrm{A-PETR}}}^{\propto \mathrm{f}_{\mathrm{A-PETR}}} \qquad 4.1$$

From equation 4.1, it is clear that an increase in the oil production share (ad_{A-PETR}) ceteris paribus, increases the quantity demanded ($QF_{f,A-PETR}^{\alpha f,A-PETR}$) of factor *f* from activity oil activity (A-PETR), which will in turn increase oil output (QA_{A-PETR}).

Thus, we can deduce that the impact of oil on the economy at large and household in particular depend on four factors notably: the contribution of oil to value-added, its share in value-added, oil payments to factors and oil factor shares. A preliminary analysis in the next chapter contained in Table 5.7 show oil with the lowest figures on all these factors. Therefore, we hypothesis minor impacts of oil on the economy particularly on poverty and inequality.

While many studies on oil impacts are available, very few have gone into details particularizing the extent to oil production affects the different factors of production and consequently household incomes and its distributions. This study makes an inroad in its analysis to fulfil some of these gaps.

4.1.2 Oil Absorption (SIM2)

Oil occupies a very unique position in the world's economic system. It is a vital source of energy, a matchless transport fuel, and a crucial raw material in many manufacturing processes. Hence, its demand in domestic and world markets is ever increasing. In equation 6.36a in chapter 6, the total domestic output demand is given. Because in this equation, there is no share parameter to shock, we introduce a shift dummy for Uganda's oil absorption, we baptized (QQ0DUM)[22], to yield equation 6.36b.

$$QQ_{C-PETR} + \mathrm{QQ0DUM} = \sum_{a \in A} QINT_{C-PETR} + \sum_{h \in H} QH_{C-PETR} + QG_{C-PETR} + QINV_{C-PETR} \quad (4.2)$$

From this equation, an increase in the shift dummy for oil absorption (QQ0DUM), will have an immediate effect on the composite supply of oil (QQ_{C-PETR}), which will in turn trigger adjustments in the intermediate demand of oil the production process of the different activities ($QINT_{C-PETR}$), total household and government consumption of oil (QH_{C-PETR}) and (QG_{C-PETR}) respectively, plus the portion for investment ($QINV_{C-PETR}$).

Like in the case of oil production, an overture of the country's absorptive capacity contained in Table 5.8 in chapter 5 show miserable figures for oil this respect too. Little

[22] This dummy does not take on 0 or 1 as it is traditionally done in econometrics models. Rather, I have calculated the values from the Social Accounting matric and injected it into the model equations during codding. Its values are not calibrated by the system.

is absorbed in manufacturing and by households. Non is actually consumed for investment purpose and by the government. In the simulation therefore, we predict little improvements if any to the overall health of the economy resulting from a surge in oil absorption.

Although many studies have articulated the effects of oil consumption on the economy particularly on the environment, few if any have decomposed the absorptive capacities of the different economies on the economy in particular household poverty and inequality. This study attempts to fill in this gap.

4.1.3 Oil Export (SIM3)

A common feature of all oil rich economies is that they export it. Some even export all their crude produce and import the refined one to consume domestically. In equation 6.18b in chapter 6, the total export volume is given. Like the absorption equation, this too does not have a share parameter to utilize in the simulation. Hence, we introduce yet another shift dummy for the countries oil exports (QE0DUM), described in equation 4.3.

$$\mathrm{QE_{C-PETR}} + \mathrm{QE0DUM} = \mathrm{QD_{C-PETR}}\left(\frac{\mathrm{PE_{C-PETR}}}{\mathrm{PD_{C-PETR}}}\right)\left(\frac{1-\delta_{\mathrm{C-PETR}}}{\delta_{\mathrm{C-PETR}}}\right)^{\frac{1}{1+\rho q_C}} \qquad (4.3)$$

From this new equation, an increase in the shift dummy for oil export (QE0DUM), will have an instant effect on the composite supply of oil (QE_{C-PETR}), which shifts the aggregate demand for the country's oil towards export.

A prelude of the country's exports in chapter 5, Table 5.4 show that only 7.7% share of oil in the total exports. Therefore, we hypotheses a small effect of the surge in oil export due to its little share in the total exports in the country.

Generally, oil export and its various impacts have been studied in the previous literatures. Unlike in those studies, ours focus on how oil export will affect oil demand and consequently its domestic production and thus the economy including agents such as households.

4.4 Oil Production, Absorption and Export Theories[23]

In this section, we review some of the theories related to our conceptual framework.

4.4.1 Production Theories

During production, inputs are transformed into outputs. In economic theory, this relationship is represented by a production function, which may be expressed as follow:

$$Q = f(a, b, c, d, \dots) \quad (4.4)$$

Where (Q) is the total output produced, $(a, b, c, d, \dots)$are the inputs that were used and $(f)$is the function. Thus, this implies that output in the economy is a function of the different inputs. This therefore implies that the amount of output produced (Q) in any economy, depends on the quality and quantity of inputs $(a, b, c, d, \dots)$. Henceforth, a production function expresses the amount of output that can be produced subject to the state of technology. During production, some inputs are used in fixed proportions while others vary according to output in the short-run. However, in the long-run, all inputs may vary, for instance, when new technology is incorporated to replace the old one. The more the variable inputs increase in the presence of fixed inputs, the less the marginal and average output realized during production, a phrase that has been referred to as" the law

[23] The discussions of these three theories, particularly the equations are largely borrowed from (Murshed, 1997).

of diminishing returns". As the size of the firm producing a particular good or service in the economy increases, so does aggregate output. Economists have referred to this phenomenon as "economies of scale". It manifests in two forms: internal and external. Internal economies of scale - are benefits enjoyed by a firm to enhance its output and these includes but not limited to: deployment of superior technology, cheaper raw materials, higher output prices and cheap and easy access to investment funds. External economies on the other hand are the advantages which accrue to all firms in the vicinity. These include among others, good infrastructure (transport, communication and energy) and good financial institutions (banks, and insurance). However, the size of a firm may not viable in economic sense. Optimal scale, that covers up cost per unit of output, is more desirable than firm size.

Economies often produce two types of outputs or goods: tradables and non-tradables. Tradable goods are those that are exportable (X) for instance oil, while non-tradable denote those which are solely consumed in the domestic market (N), for instance real estate. Small economies like Uganda do influence world price of the tradable goods ($P*$). Equilibrium output in economies is traditionally demand-determined (Murshed, 1997). Thus, supply for tradables (S_X) and non-tradables (S_N) are determined by the demands for tradables (D_X) and non-trades (D_N), as expressed in equations (4.5) and (4.6), respectively.

$$S_X = D_X + X \qquad (4.5)$$

$$S_N = D_N \qquad (4.6)$$

Murshed (1997), suggests a set of assumptions in order to understand how prices are determined. First, we assume that production is subject to constant returns to scale, with fixed input (Leontief) coefficient in the short-run. Second, output in the economy is assumed to be produced using: labour (L), capital (K) and imported intermediate input (M), for example oil. With these assumptions, the average prices for both tradables (P_X) and non-tradables (P_N) can be described as

$$P_X = a_X W + b_X R + c_X P_M \tag{4.7}$$

$$P_N = a_N W + b_N R + c_N P_M \tag{4.8}$$

Where, P_M is the price for intermediate goods. And a_i, b_i and c_i are fixed labour, capital and intermediate input demands per unit of output in the economy. W and R are the fixed money wage and rent rates respectively.

The determination of total labour can be described as

$$L = a_x X + a_x D_X + a_n D_N \tag{4.8}$$

While that of total capital

$$K = a_x X + a_x D_X + a_n D_N \tag{4.9}$$

Henceforth, the national income may be written as

$$Y = WL + RK = (W + R)\,(a_X W + b_X R + c_X P_M) \tag{4.10}$$

Real income, Z, is deflated by Q yielding

$$Z = WL/Q + RK/Q \tag{4.11}$$

Where, Q, denotes

$$Q = P_X^{\beta} P_N^{1-\beta} \tag{4.12}$$

The output demand function for an ideal economy can thus, be described as

$$X = X(S) \tag{4.13}$$

$$D_X = D_X(P_D, Y) \tag{4.14}$$

$$D_N = D_N(P_D, Y) \tag{4.15}$$

From here, we define both the domestic (P_D) and international terms of trade (S), by

$$P_D = P_X / P_N \tag{4.16}$$

$$S = P_M / P_X \tag{4.17}$$

In domestic terms, P_D is subjected to exchange rate, hence it turns to be,EP^*

Performing partial derivative for equations 4.13 to 4.15; $X_1 = \delta X / \delta S > 0$, which depict that deteriorations in terms of trade, surge world demand for tradable (exports); and $D_{X1} = \delta D_X X / \delta P_D < 0$, portraying that a rise in terms of trade decreases domestic demand for tradable. Whereas for non-tradable, these effects are reversed. $D_{N1} = \delta D_N / \delta P_D > 0$;. $D_{X2} = \delta D_X / \delta Y > 0$, and $D_{N2} = \delta D_N / \delta Y > 0$, these set of derivatives demonstrate the fact that, a rise in domestic income, consequently, rises non-tradable demand.

According to Murshed (1997), production can be affected by variations in wage rates or/and rent, exchange rates and the price of the intermediate input. He suggests that in order to know the effect of these variables, a total differentiation of the respective equations needs to be performed. What happens then if there is a variation in W or R or both? To get a picture of what really happens to the economy, we formulate the equations for the main factors of production: labor (L) and capital (K). The total employment of labour can thus be rewritten as:

$$L = a_x X(S) + a_x D_X(P_D, Y) + a_n D_N(P_D, Y) \tag{4.18}$$

And that of capital as:

$$K = a_x X(S) + a_x D_X(P_D, Y) + a_n D_N(P_D, Y) \tag{4.19}$$

The real picture can be viewed with a total differentiation of equations 4.18 and 4.19. For simplicity however, we hereby perform a differential on equation 4.18. In case the real money wage rate (W) rises, this equation can be described as:

$$\frac{dL}{dW} = a_x\left(\left(\frac{\delta X}{\delta S}\frac{dS}{dW}\right) + \left(\frac{\delta D_X}{\delta P_D}\frac{dP_D}{dW}\right) + \left(\frac{\delta D_X}{\delta Y}\frac{dY}{dW}\right)\right) + a_n\left(\left(\frac{\delta D_N}{\delta P_D}\frac{dP_D}{dW}\right) + \left(\frac{\delta D_N}{\delta Y}\frac{dY}{dW}\right)\right) \tag{4.20}$$

Where, $\delta X/\delta S > 0$; $dS/dW < 0; \delta D_X/\delta P_D < 0; dP_D/dW > 0;$

If the production of X is rather labour intensive then: $\delta D_X/\delta Y > 0$; $dY/dW > 0; \delta D_N/\delta P_D > 0; \delta D_N/\delta Y > 0$. If on the other hand, it is, capital intensive like in the case of oil we are analyzing, these differentiated values, acquires, the opposite signs.

Murshed (1997), argues that given those limitations, the term, $\left(\frac{\delta X}{\delta S}\frac{dS}{dW}\right)$, state that the surge in wages is detrimental to the economy, for, it compromises its competitiveness in the global market. This is so owing to the very fact that the international terms of trade, S, appreciates as wages increases renders domestic prices to be higher than world prices. In case the exportable are comparatively, labour intensive $(a_x > a_n)$ like in most developing economies, this rise in wages, equally, rises the domestic terms of trade $(P_D = P_X/P_N)$.

This consequently, lowers the domestic demand for tradables through the relative price effect$\left(\frac{\delta D_X}{\delta P_D}\frac{dP_D}{dW}\right)$. However, income as depicted in equations (4.8 and 4.9) is likely to rise, rendering the income effect on the tradable demand to be positive$\left(\frac{\delta D_X}{\delta Y}\frac{dY}{dW}\right)$. Thus, assuming normalcy, demand for tradable declines. In terms of non-tradable, however, the rise in wages generates positive impacts on price $\left(\frac{\delta D_N}{\delta P_D}\frac{dP_D}{dW}\right)$ and income $\left(\frac{\delta D_N}{\delta Y}\frac{dY}{dW}\right)$.

Hence, from these descriptions, we can conclude that on average, output of tradables in the economy can decline through contracted export and home demand in case production is labour intensive. In this case, the production of non-tradables is likely to increase. The opposite is true in case non-tradables are labour intensive. Nevertheless, overall employment in the economy increases if the export $\left(\frac{\delta X}{\delta S}\frac{dS}{dW}\right)$and home price$\left(\frac{\delta D_X}{\delta P_D}\frac{dP_D}{dW}\right)$ elasticities of demand are small in comparison to the expansionary effects of expanding non-tradable demand. Petroleum production being capital intensive and essential, as inputs in all economies, an exogenous rise in wages generates the opposite effects. Both its global and domestic demand will surge, and consequently, total employment in the economy.

Trade balance (T) too, has some implications on production in one way or another. Theoretically, it is the difference between exports and imports, described as follows:

$$T = P_X X(.) - P_M b_x\big(D_X(.) + X(.)\big) - P_M b_n(.) \qquad (4.21)$$

Breaking tradables into constituent parts, we obtain the following equation for trade balance (T) from equation (4.21):

$$T = WL - \left(P_X D_X(P_D, Y)\right) + P_N D_N\left(P_N(P_D, Y) + X(.)\right) \quad (4.22)$$

This help us to describe trade balance as the difference between income, Y(WL) on one hand and absorption on the other. To understand the impact of say a rise in wage rates on trade balance, we total differentiate equation (4.22), yielding the following:

$$\frac{dT}{dW} = L + W\frac{dL}{dW} - D_X\frac{dP_X}{dW} - P_X\left(\frac{\delta D_X}{\delta P_D}\frac{dP_D}{dW}\right) - P_X\left(\frac{\delta D_X}{\delta Y}\frac{dY}{dW}\right) - D_X\frac{dP_N}{dW} - P_N\left(\frac{\delta D_N}{\delta P_D}\frac{dP_D}{dW}\right) - P_N\left(\frac{\delta D_N}{\delta Y}\frac{dY}{dW}\right) \quad (4.23)$$

Where dL/dW is ambiguous in sign: $dP_X/dW > 0$; dY/dW>0; $dP_N/dW > 0$.

Given the fact that both change in employment (dP_X/dW) and change in income (dY/dW) are positive, the balance in trade must equally be positive. The reason for this phenomenon is the fact that a surge in income is followed by a less than proportionate rise in absorption (Murshed, 1997). If the tradables are price inelastic, the trade balance will improve further. Hence, as a consequence, intermediate input imports will dampen.

Turning to another import variable that affects particularly oil producing and exporting economies; exchange rate, it too, has great bearing on production. To understand these effects, we totally differentiate (4.18) with respect to E obtaining the following;

$$\frac{dT}{dE} = a_x\left(\left(\frac{\delta X}{\delta S}\frac{dS}{dE}\right) + \left(\frac{\delta D_X}{\delta P_D}\frac{dP_D}{dE}\right) + \left(\frac{\delta D_X}{\delta Y}\frac{dY}{dE}\right)\right) + a_n\left(\left(\frac{\delta D_N}{\delta P_D}\frac{dP_D}{dE}\right) + \left(\frac{\delta D_N}{\delta Y}\frac{dY}{dE}\right)\right) \quad (4.24)$$

Where, $dS/dE > 0$;$dP_D/dE < 0$, X is labour intensive. dy/dE is ambiguous in sign.

To raise the volume of exports, economies normally rise exchange rate, technically referred to as “devaluation”. This, in the long run normally improves the trade balance.

Devaluation rise demand for exports $\left(\frac{\delta X}{\delta S}\frac{dS}{dE}\right)$ due to the raise in (S) and consequently, improves the competitiveness of the economy. In case the tradables in question are labour intensive, then P_D, declines, and this price effect in turn raises the demand for tradables $\left(\frac{\delta D_X}{\delta Y}\frac{dY}{dE}\right)$ and non-tradables $\left(\frac{\delta D_N}{\delta Y}\frac{dY}{dE}\right)$. On the other hand, devaluation has the opposite effects on intermediate imports. It raises, the prices of these vital inputs in the domestic market which reduces their supply, which in the process lowers income (Y). If, however, the impacts of devaluation on exports are greater than that on imports, then, income will on aggregate rise and thus, the income effects will be largely positive.

The effects of devaluation on output and employment are pervasive, depending on the side effects on the supply of inputs and the degree of price elasticities of demand. The effects of devaluation could also be observed if equation (4.18) is totally differentiated with respect to E;

$$\frac{dT}{dE} = W\frac{dL}{dE} - D_X\frac{dP_X}{dE} - P_X\left(\frac{\delta D_X}{\delta P_D}\frac{dP_D}{dE}\right) - P_X\left(\frac{\delta D_X}{\delta Y}\frac{dY}{dE}\right) - D_X\frac{dP_N}{dE} - P_N\left(\frac{\delta D_N}{\delta P_D}\frac{dP_D}{dE}\right) - P_N\left(\frac{\delta D_N}{\delta Y}\frac{dY}{dE}\right) \quad (4.25)$$

Where, $dL/dE > 0$ is ambiguous in sign;$dP_n/dE > 0$,

With this differentiation, the same effects are noted as in the previous one.

We now turn to the effects of a rise in the intermediate input price. We can get them via a total differentiation of (4.18) with respect to P_M;

$$\frac{dL}{dP_M} = a_x\left(\left(\frac{\delta X}{\delta S}\frac{dS}{dP_M}\right) + \left(\frac{\delta D_X}{\delta P_D}\frac{dP_D}{dP_M}\right) + \left(\frac{\delta D_X}{\delta Y}\frac{dY}{dP_M}\right)\right) + a_n\left(\left(\frac{\delta D_N}{\delta P_D}\frac{dP_D}{dP_M}\right) + \left(\frac{\delta D_N}{\delta Y}\frac{dY}{dP_M}\right)\right) \quad (4.26)$$

Where, $dS/dP_M < 0$; $dP_D/dP_M < 0$; dY/dP_M, is ambiguous in sign. The trade balance effects obtained through differentiation of (4.22) are algebraically very similar to (4.25).

The rise in the price of an intermediate good on the world market could be due to external shock such as a sudden increase in oil prices. This has an immediate effect of appreciating the international terms of trade: hence, S declines as PX rises. This leads to a decline in export $\left(\frac{\delta X}{\delta S}\frac{dS}{dP_M}\right)$. As a consequence, the domestic terms of trade declines as X is labour intensive. Hence, domestic demand of tradables $\left(\frac{\delta D_X}{\delta P_D}\frac{dP_D}{dP_M}\right)$, rise as a process while that of non-tradables $\left(\frac{\delta D_N}{\delta P_D}\frac{dP_D}{dP_M}\right)$ decline. In case the fall in export is more than the rise in domestic demand for tradables, income (Y) and employment will all fall. That is, the effects on the economy as a whole are contractionary; similar to devaluation discussed earlier.

4.4.2 Absorption Theories

This section illustrates the different issues in the absorption of natural resources like oil and gas in an economy. This word absorption in economic theory was coined by Alexander (1952), in his study of trade balance. It was elaborated further specifically on balance of payment (Harberger, 1950; Johnson, 2013; Meade, 1951). Given the national income equation

$$Y=C+I+G+(X-M) \tag{4.26}$$

Where C, stands for the aggregate private consumption, I, aggregate investment, G, government expenditure, X, exports and M, imports.

In equation (4.26), (C+I+G) =A, where A, is domestic absorption

Thus, domestic absorption is a component of aggregate private consumption, investment and government expenditure.

To understanding the factors affecting domestic absorption, we utilize the goods and money markets following (Murshed, 1997). Equilibrium in the goods market is described as

$$Y = PA(Y, r) + PG + PX(E) - EP^{*}X^{*}(Y, E) \qquad (4.27)$$

Where, Y denotes national output; A stands for total domestic absorption; P for the domestic price level; X for exports and X^{*} for imports; r for the domestic interest rate; and E for the nominal exchange rate.

In equation (4.27), absorption is part and parcel of price and is a function of income and interest. According to Murshed (1997, p. 13), if $A_1 > 0$, it implies that absorption is raising due to a rise in income; while the case when $A_2 < 0$, shows a fall in absorption resulting from a fall in interest rate.Thus, accordingly, absorption could increase in two situations: increase in income or decline in interest rate. Such an adjustment creates a necessity for inputs such as production factors and raw materials provided by households, which in turn affects their incomes.

4.4.3 Export Theories

Mostly, oil is exported either in its crude or refined form. Continuing the discussion from equation (4.19), we raise an assumption (X_1>0) to depict the behavior of export. This assumption proposes that growth in export is caused by a rise in nominal exchange rate. Thus, for oil exports to grow in our case, a rise in the nominal exchange rate is required.

With such rises, domestic production will rise and consequently, more income to households and government.

From this analysis, we see production enhancing absorption in the form of higher incomes. With increased income, composite consumption will surge. This brings in trade into equation (4.19). According to Murshed (1997, p. 13), the effects of import could be captured in two scenarios; $X_1^*>0$ and $X_2^*<0$. The latter suggests that a raise in import is as a result of rise in income, and the former implies that a decline in import is as a consequence of the decline in nominal exchange rate depreciates. Oil producing and exporting countries are usually characterized by the scenario where $X_1^*>0$. The results of this study show an increase in imports; implying a surge in aggregate income in the economy as a result of oil exports.

Further, the nature of incomes in an economy has an impact on the money supply expressed in equation (4.28).

$$\frac{H}{P} = H\left(Y, r\right) \tag{4.28}$$

Where, H denotes money supply. In case $H_1>0$, this suggests that demand for money is positive to income, and when $H_2<0$ it is an implication that demand for money is negatively related to interest. We do not have the financial sector in our model to ascertain the role of money supply in our oil economy.

To understand the trade standing of an economy interest rates needs to be linked to income and money supply for fixed P;

$$r = r(Y, H) \tag{4.29}$$

Where, $r_1>0$; implying interest rate is directly related to income and $r_2<0$; denoting interest rate is negatively correlated demand for money.

Real exchange rate, S:

$$S = \frac{EP^*}{P} \tag{4.30}$$

Where, S, the real exchange rate, rises as E increases, P* the foreign price level increases and as P the domestic price level falls. The rise in S amounts to an improvement in the international competitiveness of the country in question. A rise in S is also described as a real exchange rate depreciation or a deterioration in the country's terms of trade. For fixed P and P* change in E are equivalent to changes in S, this allows substitution of S for E in (4.28). Substituting (4.29) into (4.30) and normalizing by P, yields equation (4.31).

$$Y = A\Big(Y, r\big(Y, H\big) + G + X\big(S\big) - SX^*\big(Y, S\big)\Big) \tag{4.31}$$

Where all the signs of the partial derivatives are unchanged.

Subsequently, the trade balance, T is examined by balancing the external balance;

$$T = X(S) - SX^*\big(Y, S\big) \tag{4.32}$$

Full external balance implies that the trade balance, the difference between imports and exports, is zero, if T=0; E moves up (depreciates) if there is a deficit and vice versa.

4.5 Impact Analysis Theories

In empirical literature, the impacts of oil on the economy is inconsistent; it either stimulates, hinders or takes a middle course on development. In this section, we elaborate a few of the theories used in analyzing the impacts of natural resources such as oil on the economy.

4.5.1 Linkage Theories

These theories are based on the staple thesis that linked early growth to primary product exports prior the 1960s (Watkins, 1963). According to thesis, export of raw materials stimulates the growth of other industries which leads to sustained economic development and growth. Based on Canadian economy, the thesis explained how export of primary commodities contributed positively to economic growth (Watkins, 1963).

Similar to the Staple thesis, the linkage theories proposed by Hirschman (1960) too explicated how one industry led to the growth of another. Thus, the major assumption here is that developing countries are not necessarily lacking resources but the challenge is their inability to optimally invest in few they possess. Hirschman (1973, p. 72), suggests that least developed economies needs prioritize their investment with a bias in a few fundamental industries with strong linkages to leading industry. Such a linkage can halt the vicious cycle of poverty prevalence in such economies.

Originally, it was limited to the exploration of inputs and outputs, but its innovative form emphasizes the dynamic stimulation of entrepreneurship interrelations. It diverts from the traditional optimal combinations of factors by advocating for the mobilization and exploitation of resources' hidden potentials (Hirschman, 1960, p. 5). For underdeveloped economies, these theories suggest the roles of political, social and economic factors in providing stimulus to development.

According to the linkage theory, impacts results from production, consumption, and fiscal policy. Production linkage, both backward and forward, significantly enhances the density of the input-output matrix (Yotopoulos & Nugent, 1973). Backward linkage pertains to the possibility of production to stimulate the growth of supplying industries (upstream), while forward linkage, is concerned with the potential of inducing the growth of processing activities (downstream). On the other hand, Hirschman (1981), distinguishes linkages into two other forms: inside and outside. Inside linkage denotes the stimuli given to agents involved in the leading activity itself while the outside one relates to the stimuli extended to others.

Hirschman (1981) argues that consumption linkages are estimated either as adverse or favorable from a developmental viewpoint. Adverse consumption linkages occur if a country's propensity to import surges thereby shrinking the global demand for domestic commodities and consequently impending the expansion of other sectors. In a static analysis, there may be no immediate negative effect on welfare, but from a dynamic standpoint, the little short-run welfare increases vanish since the shift in demand impedes infant sector growth.

Hirschman (1981) and Gelb (1988) suggests that fiscal linkages are determined by efficiency in the allocation of rent accumulations by government. If the government opt to boost consumption, it must use the huge oil rent directly to expand public services and increase transfers to the households to stimulate consumption. However, caution should be taken to minimize the administrative challenges of direct transfers particularly to the poor in remote areas that can increase costs and reduce the benefits. Fiscal policy options such as subsidies and negative indirect taxes, should be avoided since they distort the allocative mechanism of resources. If the rent is to be used to finance a supply-side development strategy, that is, investment, it should do so well aware the potentially difficult, as such huge tempts political elites to siphon it causing either out of order investment or countless leakages in the process (Hirschman, 1981, p. 69).

Investment in public infrastructure is good but has some useful limits that bounds its fiscal linkage impact in the long run. For instance, capital infrastructure is normally produced gradually and incrementally. Moreover, historically, it has been committed in reaction to demand originating from productive activities and not in expectation of inducing production (Gelb, 1988). Allocating huge oil revenue is not a difficult task in poor countries with critically poor physical infrastructure and human capital endowments. However, public investments to produce industrial output for marketing is quite problematic since it depends on outcome which might compromise efficiency.

Further, fiscal linkage has another feature that potentially undermines its efficiency. Surplus is centralized to a few elites in government, creating a constraint of rapid inadequate planning capacity. Consequently, this renders the surplus to often be used for mostly massive projects. Despite this lessening administrative complexness of handling disbursements, it simply moves the challenge to project implementation. The labor-capital proportions needed by such projects might in some cases be unsuitable for the producer economy, as the benchmark used is administrative easiness instead of factor endowment in the long-run. Various enormous projects have the potential of driving a small producer, off the ladders of economic diversification towards reliance on limited fundamental investments, which further exposes the vulnerability of the country.

Additionally, since public servants are not individually rewarded based on the economic soundness of their choices, there are possibilities of other considerations to shape investment decisions including political and financial. An enormous rent portion in the aggregate income of the country when is not quickly and broadly disseminated amongst the population, is likely to misallocate scarcely entrepreneurial endowments from productive activities into rent-seeking ventures. Such misallocation can manifest in several ways: First, the public may undertake investments without any probable contribution to the country's out supply but to augment politicians and contractors. Second, growing local production might be over protected at the expense of vital imports. Third, incentives to assert accountability of use of public funds may be substituted by assurance rent share.

Lastly, unstable fiscal earnings from natural resources potentially cause noticeable asymmetries in decision-making. For instance, public investments projects initiated in the aftermath of the discovery are difficult to be reversed; recruited employees pause challenges to be laid off. Thus, asymmetric reaction undermines fiscal policy effectiveness by lowering public spending quality.

4.5.2 Growth Theories

Oil as a new sector will certainly have an impact on the volume of economic activities in the economy, thus an understanding of growth models is necessary. According to the neoclassical growth theory, growth in output is a result of the expansion in the production possibility frontier (Baumol, 1986). This expansion encompasses the quantities and efficiency of factors of production in an economy. There are however noted constraint to growth explained in the growth - gap models, notably the Two-gap model (Gelb, 1988). According to this model, economic growth can be constrained by either savings or foreign exchange, known as "the saving-gap" and "the foreign exchange-gap" respectively (Bacha, 1990). The former gap occurs in a situation where there are insufficient funds saved by individuals in the country's financial institutions to finance investment demand; while the later relates to a scenario where imports are greater than exports (Gelb, 1988). Such a scenario reduces demand and depreciates the local currency thus altering the gap between foreign and domestic currencies.

These gaps have been financed to meet the target growth in much of the developing world by foreign aid (Weisskopf, 1972). However, such aid is limited and conditioned by the donors (Chenery & Strout, 1966). Some country rich in mineral resources like oil can easily raise the much-needed revenue through taxes, royalty and other sources of revenue from minerals to finance the two gaps. Nonetheless, it is not true that growth is constrained by only capital and foreign exchange, there are many more other factors in play, particularly the budget constraints or rather "the fiscal-gap", a constraint to growth yields the three-gap model (Koo, 2002). There is need for public funds especially that raised from oil to be injected into the economy to bridge the three gaps and other constraints to growth.

In conclusion therefore, the three growth gaps can easily be overcome simultaneously by resources from rent-intensive activities. It all depends on the taxation and optimal allocation of the rent. If taxation is fine and the proceedings are invested rather than consumed, a discovery like the one in Uganda can have a favorable impact on growth, assuming domestic labor does not turn to be a binding constraint.

4.5.3 Export Instability Theories

This class of theories attempts to explain in particular, the effects of unpredictability of export in the different sectors of the economy. The cause of this unpredictability has traditionally been presumed to rest on three factors notably the concentrations on primary production, commodity and geography. With regards to production, unlike in developed economies, developing countries' exports are typically, to a greater extent concentrated in the form of primary production particularly minerals and agriculture (Jaffee & Henson, 2004). Agriculture commodities are price-inelastic in demand, characterized by production fluctuations subjecting it to supply shocks that prompt enormous price volatilities. While, minerals on the other hand have the tendency to exhibit price-inelasticity in supply and demand subject to global economic activities (Islam & Subramanian, 1989). Thus, cyclical demand fluctuations henceforth induce large price and revenue shifts, that tend to vary with respect to trade for developing and developed economies. Empirical studies suggest that mineral rich economies are more prone to abrupt variations in export prices and revenues than those with less minerals (MacBean, 2012).

Commodity concentration is another key factor affecting export instability especially in poor countries. Most of these countries export a few commodities, thus in the event of fluctuation in their export, the magnitude of the effect on the economy is vivid. This is particularly so in most of the oil –rich countries, they mostly export oil, which always paralyzes their economies during decline in exports. This calls for diversification of exports to mitigation this challenge in export instability. Geographical concentration is yet another factor to explain instability in exports. This comes into play when a country exports to a few or limited number of markets particularly in the developed world. These markets are continually undergoing rapid changes in technology and hence, equal changes in the nature and magnitude of demand predominantly of primary commodities from developing economies. Thus, to the reduce this risk, diversification in markets is important to offset the decline in demand in one consuming market. Empirical studies however, are inconclusive. Some do not articulate any strong relationship between export instability and commodity, geographical concentrations (Coppock, 1962; Massell, 1964), others encountered an association (Erb & Schiavo–Campo, 1969; Massell, 1970). For instance, Erb and Schiavo–Campo (1969), found a positive relationship between LDCs level of export instability and economic size. Massell (1970), in his later study employing data for 55 LDCs for the period of 1950-66 found positive association between stability and food exports and between instability and export commodity concentration.

It should however be noted that the above factors are not the only cause for export instability. The instability in exports of principal commodities, higher export prices, uncompetitive position of the products in international markets, among others can equally cause export instability

In terms of the extent of effects, developing countries are more affected by fluctuations in exports than the developed ones. First, this so due to the lower levels of per capita income with little diversification in these countries. This incapacitate these economies to overcome the instability. Second, in several of these economies, a large reduction in physical imports cannot be accomplished without hurting the economy, since imports are of essential commodities like food or capital goods like machinery or other equipment. Third, monetary and fiscal tools in these countries are, generally, less effective in arresting any form of economic instability.

4.5.3.1 Export Instability and Economic Development

There is an interrelationship between export instability and economic development. Fluctuations in export earnings, impedes economic growth. Conventional wisdom has it that export instability is a more serious impediment to developing economies than the developed ones. It seriously affects the development process with its adverse impact on the foreign exchange earnings, which consequently postpones investment and other developmental activities. In short, there is an inverse relationship between instability in exports and development of a country. Therefore, greater degrees of export instability tend to generate greater difficulties in sustaining a steady rate of development. The instability hurts the wider economy in terms of essential imports, national income, foreign exchange reserves, investment and employment, among others. Thus, a short fall in anticipated export earnings is pause a severe bottleneck to the developmental efforts of poor countries.

To a certain extent, the instability in exports has some favorable positive effects. It has the potential to increase the propensity to save and to stimulate entrepreneurship.

However, these effects depend largely on the magnitude of the instability and the reaction to it under particular conditions (Finger & Derosa, 1980). In case of a sustained positive instability, the better for the economy. But in this case, the nature of the windfall is very important. This is so given the fact there is more evidence of negative than of positive effects of export instability. Furthermore, sustained positive instability, point to a weakness in the macroeconomic policy formations and implementations, which in a way did not forecast such deviations in the actual and targeted outcomes.

Studies on the impact of export instability on economic development and growth are not quite clear. For instance, MacBean (2012), in his study of 35 developing countries in the period 1946 to 58 found no correlation between export fluctuations and income as measured by GNP. In his analysis, he found countries with fairly stable income, had relatively unstable exports and vice versa. When he reduced the sample size however, the estimates found a correlation. Thus, this technically implies that there is no significant relationship between export instability and national income. Similarly, (Kenen & Voivodas, 1972), found no pervasive connection between the rate of economic development and the degree of export instability.

But studies of Knudsen and Parnes (1975), found significant positive relation between export instability and the rate of GDP growth of 28 countries in the period 1960 to 1969. Similarly, Krueger (1978) assessed the effect of exports on GNP for 10 countries for the period 1954-71. He concluded that an increase in the rate of growth of exports of 1 percent increased the rate of growth of GNP by over 0.1 percent. Further, the work of Tyler (1981) on a sample of 55 middle-income LDCs, found a strong correlation between export performance and GNP growth over the period 1960 to 1970. On the other hand, Erb and Schiavo–Campo (1969), found a significantly inverse relationship between export instability and GDP over the period 1954 to 1966

4.5.3.2 Export Instability and Imports

Imports are definitely affected by fluctuations in export earnings. LDCs requires substantial imports of capital goods to develop their economies. The importation of these essential goods is significantly affected by fluctuations in foreign exchange earnings.

A couple of factors affects imports either directly or indirectly: First, variations in purchases of imported goods are prompted by fluctuation in their incomes, which is consequently a result of instabilities in exports. Second, when exports raise and fall, it is followed by a relaxation and tightening of imports due to availability or shortages of foreign exchange reserves (MacBean, 2012). Finally, very often imports are meant to promote exports, thus, if exports fluctuate, this definitely affects imports.

Studies have observed a strong correlation between export earnings and imports. Therefore, any adjustment in exports certainly affect imports. For example, (MacBean, 2012), analyzed the impacts of export earnings on imports for 5 LDCs using time lag technique and found a strong association between them. This finding therefore, implies that a reduction on exports has an adverse effect on imports and consequently development in least developing countries due to their limited international reserves.

And given the limitedness of foreign aid and foreign direct investment to augment and compensate the loss in export earning, import essential for development may turn to be sporadic, or at worst retard the sustainability of economic growth and development in LDCs (Hawkins et al., 1967).

While in some cases in the short-run, imports could be financed by loans, in the long-run, this form of financing is nether desirable nor sustainable. Thus, by and large, the insufficient of exports to meet the import requirements is detrimental to the economy in the long –run as it halts its development prospects.

4.5.3.3 Export Instability and Investment/Capital Formation

First and foremost, investment is a very crucial factor in a country's economic development journey. Further, theory and empirical evidences generally agree to the fact that investment to a large extent depends on capital formation. Studies have established that export is one of the essential ingredients in capital formation. Hence, a surge in export earnings, induces capital formation, which in turn increases the exportability of the country. Therefore, any fluctuations in export earnings, directly affects the very foundations of investment in export and the related industries. In case for example exports increase, there will be additional investments in the export industries and along the way, other industries will equally expand and develop. A decline in exports on the other hand, will do the opposite to the economy. Investments in export industries will be discouraged and so is investment in related industries.

In any case, export instability generates two inimical effects on investment. First, given the difficulty of estimating the expected return on investment owing to export earning fluctuations, uncertainty about future prospects will emerge. Thus, there will be an adverse effect on aggregate investment in the economy. Second, the government is forced to ration the little foreign reserves and, in the process, will screen and regulate the importation of the essential capital goods. With this in place, development plans related to investment suffers. Overall, the effects of export instability stretch to investment at large and in export industries in particular.

Some studies have documented no strong relationship between export instability and gross fixed capital formation. For example, in his study of Pakistan over the period 1948/49 to 1959/60 on the basis of one year lag, MacBean (2012), found a negative correlation ($r = -0.16$) on the current year and weak correlation ($r = 0.31$) on the one-year lag. He attributed the lack of correlation between fluctuations in exports and domestic fixed capital formation to interventional factors such as foreign economic aid and the use of reserves of foreign exchange to support imports.

In addition, in some instances, export instability may not directly influence gross capital formation. There instances where some other factors such as foreign direct investments may influence overall capital formation yet they are not directly related with gross capital formation (Ndikumana & Verick, 2008). In this case, only that part of capital formation invested in export industries is affected.

4.5.3.4 Export Instability and Employment

Globally, unemployment is a problem but it is more pervasive in developing countries, where it manifests in all forms, in both urban and rural areas. While many factors are responsible for this macroeconomic challenge, export instability is unquestionably part and parcel of them. There is certainly a clear and direct relationship between export and employment in export industries or rather sectors. A decline in demand for exports in importing nations, generates unfavorable balance of payments in exporting nations, lowers export earnings, investments in general and particularly in exporting sectors, which in turn leads to job cuts and consequently a raise in unemployment in the economy as a whole. Thus, we can safely say that there is a direct and strong correlation between fluctuations in exports and overall employment.

An observation of the export sector show that the volume of exports and the policies in this sector have an overall bearing on labour absorption therein. Surge in exports accompanied with export promotion and labour intensive policies go a long way in increasing employment. Therefore, we can conclude that an autonomous increase in exports coupled with a constrain in imports would increase not only output but also employment, directly and indirectly through the entire chain of input-output relationship, due to an easy in the foreign exchange constraint.

Thus, there is a possibility of a direct relationship between export promotion and employment. For instance, Krueger (2007), study concludes that employment grows rapidly in case of export promotion strategies. Further, he notes that exportable manufacturing requires double the number of labour as compared to importable. In his analysis, he observed than an annual increase in exports by 15 percent, generated 11 percent employment. On the contrary MacBean (2012), study concluded that there is no strong correlation between export instability and the level of employment in his study in Uganda.

4.5.3.5 Export Instability and Domestic Inflation

Variation in export earnings can ferment inflation, given its up and down phases. During the up phase, there significant raise in export earnings which generate additional income in the export sector. The employed labour in this sector demand a major share in the increased profits in terms of greater remuneration and/ or bonus. In the event of a fall in the export earnings, the increased wages do not fall in turn. This generates greater pressure on prices, particularly in the absence of a substantial rise in domestic production. Inflationary pressures may also arise due to government policies. A surge in export earnings during the export boom generates huge revenues to government, which may encourage investments. Depending on the nature and pattern of investment the government adopts, inflation may arise. For example, if government injects much of the proceedings from the export boom period in infrastructure projects requiring huge expenditures, it may build pressure on prices and consequently cause inflation when exports and export earnings falls, if it adopts a discriminatory policy regarding imports with a preference for capital and essential consumer goods.

In underdeveloped economies, there are some relationship between export instability and inflation. A study by (MacBean, 2012), have ambiguous correlations between export instability and inflation. In some, the level of significance is very small while in others, it is very big. In his analysis, he ranked twenty-nine countries according to the level of export instability. He graded them into three groups. The first group which comprised of countries with highest fluctuation was associated with high rates of inflation estimated at 10.6 percent. The middle group had an average inflation rate of 4.7 percent and the last one had a mean inflation rate of 2.2 percent.

Stabilization of export instability is quite a difficult job. First and foremost, there is less accord regarding the stabilization of the primary commodity market given the political difficulties associated with such efforts in poor economies (MacBean, 2012). Second, there is a persistent problem of how to determine the equilibrium inclination around which stabilization supervenes (Gelb, 1988). Third, the microeconomic arguments for stabilization concentrating on producers' risk aversion have no bearing quantitatively (Newbery & Stiglitz, 1981). Finally, instability in exports simply highlights short-run variations lasting between one to two years (Gyimah, 1991). With respect to oil, Gyimah (1991), notes that oil exporters tend to experience macroeconomic effects that are enormously larger but with slower variations with respect to fiscal revenues and trade. To him, the very large swings describing the oil market are weakened greatly by the filters used in calculating conventional instability spanning more than four years. Gelb (1988), on the other hand, observes that some of the fluctuations in the oil markets since 1970s have had longer periods spanning ten to twelve years that makes it easy to either buffer or hold commodity stock or draw from international reserves. They are however, very short in term of designing and executing massive development programs, pursuing enormous fiscal, macroeconomic and sectoral changes to manage vast swings in demand and revenue.

Conclusion

In conclusion, we can re-emphasis the fact that exports are essential for economic development of an economy. An increase in exports, has a favorable effect on the other sectors of the economy. It can equally be regarded as a propulsive sector given its linkage effects. Exports play a major role in developing countries, where they are considered as a crucial factor not only for economic stability but also economic progress. Thus, any instability in export earnings is undesirable in these economies where the development resources are little and scarce. On one hand, export instability reduces the volume of foreign exchange and creates uncertainty in earnings. On the other hand, investment and other related growth factors are adversely affected in the process. Amongst the several causes of export instability in poor economies; specialization in primary commodities, commodity concentration and geographic concentration are vital. Nonetheless, the significance of these factors can differ depending on country and commodity in question. There are divergent views regarding how export instability affects economic growth. Some scholars have empirically confirmed that export instability hinders the process of economic development, others finding instability not to affect growth.

While there are generalized conclusions on the impacts of export instability on economic development, it is safe if we considered such conclusions alongside other factors that either directly or indirectly affects fluctuations in export earnings or the country's ultimate growth. One such consideration is the impact of export fluctuations on investment. This impact is quite important given the fact that export earnings clearly and directly affects investments in the export industry. It is however not much factual that fluctuations in export can affect overall investments in the economy. Another consideration is the impact of the instability on employment levels. Instability in exports has an equal effect on employment. While it is true that export fluctuations have an influence on export earnings and in turn employment via lower investments, it is not necessary that such instability can affect the overall employment in the economy. Another equally important consideration while assessing export instability is its impact on the wage factor. In the event of increasing export earnings, any botch in the production of domestic consumer goods, prices in the domestic market will be affected. Worse still, export instability coupled with inability to curtail wages in an environmental of lower domestic production of consumption goods also build greater pressure on domestic prices. Thus, on this theoretical formation, we may then contemplate the decisive effect of export instability on economic growth through the factors, wage and prices. Analysis in this direction, appears to be more relevant before generalizing both the positive and negative aspects of the instability on growth.

Henceforward, the foremost task before researchers lies on: first, to measure the extent to which export instability affects economic growth. In our study, an increase in oil export had an overall small impact on growth. When decomposed using the different measures, some had positive while others had negative impacts. Second, to evaluate and investigate the causes of such export fluctuations. And finally, to measure the extent to which the factor export instability is affecting some of the major determinants of economic growth. There is no clear-cut solution to stabilize instability in exports due to politics and the variation in their occurrences among others.

4.5.4 Dutch Disease Theories

This theory was put into analytical use by John Cairnes to study the effects of gold discovery on the various sectors of Australian economy in 1859 (Cairnes, 1874). Since then, various theoretical literature has been pinned down of which most have been documented by (Corden, 1984; Neary & Van Wijnbergen, 1986).

This literature emphasizes the sectoral re-allotment of productive factors resulting from a favorable shock stemming either from a discovery or a surge in exportable commodities. In case income accruing from either the discovery or surge is not saved abroad but rather spent domestically, there is likely to be two effects notably: resource movement and spending. The former effect attracts productive factors into the flourishing sector and the latter, pulls factors out of tradable sectors into nontraded activities. The “Dutch Disease” is the resulting shrinkage or sluggishness of the tradable sectors.

Real exchange rate is a substantial variable behind these effects. Theoretically, an economy comprises of tradable and non-tradable sectors. The former obeys the law of one price while the latter does not. In the case of the former, domestic and international prices must equal because of the trans-boundary flow of goods, though tariffs may probably induce the prices to deviate by some defined amounts. Conversely, the market for the latter, must clear by domestic price movements. Thus, we could as well define real exchange rate as the relative price of non-tradable goods to tradable ones, P_n/P_t . In a scenario where the domestic spending-power upsurges, this ratio appreciates shifting production to the non-tradable and demand to the tradable. This as a consequence, allows real income to increase due to either greater absorption of non-tradable and or sizable net tradable imports.

Real effective exchange rate is yet another variable explaining the Dutch effects. It measures the weighted average of the local currency relative an index other foreign currency, with inflation adjustments. The weights are fixed in comparison to the relative trade balance of a country’s currency to individual countries within the index P_d/eP^*.In case tradable prices $P_t$are determined by fixed import tariffs and foreign prices, in this case $P_t = eP^*(1 + t)$that implies real effective rate appreciation (Gelb,1988). Sometimes, effective real exchange rates point to a different direction, that is it depreciates. For instance, if the tradable sectors are heavily sheltered by tariffs or any other barrier which later is replaced with a fixed nominal exchange rate, in response to increasing revenue from the discovery, this result into a fall in domestic price levels (this is to say, depreciation of real effective rate of exchange), despite the increases in the relative prices of non-tradable. With drastic trade policy changes, there is need for caution in concluding domestic resources direction rip from real exchange rate. There are a number of policy options to restrain the inflationary effect of domestically spending oil wealth that includes among others: import liberalization of imports, nominal exchange rate revaluation and price controls rationalization.

An appreciation of real effective exchange rate has yet another implication on globally mobile capital. This is so because, a rise in domestic prices at a constant nominal exchange rate, leads to a fall in the real interest rate on foreign funds. Consequently, this stimulates foreign borrowing for investment and consumption purposes, thusly, boosting domestic absorption further. Conversely, given the nature of oil markets characterized by boom and bursts, which affects domestic spending and real effective exchange accordingly, the movement of capital too moves for that reason. In case of oil market burst, the best profitable option is to hold foreign assets since domestic ones goes through adverse effect of deteriorating returns. In lieu, depreciation of real exchange rate requires nominal exchange rate devaluation which consequently leads to massive loss of value of assets designated in local currency relative to those in foreign currency. In such a scenario, interest rates in the domestic market must be allowed to increase sharply to prevent capital outflows that can probably heighten economic contraction.

4.6 Pro-Poor Economic Growth

In our study, we analyze the impacts of oil discovery on household via growth. We trace how oil discovery (proxied as production, absorption and export) affects household poverty and inequality. Scholars argue that not all growth rates do benefit poor households, only the pro-poor growth does so. Hence, in this section we discuss the basic concepts of pro-poor growth as presented by Son (2007) in her technical note of the Asian Development Bank.

4.6.1 Meanings of Pro-Poor Economic Growth

There is no consensus as to what pro-poor growth is. According to the United-Nations (2000), for instance, pro-poor growth is the growth that benefits the poor. This definition however has some weakness; for it does not offer clues on first, how much must the poor benefit for growth to be conceived pro-poor? and second, how much of poverty reduction is required for growth to be regarded pro-poor? Different meanings of pro-poor growths have been proposed in a number of works including that of Kakwani and Pernia (2000), McCulloch and Baulch (2000), Ravallion and Chen (2003), Son (2004) and Kakwani and Son (2008). From the studies of these scholars, Son (2007) has come up with three definitions: (i) General versus Strict (relative or absolute), (ii) Partial versus Full and (iii) Monotonicity. An elaboration of these definitions is presented in this section as follow:

1. **General versus Strict**

There is a consensus to the fact that poverty alleviations hinge on two factors: first, growth and second, the extent to which the benefits of growth are disseminated across the poor and non-poor. In line with this, Ravallion and Chen (2003), proposed a general definition of pro-poor growth, where they refer pro-poor growth to be the growth scenario where poverty declines irrespective of the nature of growth or the extent of benefits. Thus, according to this definition, any growth which generates fall in poverty is pro-poor. According to this definition, the growth that Uganda has experienced since the 1990s up to now is pro-poor. The strict definition of pro-poor growth on the other hand emphasizes the extent to which growth benefits, are dispersed among the poor and non-poor. This emphases on growth that results to poverty reduction through which the benefits of growth amass mostly to the poor. Studies conducted by McCulloch and Baulch (2000), Kakwani and Pernia (2000), Kakwani and Son (2008), and Son (2004) are based on the strict definition of pro-poor growth. This definition therefore suggests that the growth Uganda has experiences since the launching of the economic reforms in 1987, was not pro-poor. This is so because since that period, growth has reduced poverty but also increased inequality. This therefore clarify the fact that the benefits of Uganda's growth are flowing more to the non-poor than to the poor.

Therefore, in the Uganda's case, the general approach portray growth to be pro-poor, but the strict approach reveals otherwise. According to the general approach, growth may be referred as pro- poor in case the income of the poor and non-poor increases by the same magnitude. However, based on strict approach to defining pro-poor growth, this scenario will always be antipoor.

Strict definition of pro-poor growth is further sub-divided into relative or absolute approach. The relative approach relates to economic growth that benefits the poor proportionately more than the nonpoor. According to this definition therefore, growth must reduce both poverty and inequality. Similarly, absolute approach is where after comparing the absolute benefits from growth, the poor gains more than the nonpoor. Under this definition, absolute inequality would fall during the course of growth. In fact, this lays out the strongest requirement for achieving pro-poor growth, making it consequently more difficult to achieve absolute pro-poor growth than relative pro-poor growth (Kakwani & Son, 2008).

2. Partial versus Full Approach

A partial approach classifies growth to be pro-poor or antipoor without specifying a poverty line and poverty measure. A measure suggested by Ravallion and Chen (2003), falls into this classification in the sense that pro-poor growth is partly defined based on what is called the first-order dominance (FOD) condition. Similarly, Son's (2004) pro-poor growth measure can be also categorized as partial because a growth process is primarily determined to be pro-poor (or not pro-poor) using stochastic dominance curves. The greatest advantage of using this partial approach is that it is valid for all poverty lines and poverty measures. On the other hand, one limitation of this approach is that if the dominance conditions are not met, then one cannot infer whether a growth process is pro-poor or not pro-poor. On this ground, the approach derived from the dominance conditions may be referred to as "partial." Moreover, under this approach, there are certain circumstances where it is impossible to draw conclusive results on the pattern of growth. Another limitation is that the partial approach does not ascertain the degree of pro-poor growth, this is to say., by how much one growth process is more pro-poor than the other.

The full approach, on the other hand, usually provide a conclusive result as to whether or not growth is pro-poor. Studies, including that of McCulloch and Baulch (2000), Kakwani and Pernia (2000), Ravallion and Chen (2003), and Kakwani and Son (2008); are based on the full approach. This approach gives a complete ranking of growth processes, because unlike the partial approach, a growth process is judged from a rate or an index of pro-poor growth, not from a curve. To implement this full approach, though, a poverty line as well as a poverty measure needs to be specified. This in turn demands an inevitable value judgment in choosing the poverty line and poverty measures.

3. Monotonicity Criterion

The monotonicity criterion implies that the magnitude of poverty reduction should be a monotonically increasing function of the pro-poor growth rate. Maximizing growth alone is an essential, but not satisfactory, condition for poverty reduction. The monotonicity criterion calls for a measure of pro-poor growth that captures a direct linkage with poverty reduction, which means that poverty reduction takes into account not only growth but also how the benefits of growth are shared by individuals in society. In this way, a pro-poor growth measure that satisfies the monotonicity criterion provides a necessary and sufficient condition for the reduction of poverty.

4.6.2 Measures of Pro-Poor Economic Growth

There are a number of measures of pro-poor growth with varying conclusions. A discussion of these are discussed in this section:

1. Poverty Bias of growth (PBG)

This measure is the brain child of McCulloch and Baulch (2000). It pays a special attention on reducing inequality. It is deduced from the negative of the inequality component obtained from the symmetric poverty decomposition methodology, proposed by (Kakwani, 2000). Kakwani (2000), decomposes the change in poverty into both growth and distribution effects. The growth effect evaluates poverty changes when the distribution of income does not change, whereas the distribution effect, captures the change in poverty when inequality changes in the absence of growth. Thus, the reduction in poverty depends largely on whether growth improves or worsens inequality.

To arrive at a definite conclusion as to whether growth is pro-poor or otherwise, this technique looks at the degree to which the observed pattern of growth deviates from a distribution-neutral benchmark. In other word, it compares the actual distribution of income with that, which would have occurred under the distribution-neutral scenario. In this regard, this technique reflects a relative approach to the understanding of pro-poor growth.

A problem with it is that, it does not usually meet the monotonicity criterion. Higher values of the PBG may not necessarily imply greater reduction in poverty because poverty also depends on the growth effect. It can meet the monotonicity criterion only if growth effect is constant, something which is rather not always the case in the real world.

2. Pro-Poor Growth Index (PPGI)

This technique was proposed by Kakwani and Pernia (2000). They too, utilizes the idea of poverty decomposition to show how poverty reduction is determined by both the rate of growth and the change in income distribution. They consider growth to be pro-poor if the benefits of growth that accrue to the poor are proportionally more than those received by non-poor. They argue that a pro-poor growth scenario occurs only if growth reduces both poverty and inequality simultaneously.

This technique measures the magnitude by which growth is pro-poor. It does this by expressing the correlation between total poverty reduction and the portion of reduction in poverty resulting from a distribution-neutral growth. This correlation is expressed in the form of ratio of poverty elasticities. When a growth scenario is pro-poor, the index is greater than one. The index lies between zero and one in the case of trickle-down, while it is negative for impoverishing growth scenarios. Like the first technique, this too has the weakness of not addressing the criterion of monotonicity. Further, it does not put into consideration the level of actual growth rate.

3. Poverty equivalent growth rate (PEGR)

It was proposed by Kakwani and Son (2008) as a response to the weakness raised against PPGI. It refers to the growth rate that result in the same level of poverty reduction as the present growth rate if the growth process is not accompanied by any change in inequality.

It is derived by multiplying PPGI by the growth rate of mean income. Growth is pro-poor if this rate is greater than the mean income growth rate. If the it lies between 0 and the mean income growth rate, then growth is followed by an increasing inequality wherein poverty still declines. According to Son (2007), this situation is characterized as a trickle-down process when the poor receive proportionally less of the benefits of growth than the nonpoor.

The difference between the PEGR and the benchmark growth rate captures gains or losses of the growth rate due to changes in the distribution of income. The gains imply pro-poor growth, while the losses imply antipoor growth. An attractive feature of the PEGR is that it links the changes in inequality with the gains or losses of the growth rate: a decrease (increase) in inequality leads to gain (loss) in growth rate.

The PEGR can be calculated separately for the entire class of poverty measures including the headcount ratio, poverty gap ratio, severity of poverty index, and Watts measure. An advantage of this measure is that it addresses both the magnitude of growth and the benefits of growth the poor receive. Moreover, the PEGR satisfies the basic monotonicity criterion such that the proportional reduction in poverty is a monotonically increasing function of the PEGR. To accelerate the reduction in poverty, it is suggested that the PEGR be maximized, rather than the growth rate alone.

Whereas Kakwani and Son (2008) draw from the earlier study by Kakwani and Pernia (2000), they differ in that the former defines pro-poor growth in both relative and absolute terms while the latter uses only a relative approach. Kakwani and Pernia (2000) definition of pro-poor growth is relative in the sense that the rate of pro-poor growth implies a reduction of relative inequality. In addition to the relative approach, Kakwani and Son (2008) take a step further by defining the absolute poverty equivalent growth rate.

4. Growth Incidence Curve (GIC) and Poverty growth Curve (PGC)

According to Ravallion and Chen (2003), growth incidence curve refers to the growth rates in income at different percentile points. Where, in case the curve is positive at all percentile points, the reduction in poverty is unambiguous while if the curve shifts upward at all points, the reduction of poverty is greater.

This technique has two limitations. First, it defines the pro-poor growth rate as the area under the GIC up to the headcount ratio, which is shown to be equal to the change in the Watts poverty index (Son, 2007). Hence, unlike PEGR, GIC can only be applied to the Watts poverty measure. Second, the GIC violates the monotonicity criterion. This ensues because it estimates the pro-poor growth utilizing mathematical integration up to the headcount ratio in the initial period, ignoring the terminal period (Son, 2007). Kakwani and Son (2008) have proven that GIC measure satisfies the monotonicity axiom under highly restrictive circumstances. These circumstances may occur: (i) when growth rates are either positive or negative at all percentiles below the headcount ratio at initial period; and (ii) when nobody crosses the poverty line between the initial and terminal period.

More recently, Son (2004) proposed a poverty growth curve (PGC). The PGC can be estimated by the growth rate of mean income of the poor up to the p^{th} percentile. This measure is, however, classified as a partial definition of pro-poor growth and thus, it may not invariably provide decisive outcomes on the type of pro-poor growth. Nevertheless, this curve can be computed without knowing a poverty line or poverty measure. Compared to the GIC, moreover, the PGC will always give more stable results: while the latter is derived from cumulative mean incomes, the former estimates income at each percentile. Estimating the mean at each percentile tends to be highly unstable.

4.6.3 In a nutshell

There is no consensus as to how pro-poor growth is defined or measured. Given the merits and limitations of the different definitions and measures, monotonicity axiom is deemed to be the most critical as it satisfy pro-poor growth, as it provides the necessary and sufficient conditions for poverty reduction. However, when it comes to the measures, none is preferred over the other, and unfortunately, all the proposed them do not take account of the monotonicity axiom

4.7 Conclusion

Oil is formed from vegetable matters covered underneath the ground for billions of years. While underground, there are clues as regards to its presence before it is discovered, this is referred to as anticipated discovery. While in some few cases, it has been discovered by accident; sometimes while boring borehole or simply as a result of natural disaster. This has come to be regarded as unanticipated discovery. Each of these types of discoveries have different impacts on the economy. The former has immediate wealth effects while the latter produces effects after the arrival of the resource. In the case of the former, it undergoes different stages before it is actually discovered; these have been labelled petroleum cycles in extractive industry. Of these cycles, we look at the production. How does the anticipated oil discovery affect the economy particularly households? To respond to this question, we formulate a conceptual framework. The framework is beefed up with a couple of impact, poverty and inequality theories.

Chapter 5

The Uganda Social Accounting Matrix (SAM) 2007

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The discussion of theories in the preceding chapter takes us to the next step of presenting and briefly analyzing the data required for the estimation of our model. The presentation of different themes or sections in this chapter has been heavily borrowed from Naqvi (2010).

5.1 A glimpse of the Uganda SAM

The main source of data for the current study is the Uganda SAM 2007 by Thurlow (2008). Apparently, it is the most recent and inclusive for our study. Consequently, the year 2007 is adopted as the base year in the current study. Nevertheless, the availability of a consistent dataset contributes greatly to the choice of the year 2007 as benchmark. Nonetheless, we assume that the country's macro-economy was relatively stable that year. While this might look unrealistic on inception, it might not equally be so due to the then realities in the year 2007: First, it was relatively stable by conception of having been the period of time before the global financial crisis that disrupted world economies beginning 2008. Second, stochastic disturbances like inflation were at an average in a single digit of 6.6 percent (UBOS, 2012, p. 210). Third, a number of studies have expended the same SAM, for instance Van Campenhout et al. (2013) to explore the effect of food prices, and Wiebelt, Pauw, et al. (2011) when examining the management of oil proceedings. As some of these studies investigated oil, they did not address poverty and inequality concerns. The data and information used in developing the current SAM was sourced from the national account, the balance of payments, the national budgets and the supply-use table (SUT) for the year 2008. In its macro-format, it comprises of 37 activities and commodities and 5 factors of production. The institution account has 5 groups of households, firm, government, and rest of the world and finally, an accumulation account. The Micro SAM version however provides details of activities, commodities, factors, taxes and accumulations and hence it constitutes 120x 120 matrix. Unlike Van Campenhout et al. (2013), who used a heavily disaggregated micro SAM in their price impact study, we aggregate it to suit our objectives. The activities or commodities in the micro SAM are: agriculture (21), industry (15), service (14), households (5), factors (4), taxes (5) and accumulations (2). Given the fact that there are no theoretical guidelines regarding how to perform modification of SAM, our aggregation depends purely on the issues to be addressed. However, to adequately respond to the different objectives and questions in the study, it is important to maintain a fairly disaggregation SAM especially with regards to sectors, households and factors. The importance arises from the fact that these three accounts directly influences incomes and expenditures of households - the focus of our analysis. As noted by Iqbal and Siddiqui (2001), preliminary analysis of the data to be used is helps in discussing the results of the shocks introduced in the model.

5.2 Framework of Macroeconomic Accounting

SAM is a comprehensive description of the circular flow of income from production to consumption and vice versa (Keuning & de Ruuter, 1988). It is a single-entry accounting framework in which all transactions and transfers between activities, factors and institutions within and outside the economy described in a squared matrix in the form of rows and columns. The rows represent incomings receipts or revenue while the columns outgoings outlays or expenditures; in this manner data on production and income including that generated by the different institutions on one hand and expenditure against these incomes on the other is brought together. In the matrix principles, incomings must equal outgoings thus the total of the row equal to the total of the corresponding column (Taylor, 1983). In other words, an entry in row (i) and column (j) gives the receipts of account (i) from account (j). The row and column vectors (Y_i) are computed by summing up all the columns and rows in each account, this is to say;

$\sum_i t_{ij} = Y_i = \sum_j t_{ij} = Y_i i, j = 1, 2, ..., n,$ where, n represents the dimension of the SAM.

This illustrative equation demonstrates that for each account; income and expenditure equal each other. Furthermore, since SAM is a snapshot of the economic activities in a country during a particular year, the summing up of all accounts

$$\sum Y_i = \sum Y_j$$

which represents equality between national expenditure and income.

SAM presents final consumption expenditure, capital formation, and trade by product or industry of origin and in a similar way, intermediate consumption expressed by product or industry of origin and destination. Income generation shown by value-added. In a number of literature, SAM has been described as the extension of input-output (I-O) tables, that have until recently provided a detailed insight of the production cost structure and flow of commodities in an economy (Adelman, 1986; Pyatt & Round, 1979). Unlike SAM however, I-O tables purely derived from the absorption and supply matrix. That is, the column of an I-O table presents the inputs into the economy and the row, the distribution of the outputs. Each column of this matrix gives the values of output of that commodity produced by different industries. The symmetric I-O table is obtained from these two matrices by making certain mathematical assumptions regarding technologies (Leontief, 1986). In contrast to SAM, the I-O matrix does not show the interrelationship between value-added and final expenditures. Thus, by extending an I-O table and showing an entire circular flow of income at the macro level, derives the essentials of SAM. Table 5.1 presents a sample of the basic structure of SAM.

To facilitate the computation of different macro identities, macroeconomic accounting framework in SAM are in the form of algebraic equations. SAM traditionally comprises of four account structures viz.: commodity, factor, institutional and capital accounts. The institutional account is further split into household (h), government (g), firms (f) and rest of the world (r). The disaggregation of household account depends on the requirement of the investigator but other institutional accounts normally remain intact in SAM. For the purpose of this study, let us denote(Y_i) for income in sector i, (S_i) for saving in sector i and (E_i), for expenditure in sector i. Furthermore, let the transactions among sectors be denoted by ($TR_{i,j}$) which specify the direction of flows from sector i to sector j. For instance,($TR_{h,r}$) shows the transfers from household (h) to rest of the world (r), and ($TR_{r,h}$), the reverse.

5.2.1 Household sector

Household income (Y_h), savings (S_h), and expenditures (E_h), are the main accounts of this sector. The main source of household income is factor income (Y_f), which is generated within the production activities by virtue of household's ownership of labour, capital and land. Further, households receive income in the form of transfers from government ($TR_{g,h}$) and from the rest of the world ($TR_{r,h}$). Mathematically; the income account of household (Y_h) can be expressed as:

$$Y_h = Y_f + TR_{g,h} + TR_{r,h} \tag{5.1}$$

The accounting principle of SAM based models is built on the assumption that income must equal to expenditure (Taylor, 1983), consequently, household income must equal to household expenditure. In our model, households' total expenditure arises from their consumption spending (C), transfers to government in form of taxes ($TR_{h,g}$) and transfers to rest of the world ($TR_{h,r}$) in the form of payments for imports. We state the expenditure of household (E_h) mathematically as:

$$E_h = C + TR_{h,g} + TR_{h,r} \tag{5.2}$$

Saving is the last account of household. The identities of household savings (S_h) mathematically expressed as:

$$S_h = Y_h - E_h \tag{5.3}$$

By substituting equation 5.1 and 5.2 into 5.3, we get

$$S_h = Y_f - C + NTR_h \tag{5.4}$$

Where,

$NTR_h = \left(TR_{g.h} - TR_{h,g}\right) + \ (TR_{r,h} - TR_{h,r})$, the total net transfers received by household sector. Alternatively, equations (5.1), (5.2) and (5.4), expresses the three key accounts of the household sector.

5.2.2 Firm sector

Unlike the household, the firm sector comprises of only two major accounts namely firm income (Y_e) and expenditure (E_e) in the Uganda SAM 2007. Firm does not save anything. Firm derives its income from capital ($Y_{k,e}$), consumption of fixed capital (S_d), transfer from government ($TR_{g,e}$) and transfer from the rest of the world ($TR_{r,e}$). We state the firm income account mathematically as:

$$Y_e = Y_{k,e} - S_d + TR_{g,e} + TR_{r,e} \tag{5.5}$$

The expenditures of firm (E_e) are in the form of transfers made to the different agents namely households ($TR_{e,h}$), government ($TR_{e,g}$) and rest of the world ($TR_{e,r}$), algebraically expressed as:

$$E_e = TR_{e,h} + TR_{e,g} + TR_{e,r} \tag{5.6}$$

5.2.3 Government sector

Like the household sector, government equally consists of three accounts; government receipts, expenditure and saving. Government receipts (Y_g), include indirect taxes (I_t), income taxes from households ($TR_{h,g}$) and transfers from rest of the world ($TR_{r,g}$).

$$Y_g = I_t + TR_{h,g} + TR_{r,g} \tag{5.7}$$

Government expenditures (E_g) on the other hand consist of transfers to households($TR_{g,h}$), transfers to rest of the world($TR_{g,r}$) and government consumptions (G).

$$E_g = G + TR_{g,h} + TR_{r,g} \tag{5.8}$$

The saving account of the government is the difference between its income and expenditure. In the analysis, we will denote total net transfers received through government by (NTR_g). We state government savings (S_g), mathematically as:

$$S_g = Y_g - E_g \tag{5.9}$$

Substituting equation (5.7), and (5.8) into (5.9), we obtain

$$S_g = Y_g - G + NTR_g \tag{5.10}$$

Therefore, equations (5.7), (5.8) and (5.10) expresses total government revenues, expenditures and saving.

5.2.4 Rest of the world sector

Rest of the world sector shows supply of imports to and demand for our exports from the rest of world. This sector consists of three main accounts. These are total payments from foreigners to domestic agents (E_r), total receipts of foreigners from domestic agents (Y_r), and foreign savings (S_r). Major sources of receipts of foreigners are imports (M), transfers from government ($TR_{g,r}$) and transfer from households ($TR_{h,r}$). Algebraically expressed as below:

$$Y_r = M + TR_{g,r} + TR_{h,r} \tag{5.11}$$

The total expenditure of foreigners (E_r) consists of transfers to households ($TR_{r,h}$), transfers to government ($TR_{r,g}$) and exports (E). Thus, we depict the rest of the world expenditures account as follows:

$$E_r = X + TR_{r,h} + TR_{r,g} \tag{5.12}$$

After accounting for the total net transfer to the rest of the world (NTR_r), we obtain the savings of the rest of the world from the difference between total foreigners' income and their total expenditure, as:

$$S_r = Y_r - E_r \tag{5.13}$$

By substituting equation (5.11) and (5.12) into (5.13), we obtain

$$S_r = M - E + NTR_r \tag{5.14}$$

Hence, equations (5.11), (5.12) and (5.14) describe the total foreigners' receipts from domestic agents, total foreigners' payments to domestic agents and foreign saving, respectively.

5.2.5 The macro Aggregates

The presenting the income, expenditure and savings of the different agents in the economy, leads us to derive GDP at both factors cost and market price. The derivation of the macro aggregates from the income and expenditure side on one hand and from investment and saving equilibrium on the other, requires firstly summing up equations (5.4), (5.10) and (5.14), depicted in the equation below.

$$S_h + S_g + S_r = Y_f - C + Y_g - G + M - E \tag{5.15}$$

Defining GDP at factor cost as, all income from factors, algebraically expressed,

$$YFC = Y_f \tag{5.16}$$

Furthermore, defining GDP at market price as GDP at factor cost plus all government income; mathematically expressed, on the income side, as

$$Y = YFC + Y_g \tag{5.17}$$

Or

$$Y = Y_f + Y_g \tag{5.18}$$

By substituting GDP at market price (Y) on the right-hand side of equation (5.15), we get the following expression

$$S_h + S_g + S_r = Y - C + G + M - E \tag{5.19}$$

Since, we can write the definition of GDP at market price on expenditure side as

$$Y=C+I+G+E-M \tag{5.20}$$

Where, (I) is total value of gross investment at market price.

Rearranging equation (5.20) for (I) we arrive at

$$I=Y-C-G+M-E \tag{5.21}$$

Substituting for I into equation (5.19), we get

$$S_h + S_g + S_r = I \tag{5.20}$$

We sum all aggregate savings in equation (5.20) to obtain

$$I=S \tag{5.21}$$

Thus, equation (5.21) presents the investment and saving equilibrium.

5.3 The Basic Structure of Macro SAM

The Macro format condenses (aggregates) the details of the different accounts. It is not helpful in a comprehensive analysis of an economy particularly pertaining to impacts on households. The basic structure of macro SAM are the transfers and transactions in the economy. The structure used for Uganda SAM 2007 by Thurlow (2008) is presented below in Table 5.1. It is a square matrix comprising nine sectors, which correspond to different accounts in the economy. These nine sectors are activities, commodities, factors, households, government, firms, and rest of the world, savings - investment and the total. Across the rows, we have the different incomes and across the columns, we have the different expenditures of different agents and activities. The last rows and columns present the respective total incomes and expenditures.

5.3.1 Activities and Commodities

In Table 5.1, along row one (R1), activity account shows gross output of the activities while along the corresponding column one (C1) the cost of production is presented. Along row two (R2), commodities accounts illustrate aggregate demand of commodities while the correspondent column two (C2) demonstrates aggregate supply of the economy.

Table 5.1: Basic Structure of Macro Social Accounting Matrix

			Expenditure								
			Act.	Com.	Factors	House	Govt.	Firm	ROW	Invest.	Total
			C1	C2	C3	C4	C5	C6	C7	C8	C9
Receipts	Activities	R1		A1.2 Gross output		A1.4 Household consumption					Activity
	Comm.	R2	A2.1 Inter. input	A2.2 Transaction cost		A2.4 marketed consumptio	A2.5Govt. consumption		A2.7 export (X)	A2.8 invest.	Total
	Factors	R3	A3.1value added (YFC)						A3.7foreign factor earning		Factor
	Household	R4			A4.3factor income to household	A4.4inter. household transfers	A4.5Transfer to households	A4.6Indirect capital payments	A4.7Foreign remittance received		Household
	Govt.	R5	A5.1Production taxes ($TR_{a,g}$)	A5.2Sales /import taxes ($TR_{c,g}$)	A5.3Factor taxes ($TR_{f,g}$)	A5.4Personal taxes ($TR_{h,g}$)		A5.6Personal taxes ($TR_{e,g}$)	A5.7Corporate taxes ($TR_{r,g}$)		Govt.
	Firm	R6			A6.3 Factor income to firm($Y_{k,e}$)		A6.5Transfers to firms		A6.7 Foreign firm		Firm
	ROW	R7		A7.2 Imports (M)		A7.4 Foreign remittance paid($TR_{h,r}$)	A7.5 Govt. transfer to ROW($TR_{g,r}$)	A7.6Repatriated earning			Foreign
	Invest.	R8				A8.4 Household savings (S_h)	A8.5Govt. saving (S_g)	A8.6 Firm savings (S_e)	A8.7 Foreign savings (S_r)		Saving
	Total	R9	Gross Output	Total Supply	Factor Expense	Household Expense	Govt. expense	Firm expense	Foreign exchange	Investment	

Each row of this matrix presents the division of outputs of different commodities produced by the industry of that row. Each column of this matrix gives the value of output of the commodity of that column produced by different industries (A1.2). Whereas, industry purchases goods and services in the form of commodities (A2.1) and employ services of factor services (A3.1) also pay indirect taxes towards the purchase of goods & services (A5.2).

In addition to commodities produced by industries (A1.2), imports (A7.2) are also included in the aggregate supply. This supply of commodities, in addition to meeting the intermediate demand of industries, meets the requirements of the components of the final demand. The components of final demand are final demand of households (A2.4), government (A2.5), exports (A2.7) and gross fixed capital (A2.8).

5.4.2 Factors

The third row (R3) gives the income of factor account. This account receives value added (A3.1) as an income for their services. It is also known as Gross Domestic Product (GDP) at factor cost, that is, net of direct taxes on activities and explained in algebraic form in equation (16). Institutions receive income of factors as payment for their provision of factor services. It is allocated to three accounts: household factor income (A4.3), operating surplus into firms (A6.3) and depreciation (A8.3) - consumption of fixed capital.

5.3.2 Households

Production involves intermediate goods and the factors of production. The households contribute these factor endowments. They receive factor payment as value added in return. Households also get income from additional sources, for instance transfers from rest of the world and from the government. The fourth row (R4) in Table 5.1 presents household income. In addition to the value added, other sources of income for households are government transfers (A4.5), distributed profit from firm (A4.6) and Foreign transfers (A4.7). Equation (1) mathematically described household income. On the other hand, household spend its income on goods and services (consumption expenditure) and for tax payments; saving the reminder for the future. Households expenditure (Table 5.1, column four (C 4)) consists of consumption expenditure (A2.4), income tax (A5.4) and transfers to rest of the world (A7.4), whilst keeping the remaining income as saving (A8.4). Equation (2), expressed total household expenditure.

5.3.3 Government

The main sources of receipts of government are income taxes from households, indirect taxes from production activities, and profit of corporate taxes from firms. The government disburse its receipts as transfer payments to households as transfer payments, interest payment to firms and to the commodity account as final consumption of government. Government's budget (Table 5.1, column five (C 5) and row five (R 5)) includes government's receipts, composed of taxes on intermediate and import duties (A5.1), income taxes (A5.4), and transfers from firms (A5.6). While, government's outlays (expenditures) includes its final consumption on goods and services (A2.5), transfer to households (A4.5) and firms (A6.5). The remaining receipts are savings (A8.5) thus balancing the budget.

5.3.4 Firm

Firm account is presented in row six (R 6) and column six (C 6). Firm generates its income via two main sources, namely, factor income (A6.3) and transfers from government (A6.5). The allocation of firm expenditure goes to four accounts: as transfers to households (A4.6), transfers to government (A5.6), transfers to rest of the world (A7.6) and residual is savings of firm (A8.6). Algebraic expression of firm income, saving and expenditure are explained in previous section. However, in the case of Uganda SAM 2007, firm does not save, so account (A8.6) is not there, (see Appendix C).

5.3.5 Rest of the world

Transaction, between Rest of the World (ROW) and domestic economy is presented in row seven (R 7) and column seven (C 7). The main sources of inflow of foreign exchange are exports (A2.7) and transfers to household from the rest of the world (A4.7). While outflow of foreign exchange from the country are imports (A7.2), transfer from households (A7.4) and firms (A7.6) to rest of the world. Total difference between the foreign exchange receipts and outflow gives the net foreign exchange reserve as foreign savings (A8.7).

5.3.6 Saving-investment

Saving-investment account presents the aggregate capital account of all the institutions in the economy. Household, firm and government savings altogether form total domestic savings. Total savings of the economy are the sum of depreciation, foreign savings and domestic savings. These savings are enough to finance the investment in different production sectors. Column 8 (C8) presents the investment demand in the economy. Row eight (R 8) shows the sources of saving in the economy. These include household savings (A8.4), government savings (A8.5), firms saving (A8.6), foreign savings (A8.7), and aggregate capital depreciation in the economy (A8.3).

5.4 The Uganda Macro SAM 2007 (in billions of Shillings)

Table 5.2 presents the monetary values of Uganda Macro SAM 2007.

5.4.1 Activities and Commodities

In Table 5.2, column (A1.2) shows the gross output for the year 2007 produced by the different firms in the country which amounted to Sh. 33,559. To have that output, firms used capital to the tune of Sh. 12,257 (A2.1) and hired labour costing Sh. 21,302 (A3.1). However, there is no mention in the macro SAM of indirect tax payment to government in (A5.1). The total receipt Sh. 33,559 and total expense (Sh. 12,257 + Sh. 21,302) were equal for this account fulfilling the SAM accounting principle.

Total aggregate supply for the year in question amounted to Sh. 40,827, which included both domestic produce Sh. 33,559 in (A1.2), and imports Sh. 7,268 in (A7.2). This supply of commodities, met the intermediate demand of industries, in addition to the final demand of the different consumers in the economy. They were households, which consumed Sh. 18,743 as shown in (A2.4), government Sh. 2,689 in (A2.5), exports Sh. 3,767 in (A2.7) and gross fixed capital Sh. 5,076 in (A2.8).

5.4.2 Factors

Income of factor account is presented in the third row was allocated to two accounts namely; household factor income to the tune of Sh. 8,493 as in (A4.3), and operating surplus into firms totaling to Sh. 12,809 in (A6.3). There was however no depreciation (consumption of fixed capital) during that year, which was supposed to be presented in account (A8.3).

Table 5.2: 2007 Uganda Macro Social Accounting Matrix (billions of Shillings)

		Activities	Commodities	Factors	Households	Government	Firm	Rest of the World	Investment	**Total**
		(C1)	(C2)	(C3)	(C4)	(C5)	(C6)	(C7)	(C8)	(C9)
Activities	(R1)		33,559		00					33,559
Commodities	(R2)	12,257	8,417		18,743	2,689		3,767	5,076	50,949
Factors	(R3)	21,302						00		21,302
Households	(R4)			8,493	00	00	12,386	00		20,878
Government	(R5)	00	1,705	00	395		423	1,384		6,306
Firm	(R6)			12,809		00		00		12,809
ROW	(R7)		7,268		00	00	00			7,268
Savings	(R8)				1,741	1,219	00	2,117	62	5,138
Total	(R9)	33,559	50,949	21,302	20,878	6,306	12,809	7,268	5,138	
Source: (Thurlow, 2008) Uganda SAM 2007										

5.4.3 Households

Accounts (A4.3) and (A4.6) presents the households' income that totaled to Sh. 20,809 in 2007. The came from its provision of factors (labour) Sh. 8,493 shown in (A4.3) and dividends it received from firms Sh. 12,386 presented in (A4.6). Equation (1), described the income of households. On the other hand, households spend income on consumption and tax obligations and saved the balance. Account (A2.4) holds household consumption, which amounted to Sh. 18,743. Account (A5.4) shows taxes paid by household amounting to Sh. 395, while account (A8.4) presents household savings amounting to Sh. 1,741. Equation (2) contains the details.

5.4.4 Government

Government's income totaled to Sh. 6,306, generated from taxes on commodity - Sh. 1,705 shown in (A5.2), income tax - Sh. 395 in (A5.4) corporate tax –Sh.423 in (A5.6) and import duty Sh. 1,384 in (A5.7). On the other hand, the government spent the same amount on only government final consumption amounting to Sh. 2,689 in (A2.5) and saved the remainder Sh. 1,219 seen in (A8.5) to balance the budget.

5.4.5 Firm

Firm received its income from only from the factor account and amounted to Sh. 12,809. It received no transfers from government as shown in (A6.5). The expenditure of firms on the other hand included transfer to households Sh. 12,386 seen in (A4.6), and to government Sh. 423 as in (A5.6). Firms during this year did not make transfers to rest of the world (A7.6) and had nothing to save (A8.6).

5.4.6 Rest of the world

Capital inflows amounted to Sh. 7,268, from sale of exports Sh. 3,767 shown in (A2.2), foreign transfers to government Sh. 1,384 shown in (A5.7) and foreign savings Sh. 2,117 in (A8.7). Outflows were on the other hand was solely on imports Sh. 7,268 seen in (A7.2). There were no transfers made on households (A7.4), government (A7.5) and firm (A7.6). There was too, no foreign savings (A8.7)

5.4.7 Saving-investment

Accumulations for the year totaled Sh. 5,138. Savings came from households Sh. 1,741 shown in (A8.4), government Sh. 1,219 shown in (A8.5), foreign Sh. 2,117 seen (A8.7) and investment Sh. 62 posted on (A8.8). There was no aggregate capital depreciation (A8.3) and firm savings (A8.6). Investment allocations went to stocks (A2.8) and small savings Sh. 62 (A8.8).

5.5 Structure of Micro SAM 2007

The Micro SAM for year 2007 presents a broad representation of the economy of Uganda that showing the relationships between the different aspects of the economic transactions in production, consumption, and investment. It has five main accounts namely, activity, commodity, factors, institutions and accumulations.

5.5.1 Activities account

Table 5.3A: Aggregation of Agriculture Activities

Activity		Type of Activities in UGSAM 2007			Author's Aggregations		
	Agriculture	A1	$Aflow$	Flowers	A1	*Agriculture*	A-AGR
		A2	$Acott$	Cotton			
		A3	$Atoba$	Tobacco			
		A4	$Acoff$	Coffee			
		A5	$Altea$	Tea, cocoa & vanilla			
		A6	$Amaiz$	Maize			
		A7	$Arice$	Rice			
		A8	$Aocer$	Other cereals			
		A9	$Acass$	Cassava			
		A10	$Aipot$	Irish potato			
		A11	$Aspot$	Sweet potato			
		A12	$Amato$	$Matoke$			
		A13	$Aoils$	Oilseeds			
		A14	$Abean$	Beans			
		A15	$Avege$	Vegetable			
		A16	$Afrui$	Fruits			
		A17	$Acatt$	Cattle & sheep			
		A18	$Apoul$	Poultry			
		A19	$Aoliv$	Other livestock			
		A20	$Afore$	Forestry			
		A21	$Afish$	Fisheries			

As already noted, in SAM, activities are very many but, in our analysis, we do not need all the details of activities. Thus, we aggregate this account into agriculture, petroleum, industry, manufacturing, education, health and service activities. To begin with, we aggregate the agriculture presented in Table 5.3 A. Originally, agriculture activities had been disaggregated into 21 subsectors in SAM (A1-A21).

Table 5.3 B: Aggregation of manufacturing and Industry

		Type of Activities in UGSAM 2007			Author's Aggregations		
Ac	**Industry**	A-22	$Afuel$	Petrol & diesel	A2	Petroleum	A-PETR
		Type of Activities in UGSAM 2007			Author's Aggregations		
	Manufacturing	A23	$Ameat$	Meat processing	A3	Industry	A-IND
		A24	$Aprfi$	Fish processing			
		A25	$Aprgr$	Grain processing			
		A26	$Afeed$	Feed stock			
		A27	$Aprfd$	Other food processing			
		A28	$Abvtb$	Beverages & tobacco			
		A29	$Atext$	Textiles & clothing			
		A30	$Awood$	Wood & paper			
		A31	$Afert$	Fertilizer			
		A32	$Achem$	Other chemicals			
		A33	$Amach$	Machinery/equipment			
		A34	$Afurn$	Furniture			
		A35	$Aoman$	Other manufacturing			
	Industry	A36	$Amine$	Mining			

We aggregate them into a single sector named agriculture and labelled A-AGR. This is so because, this sector as a whole employs the largest percentage of labour-force of whom the majority are the poor. Thus, we need to see the changes in incomes and expenditures of households in this sector as laborers and as owners of land. Next, we aggregate the industrial and manufacturing as presented in Table 5.3B. The 15 activities of industry (A22 – A36) are aggregated into three sectors namely petroleum (A22), manufacturing (A23-A35), and industries (A36). Petroleum sector is very essential, as it is at the focus of the analysis and by virtual of that, it is essential to remain separate.

Table 5.3C: Aggregation of the Service Activity

		Type of Activities in UGSAM 2007			Author's Aggregations		
Activity	**Service**	A37	Aeduc	Education	A4	Service	A-SER
		A38	Aheal	Health			
		A39	Autil	Energy & water			
		A40	Acons	Construction			
		A41	Atrad	Trade			
		A42	Ahotl	Hotels & catering			
		A43	Atran	Transport			
		A44	Acomm	Communications			
		A45	Abank	Banking			
		A46	Areal	Real estate			
		A47	Acsrv	Community services			
		A48	Aosrv	Other private services			
		A49	Ardev	Research & development			
		A50	Aadmn	Public administration	A5	Public Service	A-PSER

Government vision 2040 aims at industrialization in particular industrial - manufacturing. Hence, we shall be examining the impacts of oil in the different scenarios in industrial - manufacturing of households working and earning from those two sectors. Similarly, the 14-service sector activities (A37 – A50) are aggregated into three sectors namely education (A37), health (A38) and services (A39-A50) see Table 5.3C. Such aggregations are useful in examining the impacts of oil on the social sectors. In all, we shall have 7 productive activities. The matrix formed in SAM (Appendix C: Table C) by the first seven rows of activities (A1-A7) intersecting with the columns under commodities (C1-C7) shows the output of each commodity group by each activity or sector. This forms a diagonal matrix because each activity is producing one respective commodity.

This aggregation is necessary to reduce the size of the Matrices in the Social Accounting Matrix we are using which has 120 rows and 120 columns. Besides, we are focused on the impacts of just one sector–petroleum on household. Hence it the latter that requires of us to make it a separate sector from industry and manufacturing to enable the simulations and the disaggregation of the former to understand the extent of the impact.

5.5.2 Commodity accounts

Commodity accounts shows the components of total supply in term of value, domestic production, imports, indirect taxes, total demand, intermediate input use, final consumption, investment demand, government consumption and exports. We aggregate the commodity account in the same manner as the activity one. The matrix formed in Table 5.29 by commodities (C1-C7) in the rows and activities (A1-A7) in the column gives the intermediate input of each commodity into each sector. Appendix C, reveals that petroleum, industry, education, health and services have no intermediate input from agriculture; industry has no input from petroleum; agriculture, industry, education, and health have no intermediate inputs from industry; agriculture, petroleum, manufacturing and industry have no inputs from education in their production processes.

Furthermore, in Table 5.27, the rows F1 to F5 (factors) provide the primary input into each activity. These matrices jointly comprise the absorption matrix of the input-output system. Since agriculture sector is labour intensive, it uses high amount of primary inputs. Rows F1 to F3, shows labour requirements for each sector. Agriculture uses more labour than other sectors in total. Additionally, it is the only sector using self-employed labour, has highest unskilled labour but does not use skilled labour. The service sector comes at the top in the use of both skilled and unskilled labour force in the country. Education sector comes second to the service sector in using skilled labour. Petroleum sector is small in terms of labour, and the little in this sector is skilled. Concisely, unskilled labour force is a dominant phenomenon in the country, requiring urgent attention if poverty and inequality is to be addressed. Rows F4 and F5 show land and capital factors respectively. Agriculture is the only sector that uses land in its production process; in addition, it makes use of a significant amount of capital following the service sector. On average, service (A7) uses comparatively high amount of intermediate inputs into all sectors; followed respectively by Agriculture (A1), manufacturing (A3), education (A5), health (A6), industries (A4), and petroleum (A2).

The matrix formed by the rows of commodities (C1-C7) intersecting with the columns headed “households” (H1-H5), “firm” (ENT) and “government” (GOVT) show the final consumption demand of each commodity by each institution in Table 5.27. The column headed 'ROW' shows the exports of each commodity to the rest of the world. Imports of commodities (C1-C7) are shown by the entries in the row headed "ROW". As a commodity, Education and health are neither exports nor import, while Petroleum is neither export. Last column against the commodities (C1-C7) shows the investment expenditure of each commodity. Information from Table 5.27 shows that there is no investment in agriculture and education, a disinvestment in petroleum and marginal investment in health. Investment in the country is in four sectors other manufacturing, industry, health and services. Indirect taxes on various commodities are given by the entries in the row for the government (GOVT) against the column of commodities (C1-C7). These taxes are applicable to the service-related sectors of education, health and services. Agriculture, petroleum, manufacturing and industries do not pay indirect tax. We now turn to the value of the forgoing presentations in Uganda SAM 2007 as follows:

5.5.2.1 Domestic Production and Export for the Year 2007

After the detailed description of the commodity account in Uganda SAM 2007, we turn to the commodity production and export for that year, presented in Table 5.4.

From Table 5.4 shows total domestic production and approximation of commodities and services for both domestic consumption and foreign markets - exports. The service sector dominated in the total production. Its total contribution to total production amounted to 53.35% followed by the agriculture sector at 17.07%t. Industry (16.40%), education (7.37%), petroleum (3.83%) and health (1.95%) followed respectively. On the domestic demand side, the summation of sector consumption, households and government as a percentage of domestic production reveals that Uganda is not self-sufficient in many sectors.

Table 5.4: Export and Domestic Markets Goods for the Year 2007

	Total production (billions of Shillings.)	Domestic demand of total production (billions of Shillings)	Sectoral share in total production (%)	Domestic demand as % of total production	Export of goods (billions of Shillings)	Export of goods as % of total production	Sectoral share in total export %
A-AGR	5759815	6340711	17.1	110.1	1088460	18.9	28.09
A-PETR	1291182	1703604.16	3.83	131.9	298502	9.02	7.7
A-MAN	5206110.7	11453566.9	15.43	207.0	812685.4	21.76	20.97
A-IND	326419.3	718130.1	0.97	13.00	50954.77	1.36	1.31
A-EDU	2485932	2394532	7.37	96.32	0	0	0
A-HEAL	666910.5	666865.4	1.98	99.99	0	0	0
A-SER	18005582	10921422	53.4	60.66	1624895	15.6	41.93
TOTAL	33741951	33688976	100	100	3875498	11.49	100
Source: Uganda SAM, (2007)							

According to Table 5.4, Uganda is sufficient in the service sector where domestic demand of total demand is just 60.66% but the situation is running out of hand in health and educational sectors where it is approaching 100% point (99.99% and 96.32%, respectively. There are however very significant levels of insufficiency in industry (220%), petroleum (131.94%), and agriculture (110.09%). On average, we can conclude that the country is not self-sufficient in in its domestic production as there is a great mismatch between domestic production and domestic demand. Thus, more efforts are urgently required to boost domestic production especially industrial, petroleum and agricultural products.

In terms of export as a percentage of total production, industry is higher in comparison to other sectors with a percentage share of 23.13%. It is followed respectively by agriculture (18.90%), service (15.61%) and petroleum (9.02%). According to Uganda SAM 2007, non-exported commodity accounts included education and health. Furthermore, Table 5.4 presents the contributions of the different sectors to the country's exports. In the Table, the service sector has the highest contribution of 41.93%, followed respectively by agriculture, industry and petroleum with percentages of 28.09, 22.28, 7.7 respectively.

5.5.2.2 Taxes and related Transaction Costs for 2007

Production and export introduce us to taxes and other costs, presented in Table 5.5. Table 5.5, presents taxes and other costs – that constitute government revenue. In this Table, with the exception of education and health which do not pay sales tax, there is little different the sales tax contributions of other sectors. The largest contributor is industry with 6.27 percent followed by petroleum (4.44 percent), agriculture (1.59 percent) and finally service (0.91 percent).

Petroleum with a very high share of 80.49 percent significantly contributes to the import tariffs. Other import tariffs contributors include in order of significance industry (25.73 percent) and agriculture (0.71 percent). Transaction costs are highest in industry at 66.59 percent, followed by agriculture (17.71 percent) and petroleum (9.30 percent).

Table 5.5: Imports, import tariffs, sale taxes and transaction costs for Year 2007

	composite supply[24]	Imports	sales tax	import duty	Transaction cost	sales tax rate	import tax	Transaction	Share in total
A-AGR	6309795.53	260418.11	100051.76	1845.36	1117478.24	1.59	0.71	17.71	3.58
A-PETR	624624.40	600145.67	27718.00	483071.46	58096.14	4.44	80.49	9.30	8.26
A-MAN	9740989.16	4263239.0	324833.79	527140.66	2853783.39	5.9	24.21	62.66	58.65
A-IND	610752.77	267301.92	20366.84	33051.33	178930.1	0.37	1.52	3.93	3.68
A-EDU	2394531.81	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
A-HEAL	666910.49	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
A-SER	20479354.3	1876702.5	186842.86	70.94	0.00	0.91	0.00	0.00	25.82
Source: Uganda SAM 2007									

With respect to the shares of the seven sectors in import, industry has the largest share of imports estimated at 62.33 percent, followed by service with 25.82 percent; then petroleum with 8.26 percent, and agriculture with 3.58 percent. These figures show that the country is importing a lot of manufactured commodities and services.

5.5.3 Factors account

The factors of production account illustrate the sources of factor income, this is to say, the value added in each productive activity and the dispersion factor payments institutions namely: households, government, firms and government, of the economy. The Uganda SAM 2007 defines labour factor of production according to type of employment and

[24] Sum of Domestic production and Imports

skills, thus; there are three namely: self-employed, skilled and unskilled. In addition to labour, other factors of production in Uganda SAM 2007 includes land, capital and cattle. The aggregation in this account will be combining cattle with capital. Table 5.6 presents aggregations of the factor account.

Table 5.6: Aggregation of Factors

Types of Factors in SAM 2007				Author's Aggregations		
Factors	Labour	lab-self	Self-employed labor	F1	Same	LAB-SEL
		lab-unsk	Unskilled labor	F2	Same	LAB-USK
		lab-skll	Skilled labor	F3	Same	LAB-SK
	Land	Flnd	Land	F4	Same	LN
	Capital	Fcap	Capital	F5	CAPITAL	K
		Fcat	Cattle			

The maintenance of the disaggregated labour is necessary in examining their contribution to household income and in assessing the required transfers needed to enhance labour productivity.

Income of factors of production is shown by the matrix form by rows and columns headed (F1-F5). The matrix formed by columns of factors (F1-F5) intersecting with the rows headed (F1-F5) show the expenditure of factors of production. Factors of production are very essential in the value-addition in the economy.

5.5.3.1 Production

The structure of production and thus value added in the Uganda in 2007 is presented in Table 5.7.

Table 5.7: Production and value added (%)

		Value added		Factor shares in Value Added					Sector factor shares				
	Total output	VA/QX	Share	LAB-SEL	LAB-USK	LAB-SK	K	LN	LAB-SEL	LAB-USK	LAB-SK	K	LN
C-AGR	17.1	79.76	18.56	11.8	17.14	0.00	24.57	46.4	100	32.27	0.00	9.09	100
C-PETR	3.8	6.42	0.07	0.00	9.52	13.51	76.97	0.00	0.0	0.01	0.01	0.01	0.00
C-MAN	14.2	81.02	19.03	0.00	27.03	8.03	101.4	0.00	0.0	7.11	4.06	8.01	0.00
C-IND	2.2	26.6	0.25	0.00	2.10	3.02	58.4	0.00	0.0	2.65	0.42	2.10	0.00
C-EDU	7.37	68.30	5.22	0.00	8.83	73.21	17.96	0.00	0.0	5.63	41.54	2.25	0.00
C-HEAL	1.98	55.24	1.45	0.00	6.66	55.25	38.08	0.00	0.0	0.96	7.06	1.08	0.00
C-SER	53.4	68.67	55.43	0.00	10.31	10.59	79.11	0.00	0.0	51.38	46.91	77.47	0.00
Total	100		100	11.8	12.03	13.53	61.23	10.5	100	100	100	100	100
Source: Uganda SAM 2007													

In this Table, the service sector contributes 53.4 percent to the overall gross value of economic output, followed by agriculture (17.1 percent) which is closely followed by manufacturing (14.2 percent) and then education (7.4 percent), petroleum (3.8 percent), industry (2.2 percent) and lastly health (1.98 percent).

5.5.3.2 Value-added

The value-added contribution of each sector presented in Table 5.7 shows; manufacturing, agriculture, service, and education contributing in excess of 50 percent, estimated at 81.02, 79.76, 68.67, 68.30 and 55.24 respectively. While petroleum has lowest levels of contribution to value-added 6.42 percent.

5.5.3.3 Sectoral Share in Value-added

In relations to the sector share of value-added in Table 5.7, the service sector has the largest share of 55.43 percent, followed by manufacturing (19.03 percent), agriculture (18.56 percent), then education (5.22 percent), health (1.45 percent), industry (0.25 percent) and lastly petroleum – the sector which is the subject of our analysis has a mere share of 0.07 percent.

5.5.3.4 Payment to Factors

An estimated 61.23 percent of overall value added is payment to capital, 13.53 percent to skilled labour, 12.03 percent to unskilled labour, 11.84 percent to self-employed labour and 10.52 percent to land. Agriculture makes the highest payment to land (46.45 percent) and unskilled labour (17.14 percent), industry the highest payment to capital (159.82 percent) and education the highest payment to skilled labour (73.21 percent).

5.5.3.5 Factor Sectoral Shares

In view of the contribution of factor shares to the different sectors; 100 percent of self-employment labour and 100 percent of land contribute to agriculture; 77.47 percent of capital, 51.36 percent of unskilled and 46.91 percent of skilled labour contribute to service. Petroleum the focus of our study has very insignificant shares, that is, 0.01 across unskilled labour, skilled labour and of capital and nothing when it comes to self and land.

5.5.2.3 Domestic Absorption

This comprises of consumption and investment patterns of the different commodities in the economy for the year 2007. The details are presented in Table 5.8.

Table 5.8: Absorption (%)

	Total	Intermediate	Households	Government	Investment
C-AGR	16.01	13.92	24.73	0	0
C-PETR	3.17	5.78	2.59	0	0
C-MAN	25.08	38.66	33.55	0	19.74
C-IND	5.30	3.08	4.15	0	3.00
C-EDU	5.09	3	5.79	34.98	0
C-HEAL	1.42	0.28	1.79	11.06	0
C-SERV	43.93	35.28	27.45	53.97	77.26
Total	100	100	100	100	100

In this Table, service with 43.9% has the highest share in absorption, followed by manufacturing (25.08%), agriculture (16%), industry (5.30%), education (5.1%), petroleum (3.2%) and health (1.4%). Regarding the breakdown in absorption; manufacturing with (38.66%) leads in consuming intermediate inputs, followed in order by service (35.3%), agriculture (13.9%), petroleum (5.8%), industry (3.08%), education (3%) and health (0.3%). Manufacturing (35.55%) tops household consumption followed by service (27.5%), agriculture (24.7%) and petroleum has just a mere 3.59%. Government consumption is directed mainly on services (54%), while significant investments are made in service (77.3%) and industrial sectors (22.7%). Notably, petroleum doesn't have any share in investment.

5.5.3.6 Labour-force

The distribution of labour in thousands across the sectors is presented in Table 5.9.

Table 5.9:Total number of labour in employment (in thousands)

	A-AGR	A-PETR	A-MAN	A-IND	A-SER	A-EDU	A-HEAL
LAB-SEL	35322.21						
LAB-USK	10550.79	3080.28	121060.47	13168.13	439102.2	72122.57	37653.03
LAB-SK		111.72	4614.75	253.64	135797.7	133828.60	69867.90
Source: ILO (2011), UBOS (2008), UBOS (2010)							

From the Table above, self-employed labour was used only in the agriculture sector. That implies that they it cannot have a direct impact from petroleum the subject of our analysis. Skilled labour on the other hand was employed in all sectors except agriculture. This show the extent to which the country's agriculture is still traditional. However, its number in petroleum was very small, which could make it lose out in this vital sector. Unskilled workers were distributed across all sectors with the majority being in service.

5.5.3.7 Labour Income

Table 5.10 presents labour income from the work done in Table 5.9. The distribution of labour in Table 5.9 greatly affected its income.

Table 5.10: Total income from work (in billions of Shillings)

	A-AGR	A-PETR	A-MAN	A-IND	A-SER	A-EDU	A-HEAL
LAB-SEL	571396.4	0		0	0	0	0
LAB-USK	827026.4	149.46	225494.09	24527.71	1188498	195210.73	101913.67
LAB-SK	0	212.22	122455.31	6730.59	1101282	1085313.41	566609.59
	Source: Uganda SAM 2007						

With the exception of agriculture, self-employed labour earning nothing from other sectors. Unskilled and skilled derived very little income from petroleum

5.5.3.8 Activity Wages

And finally, Table 5.11 presents the average wage rate of each type of labour, obtained by dividing labour income by the number of labour.

Table 5.11: Activity specific wages (in billions)

	A-AGR	A-PETR	A-MAN	A-IND	A-SER	A-EDU	A-HEAL
LAB-SEL	16176.69						
LAB-USK	78385.26	48.52165	3228.04	351.12	15717.05	2581.53	1347.74
LAB-SK		1899.586	54406.02	2990.35	21629.49	21315.87	11128.37
	Source: Author's construction using Tables 5.9 and 5.10						

On average, unskilled labour generated much of its income from agriculture while skilled from manufacturing. Self-employed labour had its earning from a single source agriculture. Earnings from oil for unskilled labour is very small, yet these constitute the majority of the poor. This is likely to affect their incomes in the wake of the discovery.

5.5.4 Agent Account

From Uganda SAM 2007, agent account comprises of households, government, firms, and rest of the world. In Appendix C, Table C, rows 11 to 17 and 27 shows income of these institutions and columns 20 to 27 displays expenditures. Rows 18 to 21 show taxes and other costs, while columns 18 to 21display expenditures, rows 22 to 26 shows earnings from wages and rents and columns 22 to 26 show expenditures of wage and rent income. This section describes the agent account.

5.5.4.1 Households

Uganda SAM 2007 categorized household population in Uganda according to the geographical location and type of work. Accordingly, in it, there are five subgroups namely: rural farm, rural nonfarm, Kampala nonfarm, urban farm and urban nonfarm. We adopt this categorization in this study to have an in-depth analysis of oil impacts on household poverty and inequality. The aggregation of households is described in Table 5.12.

Households' categorization is very crucial because conclusions concerning poverty and inequality of households depend on how the population is sub-divided. In SAM 2007, household account specifies five groups (H1 – H5). They are classified into three subgroups, rural, Kampala capital and urban. H1 to H2 are rural households, H3 is Kampala, while H4 and H5 are urban households.

Table 5.12: Aggregation of household

Types of households in SAM 2007				Author's Aggregations	
Institutions	Households	hhd − r − f	Rural farm households	H1	HHD-R-F
		hhd − r − nf	Rural nonfarm households	H2	HHD-R-NF
		hhd − k − nf	Kampala nonfarm households	H3	HHD-K-NF
		hhd − u − f	Urban farm households	H4	HHD-U-F
		hhd − u − nf	Urban nonfarm households	H5	HHD-U-NF

The classification of households follows the definition provided in SAM 2007, this is to say, the type of employment sector. Where in rural households H1 refers to household employed on farm and H2 that employed in non-farm. For the capital city, Kampala H3 is non-farm. For urban households H4 is employee on farm and H5 is non-farm.

Table 5.13 presents the composition of households in the country in 2007. This Tables provides details of on each category of households notably its population size, the poor there in, income and shares. In the Table, households employed on farm (H1) are the majority (47.11), they are followed by urban non-farm (H5), non-farm rural (H2), urban farm and Kampala non-farm with percentages of 24.70, 18.7, 6.2 and 3.3 respectively.

Table 5.13: Household composition in Uganda in 2007

Household Groups	Household Population	Poor Household Population	Household Income	Household Population share	Share of Poor Household in Population
H1	17081755	5088182	10137145	47.11	14.03
H2	6775445	2018218	3035811	18.69	5.57
H3	1189142	124186	3882936	3.28	0.34
H4	2258019	235435	1729435	6.23	0.65
H5	8956389	933979	2099278	24.70	2.58
Uganda	36260750	8400000	20884605	100	23.17
Source: UBOS (2008), UDHS (2011)					

Majority of the poor in the population were rural farm households. They had a percent of 14.03, they were in order followed by rural non-farm (5.57), urban non-farm (2.58), and urban farm, Kampala non-farm with less than 1 percent.

In the wake of oil discovery, this composition is very crucial in figuring out the likely impact of this new resource on households.

We explain the sources of income and pattern of consumption of households to have an in-depth understanding of their characteristics. Table 5.14 presents the characteristics and shares of income of the five household groups. The computation sourced data from the Uganda bureau of statistics 2008. These includes working population and employment by occupation (UBOS, 2008, p. 111).

Table 5.14: Characteristics of household groups

Household Groups	Household per Capita Income (Shillings)	Wage Income Share (%)	Land Income Share (%)	Capital income share (%)	Transfer from Firm (%)
H1	593.45	38.61	96.32	90.76	43.92
H2	448.06	15.86	0.00	0.00	16.80
H3	3265.33	20.77	0.00	0.09	21.25
H4	765.91	12.94	3.68	9.11	6.84
H5	234.39	11.82	0.00	0.04	11.20
Uganda	575.96	100	100	100	100
	Source: Uganda SAM (2007); UBOS (2008)				

In Table 5.14, the overall per capita income of the country is Sh. 575.96 and Kampala non-farm households has the highest level approximated at Sh. 3265.33.

With regards to the sources of income for different households; wage contributions were as follows: It contributed greatly as income source to household H1 (38.6%), followed by H3 (20.77%), H2 (15.86%), H4 (12.94%) and H5 (11.8%). Land rent was the major source of revenue for household H1 (96.3%) with the remainder (3.68%) of the share going to H4 household. Similarly, the largest income of capital was taken by household H1 (90.76%) followed by H4 (9.11%). In terms of transfers, household H1 received the highest share from firm (43.9%), followed by H3 (21.25%), H2 (16.80%), H5 (11.20%) and H4 (6.8%). Table 5.15 displays further analysis of household income in terms of type of labour.

Table 5.15: Household earnings by labour type (%)

Household group	LAB-SEL	LAB-USK	LAB-SK
H1	95.47	43.35	23.13
H2	0.00	16.49	18.45
H3	0.00	21.88	23.90
H4	4.53	6.96	19.92
H5	0.00	11.32	14.61
Total	100.00	100.00	100.00
Source: Uganda SAM 2007			

Only farm-based household earned income from self-employment. Rural farm had the highest share of income from self-employment estimated at 95.47% while urban farm had a small share of 4.53%. In terms of unskilled labour, rural farm had the highest earning (43.35%), followed in order by Kampala nonfarm (21.88%), rural non-farm (16.49%), urban nonfarm (11.32%) and urban farm (6.96%). The distribution of the income of labour according to skills is as follows in order of hierarchy: Kampala nonfarm (23.90%), rural farm (23.13%), urban farm (19.92%), rural nonfarm (18.45%) and urban nonfarm (14.61%).

Next, Table 5.16 expressions the consumption structure of the five household groups in the seven sectors. Overall, the largest items in the consumer basket across household groups come from services (27.45%), agriculture (24.73%), industry (22.88%) and processed food (14.77%). Other sectors constituted to a smaller consumption expenditure of household, for instance, education (5.79%), petroleum (2.59%) and health (1.79%).

Table 5.16: Household consumption share (%)

	H1	H2	H3	H4	H5
C-AGR	31.80	25.00	13.54	17.83	14.61
C-PETR	2.22	4.70	1.46	4.20	2.02
C-IND	36.80	39.83	38.52	33.55	40.43
C-EDU	5.07	3.53	7.30	10.17	6.48
C-HEAL	2.37	1.46	1.03	1.15	1.26
C-SER	21.74	25.48	38.16	33.10	35.20
Total	100	100	100	100	100
Source: Uganda SAM 2007					

Across household groups, however, the consumption ratios vary but the dominant sector for which all households across the board spends much of the income on industrial products. Household H1 spent much of its income on industrial commodities (36.8%), followed by on agriculture 31.8%, service (29.2%) and a small portion on petroleum (2.22%). H2 spent much of its income on industrial consumption (39.8%), service (30.47%), agriculture (25%) and least on petroleum (4.7%). H3 spent mostly on service (46.49%) and industry (38.5%), while H4's expenditures were directed at service (42.9%) and industry (33.55%). Finally, H5 made big consumption of service (42.94%) and industry (40.43%). All households had least consumption of petroleum in their consumption. This bounds bad regarding the potential absorption of the newly discovery hydro-carbon, whose high domestic consumption is essential in boosting economic activities countrywide.

5.5.4.2 Government

The government account describes the national budget, this is to say, revenue and expenditure. Government revenue includes taxes and any transfers; while expenditures comprises public final consumption, transfers from the government to other institutions and savings. Table 5.17, presents the five sources of government revenues.

Table 5.17: Sources of government revenue

Sources	Revenue (in Shillings)	% share in Total Revenue
Transfer from ENT	124818.001	3.19
Transfer from ROW	1384206.59	35.42
DTAX	693635.109	17.75
STAX	659813.2636	16.89
MTAX	1045179.757	26.75
Total	3907652.721	100
Source: Uganda SAM 2007		

Table 5.17 shows that; the government derives the bulk of its revenue (35.42%) from abroad - ROW. Other significant sources of revenue to government includes import duty (26.75%), direct tax (17.75%), sales tax (16.89%), and transfer from enterprise (3.19%).

Table 5.18 presents how government revenue is spent. Much of the Government revenue is spent the service (37%), savings (31%), education (24%) and health (8%). Government is skewed towards services implying that the size of public sector is quite big. The share of expenditure on health sector is very low. This explains the poor service delivery in this sector.

Table 5.18: Government expenditure

Sources	Expenditure	% share in Total Expenditure
C-EDU	940543.1806	24.00
C-HEAL	297270.3745	8.00
C-SER	1451138.419	37.00
INV	1218700.747	31.00
Total	**3907652.721**	**100**
Source: Uganda SAM 2007		

5.5.4.3 Firms Account

Firm, another agent in SAM has two accounts; the expenditure and income. The income of firm is described in Table 5.19. Firm derives the bulk of its revenue from capital (Table 5.19). This is very worrying and could account to the fact that in SAM, this agent does not have any saving. There is need for firm to diversify its sources of revenue. It could initiate transfers from other agents like households and government. In a globalized world, it needs to look at investments abroad to earn the country the much-needed foreign exchange.

Table 5.19: Firm revenue

Sources	Firm Revenue (in Shillings)	% share in Total Revenue
CAP	12809146.97	100.00
Transfer from HHD	00.00	0.00
Transfer from GOV	00.00	0.00
Total	12809146.97	100.00
Source: Uganda SAM 2007		

Firm expenditures on the other hand are presented in Table 5.20. Unlike revenue, firm has a broad expenditure on other agents except the abroad.

Table 5.20: Firm expenditure

Sources	Firm Expenditure (in Shillings)	% of Total Expenditure
HHD	12385950.97	96.70
Transfer to Govt.	124818.001	0.97
DTAX	298378.0021	2.33
Total	12809146.97	100
Source: Uganda SAM 2007		

The bulk of firm expenditures are on households 96.70%, direct tax 2.33% and transfer to 0.97%. Firm spend much of its earnings paying households for the supply of labour and capital. The rest of the expenditures are very small. This shows how households are very important in the economic life of a country.

5.5.4.4 Rest of the world Account

The Uganda SAM 2007 treats all foreign agents (ROW) as a single entity which must satisfy a budget constraint as far as its transactions with Uganda are concerned. This account shows the demand for Uganda's exports to and supply of imports from the rest of the world. The row labeled 'ROW' against the columns of commodities (C1-C7) shows the demand for imports, which together constitute income of rest of the world. Along the corresponding column (C1 – C7) is exports demand of rest of the world and net transfers to government "GOV", which constitutes expenditure of the rest of the world. Income and expenditure of rest of the world are balanced by adding foreign savings (CAB) along the column in the capital accounts, which is current account balance of the balance of payments (Table 5.27). Income of rest of the world from various sources is presented in Table 5.21.

ROW earns her income from mostly exporting into the country. Much of the ROW are in the form of industry (62.34%), services (25.82%), petroleum (8.26%) and agriculture 3.58%). From the table, it is very clear that the country is importing a lot of industrial products and thus losing significant amount of foreign exchange. Income from service is also quite significant, implying the economy is outsourcing foreign services. Formers however, earns little from petroleum and possibly with domestic oil, their earning from this product will drastically reduce.

Table 5.21: Rest of World income

	ROW Income	% of Total Income
C-AGR	260418.1098	3.58
C-PETR	600145.6727	8.26
C-MAN		
C-IND	4530540.941	62.34
C-SER	1876702.493	25.82
Total	7267807.217	100.00
Source: Uganda SAM 2007		

The earnings of the rest of the world is spend of the different imports from Uganda as presented in Table 5.22

Table 5.22: Expenditure of Rest of World

Sources	ROW Expenditure	% of Total Expenditure
C-AGR	1188460.112	16.35
C-PETR	25490.7323	0.35
C-IND	938149.4911	12.91
C-SER	1614895.42	22.22
Transfer to GOVT	1384206.59	19.05
Savings	2116604.872	29.12
Total	7267807.217	100
Source: Uganda SAM 2007		

. The largest expenditure of 29.12% is spent on investment. This is followed by 22.22% spending on importing services, 19.05% transfers to government, 16.35%, 12.91% and 0.35% on agriculture, industrial and petroleum imports, respectively. Foreign investment is significant and with oil, it is likely to increase. They have the capital and technical expertise that will put them at an advantage over the locals.

5.5.5 Accumulations Account

The capital account describes the consolidated balance between total investment and total saving in Uganda for the year 2007. This account is very important because it detects links with real sectors of Uganda. It shows the financing of total investment through the savings of different economic institutions, the households, firms, government, and rest of the world. Savings comprise those by households, firms, Government and the rest of the world. The row labeled 'CAP' gives the total saving in the economy, comprising household savings in the intersection with households (H1-H5), government savings in the intersection with the government (GOVT), firm savings in the intersection with the firm (ENT), and rest of the world savings in the intersection with the rest of the world (ROW). The row total represents gross savings in the economy. The column headed 'CAP' shows total investment expenditure in the economy, comprising investment in the intersection with commodities (C1-C7). The column total represents gross fixed capital formation in the economy (Appendix C).

Table 5.23 presents the level of savings and investments in the capital account in our data source. In the Table 5.23, financing of investment is majorly done by savings by ROW

(41.70%), this was followed by those of households (33.88%), government (23.72%) and savings (1.21%).

Table 5.23: Savings – Investment Balance

Accounts	Savings	% of Total Savings	Accounts	Investment	% of Total Savings
Household Savings	1740675	33.88	C-AGR	-238.143	-0.00464
GOV	1218701	23.72	C-PETR	1154486	22.46986
ROW	2116605	41.2	C-IND	24.7159	0.000481
Investment	61950.12	1.21	C-EDU	45.0959	0.000878
			C-HEAL	3921663	76.32767
			Savings	61950.12	1.205741
Total Savings	5137930	100	Total Investments	5137930	100

The direction of investment as presented in Table 5.23, show that the bulk was made in health (76.33%), followed by 22.47% in petroleum,1.22% in saving, insignificant investment in education and health. There is a disinvestment in agriculture.

5.6 Model Parameters

In this section, we present the different exogenous parameters required for the model to run. Preferably, cross section and time series data provides econometric estimates of trade elasticities. Given limited resources besides data constraints, it is not possible to estimate elasticity parameters for this study. Thus, existing literature typically provides the plausible values of elasticities. The selection of elasticities poses a potential problem to the CGE exercises.

In the CGE developed for Uganda, the intensity of commodities substituted for each other from domestic and imported goods become better substitutes for domestic goods when the values of Armington Elasticities are higher. Whereas, imported commodities become weak substitute for domestic goods when these Armington Elasticities are lower. It is uncommon to see within the context of developing countries, the empirical estimates of Armington Elasticities due to the unavailability of time series data on import prices and quantities, quantitative restrictions and variables such as seasonal fluctuations. For this reason, CGE models developed for developing countries often rely on literature surveys to find Armington Elasticities estimated for other countries. It must be noted that trade elasticities such as the value of Armington play a vital role in the relatively disaggregate models. This gives rise to the need for conducting a detailed sensitivity analysis to assess the robustness of the results.

In Table 5.24, we present Armington elasticities used in different countries for the purposes of illustration of these important variables in CGE modeling. From the Table below, we notice that these elasticities vary according to countries and time period; reflecting the trade structure and the changes over time.

Table 5.24: Armington elasticities in selected Countries

Source	Armington Elasticity	Country
Alaouze et al. (1977)	2	Australia
Vincent (1986)	2	Chile
Vincent (1986)	0.5 to 5.0	Colombia
Vincent (1986)	2	Ivory Coast
Vincent (1986)	0.5 to 5.0	Kenya
Vincent (1986)	0.5 to 5.0	India
Vincent (1986)	0.20 to 2.0	Turkey
Vincent (1986)	Less than 2	South Korea
Kapuscinski and Warr (1992)	2.0	Philippines
Comber (1995)	1.64 to 3.5	New Zealand
Kapuscinski and Warr (1999)	0.04 to 3.8	Philippines
Source: (Somaratne, 1998).		

Petroleum has been modeled by a significant number of modelers using different model specification and covering different regions or countries. A selection of a few of the elasticities of petroleum of these authors is presented in Table 5.25.

Table 5.25: Petroleum Armington elasticities from selected literature

				Elasticity	
Authors	Sample Type	Economic Geography	Commodity	Domestic-Import	Import-Import
Reinert et al. (1992)	Time series	No	Crude oil and Nat. Gas	0.3	
Gallaway et al. (2003)	Time series	No	Petroleum Products	0.85	
Hillberry et al. (2005)	Cross-section	Yes	Crude oil		15
Welsch (2006)	Time series	No	Fuel and Power Products	0.11	
Hertel et al. (2007)	Cross-section	Yes	Crude oil		10.4
N′emeth et al. (2008)	Panel	No	Coal, Crude Oil and Natural Gas	0.85	2
Welsch (2008)	Time series	No	Fuel and Power Products	0.01	
Source: Balistreri et al. (2010)					

Dorosh et al. (2003), in their study of Uganda's trade policy have detailed trade elasticities of all major sectors of the economy. In this study, we adopted them in the analysis. They are presented in Table 5.26.

Table 5.26: Trade elasticities for Uganda

	CET Elasticity	Armington
C-AGR	3.0	3.0
C-PETR	2.5	1.5
C-MAN	2.5	1.5
C-IND	2.5	1.5
C-EDU	2.5	1.5
C-HEAL	2.5	1.5
C-SER	2.5	1.5
Source: (Dorosh et al., 2003)		

Finally, Appendix C, Table C presents the aggregated SAM 2007 in billions of Uganda shillings. In all, it has seven productive activities/ commodities, 3 factors, 4 agents, 4 taxes and transaction costs and an accumulation account.

5.8 Summary

In this chapter, we explained SAM in particular its meaning, its construction and importance in general. We went on to elaborate the framework for analyzing the macro-economy in the Social Accounting Matrix context. The micro and macro structure of Uganda SAM 2007. We aggregated most accounts in SAM to suit our analysis and thereafter, a preliminary analysis was performed to aid in understanding the economy and to discuss the results. In terms of total output, the service sector is in the lead followed by agriculture, industry, agriculture and oil is the second lowest. The data shows that the country is only self-sufficient in service. Just like in output, the service sector is too leading in exports but there are no exports of education and health. It is worth noting that oil has less than 10% share in total export. In terms of taxes and other costs, industry pays the highest sales tax rate, oil the highest import tariff rates and services the highest transaction cost. The bulk of the value added is in industry and the lowest is in petroleum sector. Regarding share of factors in value addition, agriculture sector uses all self-employed labour, service and agriculture most of the unskilled while service, education and petroleum use most of the skilled labour. Land is used solely by agriculture while capital is distributed between service, industry, and petroleum. Much of the domestic absorption is directed in the service sector. Intermediate and household consumption are highest in industry, while government consumption is focused in service and its subsectors. The bulk of the investment absorption is in the service and industry. From all the analysis, we see that the petroleum sector is very small compared to all other sectors. This is likely to affect its impact in the analysis. In addition to the analysis, we presented trade elasticities from a number of studies including the one we adopted for this study.

Chapter 6

The Computable General Equilibrium Model

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The data from the preceding chapter will be used in the model equations to be derived in this chapter. The major themes in this chapter include an overview of CGE model impacts, description of the mathematical equations, and closure rules.

6.1 Modeling Oil impacts

Studies have established that economic theory is abstract and avoids detailed analysis of the economic policies (Harrison et al., 2010). Further, it has been noted that theory is inadequate in explaining the distributional effects across sectors and households (Winters et al., 2004). The increasing abundance of oil and other natural resources in developing countries have prompted research on the distributional effects of such resources on the different sectors and households. Researchers on oil impacts have used different models including the Computable General Equilibrium (hereafter CGE). Unlike econometrics, input-output, and partial equilibrium, CGE models are gaining prominence in the analysis of economy-wide impacts because of their ability to explicitly model resource abundance, optimal allocation and interaction among economic agents. In particular, these models have been recognized as a useful tool in analyzing natural resource impacts on poverty and inequality (Savard, 2003). They are supported by equations and detailed database, which are put together and solved using a variety of modern computer software including GAMS, GEMPACK, MATLAB and APML (Bandara, 1991). In general, CGE models tends to be neo-classical in character, recurrently assuming producer cost-minimization, average-cost pricing and household demands supported by optimization (Adam, 1998). Conversely, a reasonable amount of these models obeys the rules merely loosely to the theoretical general equilibrium paradigm. For example, they may consent to unemployment or imperfect competition such as monopoly pricing; demands not influenced by prices (government demands), a range of taxes and externalities (Blake, 1998). They are majorly simulation-based approaches to policy analysis, built and calibrated to data to simulate adjustments (Clarete & Roumasset, 1986). The results of the simulations are subsequently set as levels or changes in quantities and relative prices. This numerical nature of simulations implies that results can only be obtained for specific policy changes, no general proofs of results can be obtained and the models depends entirely on the credibility of parameters selected (Clarete & Roumasset, 1986). Following Taylor (1983) and Taylor (1990), we adopt a structuralist CGE-model to account for role of the entire economy in determining output, income and employment and thus household poverty, inequality and welfare. Finally, we utilize a comparative static CGE model. Thus, there is no intertemporal decision making involved We do this because we simply want to understand how the economy will react to the discovery which in turn will have repercussions to the economic agents such as households. Small country assumption ensures that Uganda is a price taker on the world market that is, its import and export decisions do not affect world prices.

6.2 Rationale of Modeling Oil Discovery Impacts in CGE Models

There are a number of models used in analyzing economic impacts including: input-out, econometric and the computable general equilibrium (Crompton, 1995; Leontief, 1936;

Miller & Blair, 2009). Input-out models depend on inter-industry data to determine inter-industrial effects (Leontief, 1987). They estimate the share of each industry's purchases supplied by local firms and use such data to calculate multipliers used to estimate the economic impacts (Leontief, 1986). Other impacts simulation techniques are econometric and general equilibrium (Boulanger & Bréchet, 2005; Tesfatsion & Judd, 2006). They extend Input-out model by incorporating forecasts caused by future economic and demographic changes. The CGE models belongs to the simulation based techniques (Tesfatsion & Judd, 2006). The CGE class of models are superior to others in terms of precision and methodological considerations. It is partly due to this superiority the current study adopts CGE modeling. We further justify the use of CGE model in our analysis following Rose (2005). His justification of CGE in modeling terrorism suits oil discovery.

6.2.1 Justifications of CGE over other Models

CGE models have a number of features than makes them more superior to others in impact analysis. A discussion of some of the advantages of CGEs is as under:

1. Target Specification

In the analysis which is usually performed in GAMS, CGE models have the advantage over other models of targeting a specific unit like individual activities and economic agents which can easily be decomposed into sectors and socio-economic classes. Input–Output and other complex disaggregated econometric models are not specified below the sector decompositions (Rose, 1995; Rose & Casler, 1996). As other multi-sector models can pinpoint individual agents, French (1998), argues that their separate identities are easily maintained in CGE models. Thus, to examine the impacts of oil on households, a model such as CGE that handle households in a disaggregated format is required.

2. Firm Behavior

Another feature of CGE models that give them a distinct advantage over others is their ability to model normal behavior as well as the broader category (bounded rationality), such as non-maximizing objectives, booms, shocks, panics and more random reactions (Doroodian & Boyd, 2003). Input–Output models lack in the least behavioral content while the behavioral content of econometric models is typically limited to optimization (Rotemberg & Woodford, 1997). Given the bounded rationality in the global oil industry including price shocks, OPEC cartelization and other factors in the international oil market, the analysis of oil discovery impacts warrants use of CGE class of models.

3. Market Behavior

In CGE models, prices provide signals to allocate resources. Prices are absent in Input–Output models, and their role is more indirect in econometric models. Economic theory contends that the behavior of the markets, is highly determined by price issues which are ideal in understanding the resilience of the different agents including households in an economy (Nicholson & Snyder, 2011). The international oil market, is characterized by volatility in oil prices whose impacts on households can easily be evaluated in CGE-based models.

4. Stock and Flow losses

The CGE models can estimate the effects in terms of sudden external and internal shocks. Most Input–Output models lack the matrix of capital coefficients necessary to evaluate such effects. CGE models are superior to econometric models in analyzing the alternative pattern of decisions that can be adopted to manage such sudden shocks (Rose, 2005). The political economy of oil-rich countries is such that they are vulnerable to sudden shocks such as overthrowing regimes by internal or external forces as happened in 1979 in Iran, Kuwait in 1990, Iraq in 2003, and embargo on oil export such as Iraq after the 1990 Gulf war, and currently the case in Iran. Such and other incidences that can affect oil export and thus revenue can easily be handled in a CGE framework.

5. Non-market Considerations

Oil-rich economies are often characterized with non-market factors including rampant corruption, personalization of oil wealth by ruling elites and other mismanagement of oil revenues. Recent advances in CGE analysis have extended its capability to include non-market considerations (Oladosu, 2000). Non-market impacts have been incorporated into Input–Output models extensively, but not in relation to any surrogate markets that might influence changes in their value if there are damages, such as oil spillover or changes in economic conditions, for instance, the discovery of alternative technology that enable vehicles use other forms of energy (Duchin & Lange, 1994). Non-market values have been much less frequently incorporated into macro-econometric models (McFadden, 1980).

6. Economic resilience to natural resource curse

The ability to integrate individual business and market resilience is essential in estimating the negative consequences such as resource curse. Non-linearity and the ability to substitute inputs are major aspects of resilience that are inherent in CGE models but nearly impossible to incorporate in Input–Output models. They are also to some extent difficult to slot econometric ones, although, econometric models are more superior to CGE in modeling the role of inventories (Rose, 2005).

7. Recovery Processes

The duration of shocks in the oil sector take some time, and has a dynamic adjustment process that is ideally modeled (Hamilton, 2013). The CGE models have the ability to extend to a dynamic form, including incorporation of changing conditions and adaptations, to trace the entire time path of adjustment (Dewatripont & Michel, 1987). This is more difficult with Input–Output models (Miller & Blair, 2009). Though it is a somewhat standard feature of econometric models to trace a time path, it is relatively more difficult to incorporate changing conditions (Enders, 2008; Sterman, 1991).

8. Economic Disequilibria

A shock to the system from oil disruptions causes an economy to be out of sync, and its return to equilibrium takes some time (Hamilton, 2011). The CGE models have the ability to take into account the various disequilibria caused to an economy by a shock from oil with respect to factor markets, economic agents, investment-savings and other socio-economic variables (Bandara, 1991). Input–Output models by their very nature hardly accommodate disequilibria, and similarly, econometric models (Giaschini, 1988; Pemberton, 1986).

9. Macroeconomic Repercussions

Rose (2005), listed three general macroeconomic consequences of a disaster like those peculiar to the oil industry that includes basic multiplier effects, general equilibrium impacts, and the broader, less tangible macro effects, such as synergies. Input–Output models include only basic multiplier processes in the analysis (Miller et al., 2009), while CGE and econometric models is capable of including a broader range of general equilibrium effects and some synergies. Thus, to evaluate the general equilibrium and synergies of oil, CGE models are more appropriate than econometrics because the latter are superior to the former in handling interest rates and financial markets matters than natural resources like oil (Okuyama, 2007).

10. Distribution of impacts across socio-economic groups

The distributional impacts of resources like oil are often uneven across the different social groupings, this is to say, households. The three impact models: input-output, econometrics and CGE have the ability to address such impacts; however, CGE and econometric models have the advantage of incorporating the differences in behavior across socio-economic groups (Rose, 2005).

11. Spatial diffusion of the economic impacts

Major shock in an oil-rich economy has the ability of spreading beyond the local economy, with feedback effects in the target region. In terms of inter-regional applications, input–output and econometric models are more advanced than CGE models (Norman, 1990) The easy applicability of input-output and econometric models for the analysis of inter-regional economic impacts has much to do with modeling experience than any inherent inability of CGE models. The CGE are less applicable on the inter-regional analysis because of their complexity that makes it relatively much more difficult conceptually to design and to obtain the data for such analysis (Rose, 2005).

12. Mitigation

Oil shocks has far reaching positive and negative impacts on an economy. The negative impacts require mitigation activities, which are much easier to incorporate into CGE and Input–Output models than econometric models. Econometric models are typically based on time series data, which limits its ability to incorporate new technology or structural changes. On the other hand, CGE and Input–Output models are not estimated as simultaneous equations systems like econometric models, thus, modifications for structural, as well as behavioral changes in them are easier to incorporate.

13. Operational (and in real time)

This is important in facilitating an emergency response. Input–Output models are the easiest to use, in part because of their simplicity. Econometric models have become easier to use, in part because of the development of off-the-shelf versions (Rose, 2005). Admittedly CGE models are more difficult to utilize than the other two modeling approaches, though this may in part be due to their more recent development, more complex software and lack of ‘canned’ versions.

14. Data Availability

One of the main disadvantages of econometric models is that they tend to extrapolate the past, and an oil boom through discovery is intended to bring about major changes in the future. Input–Output and CGE models can more readily accommodate engineering data that can reflect changes. From the standpoint of estimation, it is also easier to incorporate changes of data into Input–Output and CGE models than econometric models because of the simultaneous equation estimation of the latter.

15. Cost

Input–Output models are very inexpensive (Wiedmann, 2009), though the cost of developing a formidable Input–Output model with several important capabilities can lead to significant expense as well. Econometric models are generally expensive; though off-the-shelf versions have reduced the cost significantly. The CGE models are possibly costlier, but this is not necessarily due to inherent disadvantage vis-à-vis econometric models, but rather fewer years of experience with the former.

16. Transparency

Finally, it is important that the model need not to be a black box, so as to instill more confidence in the user, to be able to trace causation, and to facilitate checking the results. The CGE and econometric models are much less transparent than Input–Output models, though recent advances in 'decomposition' analysis have closed this gap somewhat (Norman, 1990). Although this summary has emphasized the superiority of CGE to its two major competitors, both of them deserve credit for facilitating the construction and enhancing the abilities of CGE models (Bergman, 2005). Nearly all CGE models have at their core the production of intermediate goods, the data for which almost always come from input–output tables, as do basic data on primary factors of production, and on government revenues and expenditures. Broader account balances relating to savings and investment, as well as imports and exports, are usually obtained from social accounting matrices. Econometric specification of CGE model parameters is considered to yield more accurate estimates than the standard practice of data transfer and calibration. Also, both Input–Output and CGE models by themselves have no forecasting ability, so conjoining them with econometric models is desirable for long-run analyses. Finally, the relatively lower complexity of Input–Output models makes it easier to conjoin them with other types of models in an integrated system (Rose, 1995).

6.2.2 Shortcomings of CGE models in oil impact analysis

The CGE models have a number of shortcomings compared to other approaches, an elaboration of a few of them is as follows:

1. Data

The complication of data requirements necessitates rigorous data assembly and exploitation thus lacking time series henceforth relying on single year data. This in a way renders empirical testing of functional forms impossible, casting doubt on the accuracy of CGE results.

2. Macroeconomic Closures

They are very weak in the area of macroeconomic closure: generally, all markets are assumed to clear, an assumption which is imposed on the benchmark data set. Monetary sectors are at best primitive, and most CGE models do not try to determine the price level. Rules applied to unemployment and savings are too simplistic; typically, unemployment is assumed to be constant, while savings tend to be purely supply-determined; that is, the level of savings is assumed to be determined by how much households want to save disregarding how much investors want to invest.

3. Treatment of Expectations

The treatment of expectations weakens CGE models. Typically, expectations are implicitly assumed in CGE models rendering prices to remain constant. A few CGE models try to overcome this weakness by incorporating rational expectations, but this multi-dimensional extension of the model size is in the main prohibitive in terms of modelling effort, time and data requirements.

4. Lack of Time Series

The lack of time series input-output data presents two challenges. Firstly, functional forms for production functions and consumer preference functions must simply be assumed, without any alternative choice on objective criteria. Secondly, the assumed functions are just calculated deterministically by calibration rather than being estimated econometrically, henceforth missing out on vital statistical measures particularly t-ratios and confidence intervals. Nevertheless, the frequently used functional forms notably Cobb-Douglas, Constant Elasticity of Substitution, the Leontief function, and the Constant Elasticity of Transformation functions are typically those which are well established in economic analyses. The results obtained are the central values in the implicit distribution of expected values, but no confidence interval can be given, making it difficult to determine the accuracy of the results. Since CGE models are based on single period observation, the implicit confidence interval is large, thus requiring a cautious treatment of results. The reliability of the CGE model is tested using sensitivity analysis via examining the effects of changes in 'crucial' parameters particularly elasticity values. If such tests point toward the model being convincingly robust, the result is considered quite reliable, although the value of the results gives the impression qualitative more than quantitative.

6.3 Model Mathematical Derivations

In the model, (A) and (C) stands for productive activities and goods which includes; agriculture (AGR), petroleum (PETR), industries (IND), education (EDU), health (HEAL) and services (SER). There are a number of households (h) forms and types. We have household endowment including; labour (HW), capital (HC) and land (HLN). Five labour types are included in the model: rural farm (HHD-R-F), rural nonfarm (HHD-R-NF), Kampala nonfarm (HHD-K-NF), urban farm (HHD-U-F) and urban nonfarm (HHD-U-NF). The model has a number of parameters including production functions, constant elasticity of substitution functions, constant elasticity of transformation functions, tax rates and other parameters. There are two sets of variables in this model; endogenous and exogenous. The subscript c represents commodities which are traded in the economy. The model is formulated and solved using the General Algebraic Modeling System (GAMS). In the current study, we follow the CGE model developed by Lofgren et al. (2002). This model is implemented as follows below:

6.3.1 Price Block

Typically, CGE models assume that economies are initially in equilibrium with the quantities normalized in such a way that the prices are equal to unity. We too adopt this assumption. Thus, due to the homogeneity of degree zero in prices, models can only determine relative prices. In our model, exchange rate, activity price, domestic price, domestic price of export, domestic price of imports and producer price, have been selected to provide the numeraire against which all the prices will be measured. In the model, we assume each activity produces one commodity. Endogenous, exogenous and non-prices are linked in this block as described below:

1. Import Price

The price on imports (PM_C) is determined by the tariff rate ($1 + tm_C$), world price of imports (PWM_C) and exchange rate EXR:

$$PM_C = (1 + tm_C) * PWM_C * EXR \qquad 6.1$$

Here, world price of imports is converted into local import price using exchange and import tariff rates. Thus, consumers pay composite price. Exchange rate and local import prices are assumed to be flexible, while tariffs and world import price are fixed. The fixedness is due to the smallness of Ugandan economy whose imports are too small rendering its trade share to be insignificant, hence facing an infinitely elastic supply curve at the prevalent world prices.

2. Export Price

The export price (PE_C) echoes the price received by the domestic producers for selling their output in the international market, where ($1 - te_C$) is the export tax rate and (PWE_C) is the world export price.

$$PE_C = (1 + te_C) * PWE_C * EXR \qquad 6.2$$

This price is inversely affected by export taxes and trade inputs.

3. Composite Commodity Price

Composite commodity is the summation of domestically produced and imported outputs. Thus, the price on composite commodity (PQ_C) on the domestic market is determined by the summation of the total monetary values of domestic produce$(PD_C * QD_C)$ and imports $(PM_C * QM_C)$, subject to the given sales tax rate $(1 + tq_C)$.

$$PQ_C = (PD_C * QD_C + PM_C * QM_C) * (1 + tq_C) \quad 6.3$$

Where,

(PD_C) = domestic price of domestic output,

(QD_C) = domestic sales quantity,

(PM_C) = domestic price of imported goods,

(QM_C) = quantity of imported commodity

It is thus the summation of the value of domestic and imports at a given sales rate.

4. Market Price

Among the composite, we can deduct non-imported commodity. The final market price of such commodity is obtained by multiplying composite price (PQ_C) with domestic composite supply (QQ_C) on the left hand and on the right hand multiplying domestic price of domestic output (PD_C) ,domestic sales (QD_C) as well as sales tax rate $(1 - tq_C)$.

$$PQ_C QQ_C = PD_C QD_C (1 + tq_C) \quad 6.4$$

5. Producer Price

The market producer price of domestic commodities (PX_C) is determined by adding the domestic supply price and cost of trade inputs per unit of various domestic sales

$$\mathrm{PX}_C \,.\, QX_c = PD_C \,.\, QD_c + \; PE_c \,.\, QE_c \quad 6.5$$

Where,

(QX_C) = aggregate marketed quantity of domestic output,

(PD_C) = domestic price of domestic output,

(QD_C) = domestic sales quantity,

(PE_C) = quantity of exports,

(QE_C) = quantity of exports.

Hither, marketed output values at producer price for every domestically produced goods is expressed as a sum of the values of domestic sales and exports. Domestic sales and exports are valued at the prices received by the suppliers, (PE_C) and (PD_C). These two prices are adjusted downwards to account for the cost of trade inputs.

6. Domestic demand Price

The price of commodities demanded by consumers in the domestic market (PX_C), is obtained by summing up supply price and cost of trade inputs. The final supply price (PS_C) for the non-exported commodity is computed by intermingling producer and export prices;

$$PX_C QX_C = PD_C QD_C + PE_c QE_c \qquad 6.6$$

Where,

(PD_C)= domestic price of domestic output

(PE_C)= domestic price of exported commodities

(QD_C)= domestic sales quantity

(QE_C)= exported commodity quantity

7. Activity Price

Revenue in gross terms per activity (PA_A) is computed as

$$\mathrm{PA_A} = \sum_{c \epsilon C} PX_{A,C} \; .\theta_{A,C} \qquad 6.7$$

($PX_{A,C}$) = producer price of commodity C for activity A,

¯(A, C) = yield of output C per unit of activity A.

This price reflects the return of selling the output or outputs of the activity. It is defined as yields per activity unit multiplied by activity-specific commodity prices. It is imperative in the model to allow for the activities that produce multiple commodities.

8. Aggregate Intermediate input price

This price (PVA_A) represents the value-added, that is, the income of factors per unit of activity; expressed as:

$$\mathrm{PVA_A} = \sum_{c \epsilon C} PQ_C \; .ir_{C,A} \qquad (6.8)$$

Where,

($ir_{C,A}$) = quantity of c per unit of aggregate intermediate input A.

It expresses the cost of disaggregated intermediate inputs per unit of aggregate intermediate input. It depends on composite commodity prices and intermediate input coefficients, which depict the quantity of input commodity c per unit of aggregate intermediate input.

6.3.2 Trade and Production Block

Our model assumes production activities to maximize profits subject to available technology and given prices. Hence, production is assumed to be perfectly competitive. We have seven activities engaged in production using primary and intermediate factors. They finance their production through sales of commodities from production. There are three factors involved in production, that is, labour, capital and land. Income earnings and distribution depends the flow of the value added from activities to factors. Therefore, ownership of factors, the skills and residence of households are important determinant of the income they earn.

The model uses the Cobb Douglas function to capture the pattern of production at different level. Subject to constant returns to scale, we assume the producers to maximize their profit, hence, factors of production receive income, where marginal cost equals marginal revenue. Leontief technology is used to combine factors with fixed share intermediates.

1. Activity Output

The output from activities (QA_A) with given primary factor inputs is described using Cobb-Douglas function as

$$QA_A = ad_A \prod_f QF_{f,A}^{\alpha f,A} \qquad 6.9$$

Where,

$QF_{f,A}^{\alpha f,A}$ = Quantity demanded of factor *f* from activity A

ad_A= Activity parameter of production function

$\alpha f, A$= Value added share for factor *f* in activity A

2. Demand for Factors by Activities

Factor demand is described as

$$FPD_{F,A} * PF_F = \alpha_{F,A} * PVA_A * QA_A \tag{6.10}$$

3. Demand for Intermediate Inputs

Intermediate inputs used in the activities as expressed as

$$QINT_{C,A} = ir_{C,A} * QA_A \tag{6.11}$$

Where, $ir_{C,A}$is quantity of *c* as intermediate input per unit of activity a. It should be noted that not all activities require intermediate inputs from the seven commodities in the model.

4. Domestic Commodities with output

These commodities in the model are described as

$$\mathrm{OUTPUT(C)\$CX(C)..}$$

$$QX_C = \sum_{a \in A} \theta_{a,C} \, QA_a \tag{6.12}$$

$\theta_{a,C}$= yield of output *c* per unit of activity *a*

5. Domestic Commodity with Export

Exports of domestic output takes the following form;

$$\mathrm{CET(C)\$\big(CE(C)AND\ CD(C)\big)\ ..}$$

$$QX_C = QD_C\left(\frac{PE_C}{PD_C}.\frac{1-\delta_C^t}{\delta_C^t}\right)^{\frac{1}{\rho_C^t-1}} \quad 6.13$$

Where, δ_C^t is the CET function share parameter, ρ_C^t is the CET function exponent and hence, $\left(\frac{PE_C}{PD_C}.\frac{1-\delta_C^t}{\delta_C^t}\right)^{\frac{1}{\rho_C^t-1}}$ is the export-domestic price ratio.

The equation implies higher domestic supplies consequently leads to higher exports.

6. Non-exportable Commodities

Non exportable products in our SAM includes education, health and services which are defined as

$$\text{CET2(C)\$}\Big(\big(\text{CD(C)AND CEN(C)}\big)\text{OR}\ \big(\text{CE(C)AND CDN(C)}\big)\Big)\ ..$$

$$QX_C = QD_C + QE_C \quad 6.14$$

This equation represents the domestically produced commodities that do not have both exports and domestic sales. The equation allocates the entire output volume to one of these two destinations.

7. Composite Supply

The total of domestic and foreign supplies of products(QQ_C) is stated as

$$\text{Armington(C)\$(CM(C) and CD(C))..}$$

$$QQ_C = aq_C[(1-\delta q_C)QD_C^{\rho q_C} + \delta q_C QE_C^{\rho q_C}]^{-1/\rho q_C} \quad 6.15$$

Where,

(aq_C) = an Armington function shift parameter,

(δq_C) = an Armington function share parameter, and

(ρq_C)= an Armington function exponent.

We assume the substitutability of imports and domestic output to be imperfect; captured by a Constant Elasticity of Substitution (CES) function. An Armington function is used because the domain of the CES function is limited to commodities that are both imported and produced domestically. The elasticity of substitution between commodities from these two sources is a transformation for which the lower limit is minus one.

8. Composite Supply for non-exportable Commodities

Armington2(C)$((CD(C) and CMN(C)) OR (CM(C) and CDN(C)))..

$$QQ_C = QD_C + QM_C \tag{6.16}$$

9. Import-Domestic Demand Ratio

This is expressed as

$$QM_C/QD_C = \ [(\delta q_C/1 - \delta q_C)(PD_C/PM_C)]^{\sigma q_C} \tag{6.17}$$

Where, (σq_C)=($1/(1 + \rho q_C$)>0

In this equation (6.17), the optimal mix between imports and domestic output is defined. Its domain is thus limited to imports with domestic production. It assures that an increase in the domestic-import price ratio generates an increase in the import-domestic demand ratio (this is to say, a shift away from the source that becomes more expensive).

10. Export Supply

$$\frac{QE_C}{QD_C} = \left(\frac{1-\delta_C}{\delta_C} . \frac{PE_C}{PD_C}\right)^{1/1+\rho q_C} \tag{6.18a}$$

δ_C= $(1/(1 + \rho q_C)$>0

The value of $\rho_C$varies between infinity to one. Thus, as ρ_C approaches one, elasticity of the ration QE-QD with respect to changes in the ratio PE-PD increases.

To fulfill the last objective of our study – impact of oil export, we re-arrange equation 6.18a to come up the volume of exports in equation 6.18b

$$QE_C = QD_C[(1 - \delta_C/\delta_C)(PE_C/PD_C)]^{1/1+\rho q_C} \qquad 6.18b$$

Equation (6.18b), we assume that an increase in the export, generates an increase in the export supply. This is to say, a shift towards the destination that offer higher returns.

6.3.3 Agent Block

Agents earn income from factors of production by virtue of participating in the value-addition. In the model, there are five household types. With regards to earning from labour, all the five households earn by providing skilled and unskilled, while two earn from skilled one. Only two types of household derive their income from capital and land.

1. Factor Income

The income of factor f from production ($YF_{i,f}$) is described as

$$YF_{i,} = shry_{i,f} \sum_{a \epsilon A} FPD_{f,a}\, PF_f QF_{f,a} \qquad 6.19$$

Where,

$shry_{i,f}$ = share for institutions i in income of factor f

$FPD_{f,a}$ = factor price distortion for factor f in activity a

PF_f = rate of return to factor f

$QF_{f,a}$ = quantity demanded of factor f from activity a

2. Household Incomes

Surprisingly in SAM 2007, a large share of income comes from capital (71.8%) and only a small share (28.2%). Capital income also comprises of mixed income accruing from land and other capital sources. Income from land is only taken by household rural farm. According to SAM 2007, the income distribution is highly uneven. The income of household from factors **(**YF_h) is determined by the summation of household income from factors **(**$YF_{h,f}$), transfer from government **(**$TR_{h,g}$), transfer from enterprise **(**$TR_{h,ent}$) and transfer from rest of the world **(EXR.**$TR_{h,r}$):

$$YF_h = \sum_{f \in F} YF_{h,f} + TR_{h,g}CPI + TR_{h,ent} + EXR.TR_{h,r} \qquad 6.20$$

Where, CPI = consumer price index and EXR= exchange rate.

3. Household Total Savings

Income earned is spent on the different commodity consumed by household and taxes. Thus, to obtain household total savings (HTS), we subject household income to (YH_h) to both household marginal-propensity to save (MPS_h) and household income tax rate (ty_h):

$$HTS = \sum_h MPS_h\,(1 - ty_h)YH_h \text{ 6.21}$$

HTS includes savings from all incomes irrespective from domestic or foreign sources.

4. Household Domestic Savings

The savings of household domestically (HDS) excluded income earned from rest of the world ($TR_{h,r}$), as presented

$$HDS = HTS - EXR.TR_{h,r} \qquad 6.22$$

$TR_{h,r}$ is subjected to EXR to convert it into local currency.

5. Marginal Propensity to Save

The marginal propensity to save of any household is described as

$$MPS_h = MPSIN_h(1 + MPSADJ.mpsDUM_h) \qquad 6.23$$

Where,

$(MPSN_h)$ = initial marginal propensity to save

MPSADJ = adjusted marginal propensity to save factor

$MPSDUM_h$= 0-1 dummy: 1= for those H whose saving changes, 0 otherwise

6. Marketed Commodity Consumed by Household

The amount of commodity consumed $(QH_{C,h})$ is calculated as

$$QH_{C,h} = \frac{\beta_{c,h} EH_h}{PQ_C} \qquad 6.24$$

Where,

$(\beta_{c,h})$= marginal share of household consumption expenditure on marketed commodity.

EH_h= household expenditure on consumption

7. Household Utility Function

The optimal allocation between consumption commodities (C) is given by the maximization of the Cobb-Douglas Utility function:

$$UH_h = \prod_C (\frac{QH_{C,h}}{\beta_{c,h}})^{\beta_{c,h}} \qquad 6.25$$

Where, (QH_h)= household quantity consumption, $(\beta_{c,h})$ is the household income elasticity of the demand for commodity c.

The essence of this utility function is in the subsistence consumption level, which a household has to obtain before any other consumption. All remaining income is spent on consumption above that level, according to budget shares. We are not using the Stone-Gearly utility function because we assume the subsistence level in the model to be. The magnitude of the subsistence level can also determine to what extent consumption of a particular good is demand or supply side driven. Larger (smaller) shares make demand less (more) responsive to variations in prices or income. This property will be useful when we consider scenarios involving several households broken down by income levels

8. Household Expenditure

The total expenditure of household is stated as

$$EH_h = (1 - MPS_h)(1 - ty_h)YH_h \qquad 6.26$$

Where, (ty_h) = the household income tax rate.

9. Household Consumer Price Index

The equation describing this index is as

$$CPIH_h = \prod_C PQ_C^{\beta_{c,h}} \quad 6.27$$

Where, $(CPIH_h)$= consumer price index of household

10. Consumer Price Index for the Price Normalization

This index is stated as

$$\sum_h \mu_h \, CPIH_h = CPI \quad 6.28$$

Where, (μ_h)= share of household in CPI.

11. Weight of Household Utility

This variable is expressed as

$$\mu_h = UH_h / \sum HAL, UH_{HAL} \quad 6.29$$

12. Commodity Investment Demand

This quantity of investment $(QINV_C)$ is obtained by multiplying base year investment demand by an exogenous investment adjustment factor.

$$QINV_C = INV_C * IADJ \quad 6.30$$

Where,

(INV_C)= base-year quantity of fixed investment demand.

IADJ= investment adjustment factor,

13. Government Savings

Government savings (GBS) is the difference between government revenue (GR) and expenditure (GE), presented as

GBS=GR-GE 6.31

14. Government Revenue

Government revenue (GR) is obtained by summing up income taxes from households and transfers from rest of the world plus enterprises. It is calculated as

$$GR = \sum_{h \in H} ty_h * YH_h + EXR * TR_{h,r} + \sum_{C \in CM} tq_C * PD_C\, QD_C + PM_C QM_C$$
$$+ \sum_{A \in CD} t_a * PA_A QA_A + \sum_{C \in CM} tm_C\, EXR * PWM_C QM_C$$
$$+ \sum_f YF_{g,ent} \qquad 6.32a$$

Where, $\sum_{h \in H} ty_h * YH_h + EXR * TR_{h,r}$. This represents total government income from households. Here, household income tax (ty_h) is subjected to all incomes of households – this is, the total income from productive activities in the economy (YH_h) plus any transfer to households from rest of the world $(EXR * TR_{h,r})$ such as remittances from relatives from abroad. $\sum_{C \in CM} tq_C * PD_C\, QD_C + PM_C QM_C$, represents total income from domestic sales of composite goods. Here, the monetary value of domestically produced goods $(PD_C QD_C)$ and imports $(PM_C QM_C)$ are subjected to domestic sales tax rate (tq_C).

$t_a * PA_A QA_A$, denotes government income from productive activities, where (t_a) is the production tax rate, (PA_A) is the average production price and (QA_A) is the total output produced. $\sum_{C \in CM} tm_C\, EXR * PWM_C QM_C$, this represents total government income from imports. Here, export tax in local current $(tm_C EXR)$ is subjected to the volume of imports $(PWM_C QM_C)$. And finally, $\sum_f YF_{g,ent}$, is the total government income from firm.

15. Government Expenditure

The expenditure of the government includes the total transfers to institutional agents such as household ($TR_{H,G}$)subject to consumer price index (CPI), enterprise ($TR_{ENT,G}$), rest of the world ($TR_{R,G}$) subject to exchange rate (EXR)and government final government consumption from both exportable ($\sum_{C \in CE} te_C * EXR * PWE_C * QE_C$) and imported ($\sum_{C \in C} PQ_C QG_C + EXR * TR_{R,G}$) commodities. It is computed as

$$GE = \sum_{h \in H} CPI * TR_{H,G} + TR_{ENT,G} + \sum_{C \in CE} te_C * EXR * PWE_C * QE_C + \sum_{C \in CM} PQ_C QG_C + EXR * TR_{R,G} \qquad 6.32$$

16. Enterprise Income

Enterprise earns its income (YFRM) from factors ($YF_{ent,f}$) and transfers from government ($TR_{ent,g}$)and rest of the world($TR_{ent,r}$) .

$$YFRM = \sum_f YF_{ent,f} + TR_{ent,g} + EXR * TR_{ent,r} \qquad 6.33$$

17. Enterprise Savings

The savings of enterprise (FRMS) is the difference between enterprise income and transfers to household and rest of the world as presented

$$FRMS = YFRM - \sum_h TR_{h,ent} - EXR * TR_{r,ent} \qquad 6.34$$

6.3.4 System Constraint Block

The different constraints in the model are presented in this section, beginning with the market for factors:

1. Factor Markets

The constraint imposed on this market is that the total quantity of factors supplied (QFS_f) must equal to the summation of factors used in activities (QF_{fa}) and the unused factors (QFU_f). In case there is no excess supply (unemployment) this term is equal to zero, $(QFS_f = 0)$. This is done in order to capture the labour market properties[25]. The equation is stated as

$$\sum_{a \epsilon A} QF_{fa} + QFU_f = QFS_f \qquad 6.35$$

2. Composite Commodity Markets

In this market, the constraint involves equating the quantity supplied with the quantity demanded. Thusly, mathematically presented as

$$QQ_c = \sum_{a \epsilon A} QINT_{ca} + \sum_{h \epsilon H} QH_{ch} + QG_c + QINV_c \qquad 6.36a$$

Where,

(QQ_c) = composite commodity supply

$QINT_{ca}$ = intermediate input commodity c used in activity a

QH_{ch} = commodity c consumed by households h

QG_c = government consumption of commodity c

$QINV_c$ = base year investment demand

[25] More detail is discussed in closure rules in section 6.4 at the end of this chapter.

For the purpose of simulating oil absorption, we introduce a dummy (QQ0DUM1) in equation 6.36a, hence rewriting the equation in 6.36b as

$$QQ_{C-PETR} + \mathrm{QQ0DUM1} = \sum_{a \in A} QINT_{C-PETR} + \sum_{h \in H} QH_{C-PETR} + QG_{C-PETR} + QINV_{C-PETR} \quad 6.36b$$

In which the oil dummy (QQ0DUM1), the base volume of oil is subjected to the shock which is introduced in the model and the volume obtained is added to the oil output.

3. Current Account Balance

The constraint related to this account is that there must be equality between foreign exchange earnings of the country and its spending

$$FS + \sum_{c \epsilon CE} PWE_c \,.\, QE_c + \sum_{f \epsilon F} TR_{i,r} = \sum_{c \epsilon CM} PWM_c \,.\, QM_c + \sum_{ent} TR_{r,i} \qquad 6.37$$

Where,

FS= foreign saving

$(PWE_c . QE_c)$ =Export revenue

$(TR_{i,r})$ =transfer payment from rest of the world to other institutions

$(PWM_c . QM_c)$ =Import Revenue

$(TR_{r,i})$ =transfer payments from institutions to rest of the world

4. Saving-Investment balance

Our model is savings driven which imply that aggregate investment equal total savings, which is the sum of individual savings components. This type of macroeconomic closure is known as “neoclassical closure (Taylor, 1979). Equation (6.38) depicts total savings in the economy as the sum of private savings (WALR) defined by the household savings (HDS), firm savings (FRMS), government savings (GBS) determined exogenously and foreign savings (FS) also determined exogenously less fixed investment ($\sum_C PQ_C QINV_C$):

$$WALR = HDS + FRMS + GBS + EXR * FS - \sum_C PQ_C QINV_C \qquad 6.38$$

Because our model is static, investments only play a nominal role, that is, firms' investments decisions do not affect the amount of capital available for use in production. Total fixed investment ($\sum_C PQ_C QINV_C$) is the summation of gross fixed investment and change in stock. Since investment is savings driven, all savings (HDS, FRMS, GBS and FS) are fixed, allowing investment to adjust to clear this account.

6.4 Model Closures

The CGE models are either under-determined or over-determined because the numbers of the differences between model variables and equations, thus, there is always need to fix some variables to bring a balance between the equations and variables. Thence, macro-closure is the process of fixing the variables and the variables that are fixed are referred to as exogenous. The variables to be selected to be exogenous is a contentious issue largely because the choice determines the model results.

6.4.1 Closure rules: A general discussion

Sen (1963), formulated four distinctive macro closures namely; neo-classical, Keynesian, neo-Keynesian and Johansen. All these closures arise from how market clears. There are four assumption regarding macro market clearance: first, full employment; second, independent investment function; third, independent consumption function; and fourth, Real wages = Marginal Productivity of Labour. Dropping of any of these assumptions gives a particularly closure or closure rule. Dropping first assumption yields into a Keynesian closure (rigidities); dropping second assumption leads to neo classical closure (saving-driven); dropping third assumption yields into Johansen closure (tax and government transfer to household are endogenous) and finally dropping fourth assumption, we get a Kaldorian (Neo-Keynesian) closure (income distribution between capital (K) and labour (L) are endogenous). Theoretically however, there is no general conclusion on which closure is the most suitable. Nonetheless, it is factual that the different closures yield different results even though the CGE model is same moreover with identical structure of equations. Selecting incorrect closures could therefore lead to misplaced conclusions—hence, advocating wrong policy recommendations. Nevertheless, empirical evidence on low developing countries (LDCs) studies show that a majority of models in those studies tend to utilize variants of Keynesian closures. The most famous models for LDCs particularly that of (Taylor, 1979), have stretched the closure rule debate to include what really constitutes the true Keynesian model and the interpretation of its results. The Keynesian closure assumes that there is always no full employment condition which leads to the deviation between investments and savings being mediated through changes in employment and output. For example, an increase in investments will lead to an increase in real output, which must be preceded by an increase in employment. Higher employment will generate increased incomes and hence savings. Thus, equilibrium is achieved through adjustments in unemployment, which can be an endogenous variable. The savings at full employment level could be different from investment, so that a variation in the level of employment could bring savings and investment into equilibrium. An increase in the aggregate output is always associated with a decline in real wages under this closure. As in the Keynesian closure, the labor market does not clear. The share of wages in output is fixed and there are constant returns to labor. Furthermore, it usually assumes a maximum productive capacity, above which the system switches to forced savings. Given the fact that the Taylor (1979) variant of Keynesian macro closure are suitable for modeling developing countries of which Uganda is part as evidenced in numerous studies (Taylor, 1979, 1983, 1990; Taylor & Lysy, 1979) and having a powerful distributional impact as suggested by Dervis and Robinson (1982), in this study we shall use it in our analysis.

We could not adopt Neoclassical, Johansen, and Neo-Keynesian closures given the fact that their assumptions and distinctive features are contrary to the structures of the economies of developing countries. For instance, neoclassical closure offers savings a prominent position and thus determines investments endogenously. This implies that any planned investments will simply adjust to the available savings for a full employment to be achieved in the economy. Equality between savings and investment can only be arrived at through a mechanism which is not explicitly incorporated in the system for instance-interest rate. Secondly, the Johansen closure assumes that savings and investments are not explicitly equated in the model. With full employment and exogenous investments, the system is closed by a mechanism outside the model. As such, it will require taxes and subsidies to correct the imbalances.

The neo-Keynesian closure assumes that the real wage equals the marginal product of labour. The endogeneity of investments means that savings must adjust to meet planned investments. This closure assumes that labour is not paid according to its marginal productivity and with full employment; income will be redistributed from wage earners to the high saving capitalists. The resulting increase in savings serves to attain investment-savings equilibrium.

6.4.2 Closure rules in this Study: Choice and behavior

Following Taylor (1979), we adopt the following macro-economic closures to clear the different markets (accounts) in the Uganda economy: In the current accounts market, we assume a zero balance of payment position. Thus, we fix foreign savings to enable a flexible exchange rate to clear this account. In our model, investment is saving driven. Thus, Marginal propensity is fixed enabling investment to adjust to clear investment-saving account. We assume capital to be fully mobile and employed. Hence, we fix the price of capital to enable factor price distortion to adjust to bring equilibrium in the capital market. Land is activity specific. It is used in our model in agriculture only. To clear the land market, we fix the land price distortion to enable, the price, demand and supply of land to adjust to clear the land market. Labor is fully employed and hence wages adjusts to stabilize the labor market.

6.5 Sensitivity analysis

The CGE models use the calibration technique in the estimation of parameters. Much as this technique permits the estimation of a single period data, it does not have the ability to accurately test how robust are the estimates of the parameter and consequently the results. To address this setback, Böhringer, Rutherford, and Wiegard (2004), suggest conducting sensitivity analysis. Sensitivity analysis are performed to check the robustness of the simulations with regard to the presumed values for some vital parameters and to offer confidential interval of the results. To test robustness, parameters that significantly affect the results notably constant elasticity of substitution and transformation are varied. In our case, we vary by either increasing or reducing 50%.

Judgement of robustness in the simulation is based on two criteria: first, whether the signs of the sectoral output changes are unchanged in all cases; and second, the ordering of the output changes among sectors is maintained in all cases. Conclusions are made regarding the robustness of the results by looking at the extent to which the criteria are satisfied. In case the two are satisfied, results are robust, otherwise, they are not robustness.

6.6 Poverty Measures

We use the Foster–Greer–Thorbecke (FGT) index to measure poverty, following (Haughton & Khandker, 2009). FGT indices (P_α), are described as

$$P_\alpha = \frac{1}{NZ^\alpha}\sum_{j=1}^{J}\left(Z - YH_j\right)^\alpha \qquad (6.39)$$

Where, N is the total population of households in the sample, j is the population of poor households, z is the poverty line, (YH_j) is the income of household j, and $\propto$ is the parameter that distinguishes between the different indices of FGT. When α is 0, the expression simplifies to J/N or the head count ratio, a measure of the incidences of poverty. Depth of poverty is measured by the poverty gap, obtained when α is equal to 1. The severity of poverty is measured by setting α equal to 2.

6.7 Inequality Measures

Due to data inadequacy, we examine only between household inequality. We employ the Generalized Entropy (GE) inequality measures, this is to say, the Hoover and Theil indices in the analysis, as described by Haughton et al. (2009). Theil T index ranges from 0 (lowest inequality) to "In(N)" (highest inequality). On the other hand, the Theil L index ranges from 0 to infinity and the higher the value of Theil L, the higher the inequality there is. Arithmetically, the indices are written as

$$TT = In\left(\frac{\sum_h N_h}{\sum_h YH_h}\right) - \frac{\sum_h YH_h In\left(\frac{\sum_h N_h}{\sum_h YH_h}\right)}{\sum_h YH_h} \qquad (6.40)$$

Where,

YH_h = Subgroup Income

$\sum_h YH_h$ = Total population Income

N_h = Subgroup Population

$\sum_h N_h$ =Total population

And Theil L can be written as

$$TL = In\left(\frac{\sum_h YH_h}{\sum_h N_h}\right) - \frac{\sum_h N_h In\left(\frac{\sum_h YH_h}{\sum_h N_h}\right)}{\sum_h N_h} \tag{6.41}$$

"Symmetrized" Theil index can be calculated as:

$$TS = \frac{1}{2}(TT - TL)$$

Putting values of TT and TL in the above equation

$$TS = \frac{1}{2}\sum_h In\left(\frac{YH_h}{N_h}\right)\left(\frac{YH_h}{\sum_h YH_h} - \frac{N_h}{\sum_h N_h}\right) \tag{6.42}$$

Hoover's Index can be written as

$$HI = \frac{1}{2}\sum_h \left|\frac{YH_h}{\sum_h YH_h} - \frac{N_h}{\sum_h N_h}\right| \tag{6.43}$$

6.8 Welfare Measures

We use the popular welfare measures formulated by Hicks (1939), that is, the Equivalent Variations (EV) and Compensating Variations (CV). EV, measures changes in wealth resulting from changes in prices when income remains constant. It assesses the winner-loser concern when an economic policy is carried out. It measures the extent to the value of money after price changes. Algebraically, described as

$$EV_h = \left(\frac{CPIH_h^o}{CPIH_h^1}\right) EH_h^1 - EH_h^o \tag{6.44}$$

Where,

$CPIH_h^o$ = Base year consumer price index of household (h)

$CPIH_h^1$ = Shocked consumer price index of household (h)

EH_h^o = Base year consumption expenditure of household (h)

EH_h^1 = Shocked consumption expenditure of household (h)

CV, on the other hand, measures changes in utility as a result of price changes. It denotes the additional money a household would require to reach the initial utility after a change either in prices, or quality of product, or the launching of new products or a discovery. It can be used to find the effect of a price change on household's net welfare. It reflects new prices and the old utility level. Mathematically, CV is stated as

$$CV_h = \frac{\left(EH_h^1 - CPIH_h^1\right)}{\left(CPIH_h^0\right)\left(EH_h^0\right)} \tag{6.45}$$

Further, we look at the economy wide Equivalent Variation which is arithmetically written as

$$TEV = 100\left(\frac{\sum_h EV_h}{\sum_h EH_h^0}\right) \tag{6.46}$$

The economy wide Compensation Variation is described mathematically as

$$TCV = 100\left(\frac{CV_h}{EH_h^0}\right) \tag{6.47}$$

6.9 Conclusion

We have noted that there are many models that are used in analyzing oil impacts of which includes CGE. Unlike other models, CGE is more suitable in the analysis of oil impacts given their ability to model resource abundance, optimal allocation and interactions among agents in the economy.

In addition to these, a number of justifications for the use of CGE rather than other models such as econometrics and input-out in the analysis of oil impacts were presented which included among others: the ability of CGE to specify targets, model firm behavior, market behavior, stock and flow, non-market consideration, distributional impacts of socio-economic groupings, cost considerations, and transparency. Some shortcomings were also presented notably data availability, macro closures, and the treatment of expectations. It should be noted however, that in the present analysis, we are going to mitigate some of these weaknesses by performing sensitivity analysis. The model equations were also derived based on Uganda SAM 2007. The equations represent among others: production, income and savings, demand, prices, international trade, and the different simulations to be performed. Further, equations to measure poverty, inequality and welfare of households are incorporated into the model. The choice of the closure rule to be adopted in this paper will be Keynesian, as described by Taylor et al. (1979). Taylor Macroeconomic-closure have been adopted owing to their ability to capture the realities of developing economies. Thus, any disequilibrium in the savings and investment in our model will be equated by prices.

Chapter 7

Simulation Results Presentation and Discussion

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7.1 An Overview

In accordance with our objectives, we perform simulations on the variables in Table 7.1. The three variables in this Table are true representation of the discovery. That is, natural resources once discovered have to be drilled from underneath, after, it is consumed either locally or abroad. In the Uganda Social Accounting Matrix 2007, the share of petroleum is very small. The authors did not put into consideration, the petroleum which was discovered in 2006 before the publication of Uganda SAM 2007. Two studies that have investigated the impacts of oil discovery in Uganda, that is, Wiebelt, Pauw, et al. (2011)and Robichaud, Maisonnave, and Tiberti (2014), have adjusted this figure using the input structure (technology vector) of Nigerian SAM 2006. The two studies made estimates and adjusted the original SAM. Thus, to be at per with other oil producing and exporting countries in Sub-Sahara Africa, we too hereby enhance oil production, absorption and export by 550% to have a liable effect for policy analysis. The figures obtained after the adjustment is on average same to the Nigerian SAM and most African economies with oil (Nwafor, Diao, & Alpuerto, 2010). Such a large figure is necessary given the shares of oil in GPD composition of different oil in different developing oil producing and exporting countries.

Table 7.1: Simulation scenarios

Simulation	Base Scenario	Share in SAM	Forecasted New Shares
SIM1	Production	3.83%	3.83% x550% = 21.1%
SIM2	Absorption	3.17%	3.17% x 550% = 17.4%
SIM3	Export	7.70%	7.70% x 550% = 42.4%

Simulation 1: (oil production): Oil has an estimated 3.83% share in total production of the economy (see Table 5.4). An increase of this share by 550% raises it about 21.1% of total production. This share is reasonable given the trend in poor oil developing countries whose GDP tends to be driven by natural resource output. Simulation 2: (Oil Absorption): It has approximately 3.17% share in total investment and consumption in SAM (Table 5.8). With a 550% increase, this share raises to 17.4%. Simulation 3: (Oil exports): In SAM, export of oil has a share of 7.7% in total exports, (Table 5.4) with 550% shock, it jumps to 42.35% of total export. This somehow represents the real picture in poor oil rich nations, where oil accounts for over 40% of total export. The results of these shocks are presented in Tables 7.2a through 7.9.

7.1.1 Impact on Sectors

From the review of previous studies in earlier chapters, natural resources have both positive and negative impacts on the different sectors of different economies. The results of this study too, mirrors the many previous work on oil impacts on economic sectors, as evidenced in Table 7.2a.

Simulation 1 (SIM1)

A shock in production of oil increases agriculture (Sh. 6,251,312.36 to Sh. 6,563,877.97), industry (Sh.83,990.33 to 86,510.04), education (Sh.1,757,549.92 to Sh.1,827,852.91) and health (Sh.487,934.20 to Sh.497,692.88). In neoclassical theories, this implies growth in oil output expanded the economy's production possibility frontier (Baumol, 1986).

Table 7.2A: Impact on Sectors (in billions of Uganda Shillings)

	Base	SIM1	SIM2	SIM3
A-AGR	6251312.36	6563877.97	6501365	6595135
A-PETR	23519.98	25636.78	25166.38	25754.38
A-MAN	6407939	6312635.2	6384476.4	6344674.9
A-IND	83990.33	86510.04	84830.23	86929.99
A-EDU	1757549.92	1827852.91	1792701	1836640
A-HEAL	487934.2	497692.9	492813.5	500132.5
A-SER	18668400	17120104	17746736	17213446

Service led sectoral growth since mid-1990s has been noted to have not been inclusive (Nuwagaba & Muhumuza, 2017). It was largely driven by telecommunication and trade; the sub-sectors employing a few people in the country. During this period, while poverty reduced drastically, inequality was observed to have increased. Oil stimulated sectoral growth in our study, seems to be pro-poor. It has reduced poverty as well as inequality (Tables 7.5 and 7.6). Further, it has fulfilled some of the basic definitions of pro-poor growth proposed by the different scholars. For instance, the general definition of pro-poor growth which defines growth as being pro-poor if declines in poverty benefits both poor and non-poor (Ravallion and Chen, 2003). Strict pro-poor growth which argues that growth benefits the poor more than the non-poor (MacCulloch and Baulch, 2000). It is equally well in line with the different measures of pro-poor growth. For example, poverty bias of growth; - which emphasizes the inequality reducing capability of growth (MacCulloch and Baulch, 2000); the pro-poor growth index – which emphasizes growth rates and changes in income distribution (Kakwani and Pernia, 2000) and the poverty equivalent growth rate- which emphasizes growth irrespective of distribution (Kakwani and Son, 2008)

The results generally have some connections with theory. For instance, they portray the theoretical formulations raised by Hirschman (1960) in his linkage theory. According the Hirschman's linkage theory, growth in one industry could lead to growth in others. Both backward and forward linkages can't be ruled out as suggested by Yotopoulos and Nugent (1973). Backward linkage could have occurred with oil production stimulating those sectors supplying the oil sector such as industry, agriculture, education and crude oil itself in the presence of a refinery. Alternatively, oil could have had a forward linkage in the form of stimulating industry and other processing activities in the economy.

Empirically, authors including Twaha et al. (2019), Isham et al. (2005), Sarraf and Jiwanji (2001), Chambers and Guo (2009), noted growth in natural resources to increase overall growth of the economy

The same simulation reduced manufacturing and service from Sh. 6407939to Sh.6312635.2, and Sh.18668400 to Sh. 17120104, respectively. Theoretically, these results of discovery impacts on manufacturing reinforce the theory formulated by Corden

(1984). In his formulations, he argued that discoveries of a natural resource to leads to deindustrialization via their role in raising the value of the local currency that renders manufacturing to be less competitive.

Empirically, the outcome of manufacturing in the simulations is consistent with the findings of (Benjamin et al., 1989; Beverelli et al., 2011; Bruno & Sachs, 1982; Davis, 1995; Fardmanesh, 1991; Twaha et al., 2019). These authors found a surge in oil production to appreciate the dollar which rendered manufacturing uncompetitive – the Dutch Disease. Looney (1991) for instance in his study found surge in oil production and export after the Gulf war to crowd out Kuwait's manufacturing sector. According to his finding, Kuwait's manufacturing became an enclave after the war, where boom in oil financed importation of finished products met to be produced locally. And similarly, Twaha et al. (2019), in their study of implications of Uganda's oil found manufacturing to have reduced. The similarity between Looney (1991) and Twaha et al. (2019) findings is that while manufacturing declined, imports surged, thus, an added explanation of the effect manufacturing emerged with is the surge in import observed in Table 7.3.

Despite the consistence and reinforcing role of the results of this study on manufacturing, there other empirical work which are contrary with this apparent finding. In particular, the studies of Arora and Lieskovsky (2014) and Fardmanesh (1990). These dual authors in their studies observed an increase in the production of oil to avail the manufacturing sector with cheaper raw materials which boosted it. Further, these authors noted the boost in oil production to equally enhance spending effects on manufacturing.

Empirically, the shrinking of the service sector in the results is in line with those of Bruno et al. (1982), who found oil discovery to suppress non-tradable. The decline in manufacturing reinforces

However, the findings are contrary to Fardmanesh (1991) whose work found oil boom to have a positive impact on manufacturing and non-tradable but a negative impact on agriculture. He attributed the negative effects to emerge from the world price effects. Budina et al. (2007), too found oil to have negative effect on all non-oil sectors due to surge in prices of manufactured goods.

Simulation 2 (SIM2)

According to the results in Table 7.2, absorption increased sectors like agriculture (Sh.6,251,312.36 to Sh.6,501,364.85), oil (Sh.23,519.98 to Sh.25,166.38), industry (Sh.83,990.33 to Sh.84,830.23), education (Sh.1,757,549.92 to Sh.1,792,700.92) and health (Sh.487,934.20 to Sh.492,813.54). While on the other hand it contracted manufacturing and service from (Sh.6,407,939.46 to Sh.6384476.4) and (Sh.18,668,400.00 to Sh.17,746,736) respectively. According to Murshed (1997), the impacts of absorption come into play in two ways: either through increase in income or decrease in interest rate. On average, overall income increased in our model, this can help us figure out why some sectors expanded. However, some households (HHD-R-NF, HHD-K-NF and HHD-U-NF) had their incomes reduced. This can explain the contraction of manufacturing and services. Another additional explanation of the contraction of manufacturing and service sectors is the possibility that domestic absorption of oil increased the rate of interest making it difficult to make more investments in these sectors. We are however, not certain since interest is not modelled in our study.

A large volume of empirical work could help us in understanding the results According to Fardmanesh (1991) some sectors could have expanded because oil investment – a component of absorption, expanded other sectors including non-tradable. Additional justification of the growth of some sectors can be deducted from the granger causality and co-integration studies. There could have been unidirectional running from oil consumption to GDP as suggested by Abosedra and Baghestani (1989), Ebohon (1996) and Toman and Jemelkova (2003). The possibility of a bidirectional could also help in the explanation as concluded by Aqeel and Butt (2001), Erol and Yu (1987), Glasure and Lee (1998) and Nachane et al. (1988). It appears a vicious circle was created whereby oil absorption lead to more demand that necessitated more production and so forth. For the sectors that contracted, the possibility could be lack of granger causality, an issue raised by Akarca and Long (1980), Cheng, et al.(1997) and Eden et al. (1992).That is, the absorption of oil rather led to a movement of resources from these sectors to the oil and other sectors.

Simulation 3 (SIM3)

Increase in oil export simulation equally portray similar findings like those of the other simulations thou with highest figures of them all. The positive impact of oil on agriculture, industry and education is in line with the staple theory which argue that export of primary raw materials increases other domestic industries (Watkins, 1963).

Empirically, export expansion of some of the sectors is in line with the findings of Twaha et al. (2019), Adedokun (2012), Heidarian and Green (1989), Junior (2015), (Usui, 1996)and Looney (1984). These authors did find surge in export of natural resources like oil and gas to increase the other sectors of the economy due to the multiplier effects and the availability of investable resources. The inverse association of oil export and manufacturing/ service are supported by theory particularly that of Corden and Neary (1982),Corden (1984) and Twaha et al. (2019), who illustrated how the export of oil crowded out other sectors. Murshed (1997), could further help in reinforcing the results. He argues that surge in exports has the tendency to appreciate exchange rate, which squeezes out other sectors in the long run. Therefore, we can conclude that large revenues from exports could have appreciates the local currency (the shillings), rendering manufacturing and services uncompetitive.

Further analysis in Table 7.2B show the adjustments in the sectoral composition.

Table 7—2B: Sectoral composition

	Base	SIM1	SIM2	SIM3
A-AGR	18.56	20.24	19.68	20.23
A-PETR	0.07	0.08	0.08	0.08
A-MAN	19.03	19.46	19.33	19.46
A-IND	0.25	0.27	0.26	0.27
A-EDU	5.22	5.64	5.43	5.63
A-HEAL	1.45	1.53	1.49	1.53
A-SER	55.43	52.78	53.73	52.8
TOTAL	100	100	100	100

Initially, the service sector with 55.43% was the leader in value-addition. It was followed by manufacturing (19.03%) and agriculture (18.56%). Apart from the minor adjustments, the discovery as represented by oil production, absorption and export does not change the structure and composition of the economy[26]. Like before the shocks, service remains as the dominant sector, followed by manufacturing, agriculture; with petroleum tailing throughout the three simulations.

7.1.2 Impacts on the Macro-Economic Variables

The impacts of oil discovery on the macro economy are presented in Table 7.3.

Table 7.3: Impact on macroeconomic variables

	Base	SIM1	SIM2	SIM3
GDPFC	19921820.00	19382498.94	19378514.58	19398436.40
GDPMP1	22156470.00	22488817.05	22378034.70	22710381.75
GDPMP2	22156470.00	21381091.28	21376659.99	21609302.75
INVESTMENT	9326842.43	9141768.00	9139902.64	9237834.48
EXPORT	3720840.19	3829488.72	3828744.55	3867813.38
IMPORT	9700790.00	10410887.83	10408947.67	10510805.97
NITAX	2234648.72	2118883.31	2115197.31	2141900.19
PRVCON	18809580.00	19599582.36	19561963.20	19844106.90
GBS	2234548.72	2234233.29	2234188.60	2216645.81
FS	5979950.55	5974270.99	5974151.39	5734249.89

[26] Historical observation shows that once a major natural resource is discovered in poor countries, the structure of their economies tends to adjust accordingly. For instance, Nigeria, Angola and other Sub-Saharan countries before oil discovery were predominantly agricultural economies. After the discovery, oil represents almost more than 50 percent of their production, export and revenues.

Increase in oil production (SIM1), generates a raise in GDPMP1, that is, GDP expenditure approach (Sh.22,156,470.00 to Sh.22,488,817.05), export (Sh.3,720,840.19 to Sh.3,829,488.72), imports (Sh.9,700,790.00 to Sh.10,410,887.83) and private consumption (Sh.18,809,580.00 to Sh.19,599,582.36).Conversely, GDP at factor (GDPFC) and market (GDPMP2-income approach) price declines from (Sh.19,921,820.00 to Sh.19,382,498.94) and (Sh.22,156,470.00 to Sh. 21,381,091.28) respectively. The decline in GDP as noticed with the two approaches follow the Keynesian and classical theories concerning the tradeoff between efficiency and equity. It implies that a little improvement in equity, is achieved at an average cost of a reduction in GDP at factor and market price respectively.

The ambiguity in GDP results are in line with empirical studies. Scholars including Isham et al. (2005) and Sarraf and Jiwanji (2001), among others have found natural resources to have a positive effect on economic growth. According to these scholars, abundance and production of natural resources has a multiplier effect on the economy at large. They help in technology transfer, generate income to government in form of taxes and households in form of wages and dividends. On the other hand, the inverse effect on some of the growth measures reflects the ongoing resource curse debate of natural resource abundance articulated by scholars such as Atsushi (2007), Brunnschweiler and Bulte (2008) and others. These authors described how the abundance of natural resources has the tendency adversely affecting the economy. They argue that boom in resources of nature like oil crowds out other sectors, leads to unemployment, lowers income of households hence increases incidences of poverty and inequality and generally cause instability in the economy in form of conflicts and corruption. In our model, income of some households reduced and this reduction is explained by the reduced earnings from factors of production as a result of decrease in factor prices (see Table 7.4 and A4). This perfectly account for the inverse association of the discovery on GDP as measured by income and factor prices.

In the results, investment decreases from Sh.9,326,842.43 to Sh.9,141,768. This could be attributed to decline in the private sector lead investment as previously noted. The decline in the two leading sectors of the economy, manufacturing and services, in the results also offer possible explanation of investment stagnation. Furthermore, production and value-added subsidies in the Ugandan economy, leaves fewer funds with the private investors. This, partly can explain the dire performance of investment.

However, both imports and exports increase (Sh.9,700,790.00 to Sh.10,410,887.83) and (Sh.3,720,840.19 to Sh. 3,829,488.72) respectively. This is in line with theories of oil impacts. First, while explaining the Dutch Disease, Corden and Neary (1982), pointed out how the discovery of oil and natural gas has the tendency to increase both export and imports due to its positive impact on nominal exchange rate and income respectively. Secondly, surge in production surged both exports and imports due to among others increase in earnings which leads to the expansion of exporting industries and consequently to the importation of capital goods to foster such expansion (MacBean, 2012).

The index of the net indirect tax (NITAX) declines from Sh.2,234,648.72 to Sh. 2,118,883.31. NITAX is supposed to be the difference between indirect taxes and subsidy. Subsidies in our SAM includes export, production and value added taxes. None of these taxes are levied. Thus, the availability of these subsidies to both producers and consumers, renders consumption of domestic produce to be cheap hence stimulating an increase in private consumption as seen in Table 7.3.

Government budget surplus (GBS) reduced from Sh.2,234,548.72 to Sh.2,234,233.29. This result is attributed to among others the reduction in transfers from institutional agents notably households whose incomes reduced which affected their tax commitment and the reduction in other indirect taxes and other earnings from enterprise and abroad plus the widening subsides. The increase in government consumption expenditure was observed in the results. This can too, offer us an added explanation of the reduction in the surplus. This is in line with the empirically work of Usui (1997), who concluded that booms in production of natural resources deepen domestic absorption, thereby increasing reducing government surplus. A reduction in the surplus can also come as a result of the reduction in the price of exports(Barnett & Ossowski, 2003). This is can probably offer us an added explanation. In our model, the export prices of both manufacturing and services reduced. Another results for a reduction in surplus or increase in deficit of the government is the increase in borrowing due to boom in oil extraction but which increases the burden of repayment(Barnett & Ossowski, 2003). Our model does not have the financial sector to ascertain this factor. The results with respect to budget surplus are however contrary to the findings of Ramcharran (2001), who observed a surge in OPEC's oil production to lower prices but generates more revenue to government due to boost in the volume of sales. Equally, Foreign Savings (FS) declined from Sh.5,979,950.55 to Sh.5,974,270.99, as a result of increased production of oil. The simple explanation could be the negative net export that was generated during production. Both exports and imports increased, but the increase is imports was a bit larger than the increase in exports (see Table 7.3). Thus, the heavy importation drained the country's international reserves in the process.

SIM2 and SIM3 show same results in general terms with minor differences in the variations from the base year. An increase in oil absorption (SIM2) has a negative effect on GDPFC, GDPMP2, investment and NITAX but a positive one on GDPMP1, export, import and private consumption (PRVCON). The positive-negative nexus extends the ongoing natural resource curse controversy. The inverse relationship between absorption and GDP conform to the work of Keynes (1930), who noted minerals have had an adverse effect on Spanish economy in the 16thcentury. It also reinforces the work of Kraft and Kraft (1978), who found no causality running from oil consumption and the level of economic activities in the economy. This relationship is equally similar to the findings of Abosedra and Baghestani (1989), who concluded that oil consumption did not stimulate GDP growth. The positive relation of absorption and GDPMP1 is in line with the conclusions of Reynolds (1979), who remarked how proceedings from natural resources propelled United States of America, Australian and Canadian economies. Similarly, this result, reinforces the findings of Heckscher (1963), who observed that copper, - another natural resource like oil, boosted the 17thSwedish economy and study of Houghton (1976), who noticed gold revenue to revitalize South Africa. Boom in oil production reduced domestic prices which re-allocated resources towards private consumption at the expense of investment. The positive impacts of absorption on GDP also reflects the works of Erol and Yu (1987), Nachane et al. (1988), and Glasure (2002). These authors found consumption of oil in the domestic economy not only to increase economic growth but also oil consumption in the long run. Additionally, the increase in oil absorption increased exports. A probable reason could be the raise in income of some economic agents as a result of the surge in the production and consumption of oil, which availed resources to expand the country's export industry. This argument is however watered down given the fact that in the model, aggregate investment reduced. The most probable explanation could be the expansion of the exportable sectors notably agriculture and industry accompanied with increases in export prices of the products from these sectors. This can explain the overall performance of exports in our model. This argument is supported by Scherr (1989), who observed a surge in export of agriculture exportable such as palm kernel and oil to raise as a result of boom in oil production and consumption in Nigeria, Mexico and Indonesia. The aggregate raise in income in our model can possibly explain the surge in imports as a result of boom in absorption.

An increase of oil export produces similar results as those of the earlier simulations. Theoretically, oil export has been noted to affect GDP. First, a boom in exports increases export earnings which in turn increases investments in the export industry and other sectors of the economy (MacBean, 2012). Second, exports increases overall demand which stimulates further domestic production thereby boosting growth(Murshed, 1997). Third, exports have the tendency to increase productivity in the economy (Temple, 1994). Finally, exports broadens the overall export structure of the economy (Khalafalla & Webb, 2001).The positive effects of oil exports on GDP, the export sector, imports, and private consumption conforms to the findings of Heidarian and Green (1989). In their study of the impacts of oil exports on Algerian economy, they found a positive relationship between oil and the different economic variables notably GDP, employment, imports[27] and consumption. The positive GDP results is equally in line with studies of Adedokun (2012) and Karamelikli et al. (2017), who found oil export to increase economic growth in Nigeria and Iran respectively. The direct impacts of oil export on imports is in line with the study of Oseghale and Amenkhienan (1987), who observed a boom in oil export to increase importation of capital goods. In theory, imports raises due to raise in income (Murshed, 1997, p. 13). They do increase also as a result of increase in domestic and global demands for goods Narayan and Narayan (2005), Sinton and Fridley (2000). The negative impact of oil export on investment is however contrary to the findings of Heidarian and Green (1989). In their work, they observed improvements in oil exports to increase domestic investment. It also contradicts the work of Oseghale and Amenkhienan (1987) who found surge in oil exports to increase foreign direct investment in Nigeria. Common sense and economic theory predict oil export to increase export earnings and hence budget surplus or reduce the deficit if it exists. In our model however, an increase in oil reduced the government budget deficit. The Dutch disease theories has it that oil exports have the tendency to appreciate exchange rate which crowds out major sectors in the economy(Neary & Van Wijnbergen, 1986). Possibly, the crowding out of manufacturing and service sectors reduced government revenues in terms of taxes from these sectors, and as a consequence, a reduction in the surplus. A large volume of studies on oil impacts concludes that a decrease in oil price, demand by importers and supply by exporters, heavy borrowing by exporting countries, and corruption in the oil sector negatively affects government incomes and hence increases budget deficits. Most of these factors cannot explain why the surplus reduced in our analysis. While decline in export

[27] Particularly of luxurious goods such as perfumes, and so forth.

prices of manufactured and service goods was observed, prices of other exports in the model including oil did increase. Therefore, the decline in export prices and supply of other exportable rather than oil can help us in accounting for the decline in government surplus as a result of boom in oil export. Similarly, foreign savings declined as a result of oil export boom. This is contrary to economic theory which argues that an increase in oil export increases oil earnings and consequently both domestic and foreign savings. Like in the previous simulations, a negative net export can explain why foreign savings reduced when oil exports increased.

7.1.3 Impact on Household Income

In this section we look at the impacts of the simulations on household income, consumption and utility. The impact of the discovery on poverty and inequality is directly affected by either its impact on household income or consumption or both. The results of the incomes of the different types of households are presented in Table 7.4. With the exception of rural farm and urban farm– whose income increased from Sh.10,400,000.00 to Sh. 10,718,240.00 and 1570501.05 to 1699279.80 respectively, other households had their incomes decline across all the discovery proxies as shown in the Table 7.4. In theory, boom in oil related activities such as production, absorption and exports raises household income due to the creation of employment opportunities from which they derive their incomes as laborers (Gamu et al., 2015). However, labor income from the oil sector in our SAM is very small compared to income from other sectors (see Table 5.11).

Table 7.4: Impact on household income

	Base	SIM1	SIM2	SIM3
HHD-R-F	10400000.00	10898550.00	10889480.00	10889498.81
HHD-R-NF	2869675.84	2756479.40	2744881.80	2770085.70
HHD-K-NF	3666723.61	3614356.90	3602862.60	3621752.30
HHD-U-F	1570701.05	1699279.80	1674207.56	1657768.55
HHD-U-NF	1967955.47	1954092.70	1951872.20	1965769.07
Notes: HHD-R-F = labor: rural farm; HHD-R-FN = rural non-farm; HHD-K-NF = Kampala non-farm; HHD-U-F) = urban farm and HHD-U-FN = urban non-farm.				

In theory, boom in oil related activities such as production, absorption and exports raises household income due to the creation of employment opportunities from which they derive their incomes as laborers (Gamu et al., 2015). However, labor income from the oil sector in our SAM is very small compared to income from other sectors (see Table 5.11) While employment is created, the oil industry traditionally requires highly specialized skills which, most local population in the developing world lack(Cleveland, 2005; Lal & Myint, 1998). Thus, the income derived is small, as noticed in the results .Moreover, the jobs that are created in this sector are generally fewer compared to the capital outlay (Pegg, 2003).This seem to be the case in our SAM (see Table 5.9 and 5.10). The number of labors employed in this sector is very small. Personals with skills employed in this sector is very small and worse of all, self-employed labor comprising mostly of the poor masses is not working there. Further, households tend to earn dividend from the oil sector by virtual of their shares in capital investments. Still, given their meagre income, household share in capital investment in most of the developing countries is very small. Most of the capital and other investments in this sector is undertaken by entrepreneurs from the developed countries with sound financial base (Cleveland, 2005; Sadorsky, 2001; World-Bank, 2002, 2003). In SAM, factor share of which includes capital is very small in this sector (see Table 5.7). This partly explains the dire earning from oil discovery. Household income in oil and other natural resource abundant countries is also augmented by direct public transfer of some of the proceeding to households(Moss, 2011). In Uganda, there are no direct transfers to households (see Table 5.18). The lack of transfers implies that the poor miss a vital source of income to improve their livelihood.

With specific reference to the different simulations, in SIM1, the incomes of rural and urban farm households increased in the model. The probable explanation for this increase across farm households could be the surge in the agriculture as a result of oil production as noticed in Table 7.2. Another possible reason for the increase particularly in the case of rural farm household is their diversified and large share of the earning sources as presented in Table 5.13. In this Table 5.13, rural farm household has very significant earnings from land rent (96.32%), capital rent (90.76%), wages (38.61%) and transfers from firm (43.92%). Other households experiencing negative change in income, had fewer and small shares in the income sources (see Table 5.14). Despite the increases in income for some households and a decrease for others, overall, oil production on average resulted in a small increase in income of households taken together. This is basically due to its stand in the social accounting matrix used in the analysis. In Table 5.7, the contribution of petroleum to value added is simply 6.42, share in value-added is merely 0.07, and its share in factors simply 0.01 across labor (skilled and unskilled) and capital.

With the exception of capital, where petroleum pays 76.97%, this sectors payment to factors is the lowest; 9.52% to unskilled labor and 13.51% to skilled labor. From a general perspective, oil production increased the income of households by a small fraction due to: first, its small share compared to other sectors in labor-force (Table 5.9), second, income (Table 5.10) and third, wages (Table 5.11). Thus, even the large shock we introduced in the model could not produce any meaningful adjustments in the results. Some evidences from empirical studies nevertheless suggests that oil and gas production does increase household income. For instance, Weber (2012), noted that oil and gas production in Colorado, Texas created 223 jobs annually that raised household incomes. Similar, the study of Black et al. (2005), showed how natural resource production created job opportunities in the natural resource sector and in other sectors, which boosted incomes of households. Finally, Twaha et al. (2019), found oil production to increase income of some households in Uganda.

Regarding absorption (SIM2), the results have lower absolute values than SIM1 but are similar in terms of increases and decreases. The results of rural and urban farm reinforce theory which suggests that a shock in absorption increases income (Murshed, 1997), but it is contrary when it comes to other households. The more probable reason is the impact of absorption on agriculture in Table 7.2. Taken together, absorption had a small increase in income on average. This is basically due to the share of petroleum in the SAM used in the analysis. The share of petroleum in total absorption as presented in Table 5.8 is just 3.19. This is so because, it is minor as an intermediate input (5.78%), its consumption by household is very low (2.78%), worse of all, it is not consumed by government and has no share in investment. Empirically however, the results are a confirmation of the conclusions made by Considine et al. (2014), Kevin (2017),Weber (2012) and Weinstein, et al. (2011) whose works showed how absorption in form of investment in the oil sector had wide ranging economic impacts including increasing household income. From the large volume of empirical literature, we find almost no direct impact of oil absorption and increase in household income. There are however a lot of indirect impacts with implications on incomes of households. First, the increase in domestic absorption increases the demand for factors of production to boost supply that cater for the increase in demand (Gelb, 1988). Second, increase in absorption implies increase in investment, which investment requires not only additional factors supplied by households; but equally generates profits to investors; emanating from the different households (Weinstein, et al., 2011). Third, households also earn from the different upstream and downstream industries that emerge as a result of oil absorption(Morris, Kaplinsky, & Kaplan, 2012). Finally, increase in absorption is associated with economic growth with its associated effects on households including increase in opportunities that households take benefit of (Weber, 2012).

Export (SIM3) equally emerges with same results but with higher values than the previous simulations. Like production and absorption, export too had a positive effect on the agricultural sector (Table 7.2) and hence increased rural and urban farm households. By and large, its average positive impact on household income was very small partly due to the smaller share of petroleum in the 2007 Uganda social accounting matrix (7.7%), showed in Table 5.4.From the empirical point of view, the increase in income as a result of oil export boom was due to largely the growth in some sectors and GDP. Studies by Knudsen and Parnes (1975),Tyler (1981) and Twaha et al. (2019), found boost in exports to increase economic growth, which generally raise income in many ways. Other empirical work shows that boosts in exports of one sector like oil leads to the boost in the investment in the export industry and in other industries and hence the expansion of the export sector in general (Gelb, 1988). Despite the contraction in aggregate investment, the export sector expanded and hence, the findings can be explained in terms of its overall investment in this sector. Further explanation could be the very fact that, a surge in export is usually associated with an increase in employment and income (Krueger, 2007).

7.1.4 Household Poverty and Inequality

Inequality and poverty analysis require a technique like CGE that captures how households earn and spend. Major economic shocks like the oil discovery affects earnings and expenditures of agents through three main channels: Firstly, the shocks at once affect household income by altering the return to primary factors. Secondly, an adjustment in tax or subsidies affect the disposable income of households. Finally, they affect price levels henceforth the price effect causes changes in household real income. In computing poverty and inequality in this study, we used aggregate household income. We begin our discussion with oil activities impact on poverty whose results are presented in Table 7.5.

Table 7.5: Impact on poverty

	Base	SIM1	SIM2	SIM2
P0	0.31426	0.2891192	0.29493301	0.267121
P1	0.144329	0.13278268	0.135452767	0.12267965
P2	0.067801	0.06237692	0.063631239	0.05763085
Notes: P0 = absolute poverty; P1= poverty gaps and P2 = severity				

An increase in oil production (SIM1), reduces absolute poverty from31.43% to 28.91%, poverty gap from 14.43% to 13.28% and severity from 6.78% to 6.24%. Similarly, oil absorption (SIM2), decreases P0 from 31.43% to 29.49%, P1 from 14.43% to 13.55% and P2 from 6.78% to 6.36%. Finally, oil export (SIM3), reduces P0, P1 and P2 by a relatively larger margin than the previous simulations.

In general, the reductions in poverty is very moderate due to among others: the mixed impact of the discovery on sectors as earlier presented in Table 7.2, on macro-economic variables as seen in Table 7.3 and on household income (see Table 7.4). For examples in Table 7.2, we observe agriculture, oil, industry, and the subsectors[28] of service to have a positive impact while manufacturing and service a negative one. The same ambiguous results are noticed on macro-economy, dominated by decline in the values of most variables. As a result, household income increased but by a very small margin on average.

These results are consistent with previous studies on natural resources discovery and booms. For instance, De Ferranti et al. (2002)narrated how historically, the abundance of natural resource has driven some economies to high rates of development, lower poverty and inequality. The reduction in poverty seems to have occurred due to the impact of oil discovery on economic growth as observed earlier. For instance, a study by Davis (2009), notes that oil boom produces pro poor growth. In a more specific form, the studies by Humphreys, Sachs, and Stiglitz (2007) and Weber-Fahr (2002) concluded that oil and gas resource booms leads to economic growth that reduces poverty. Additionally, a detailed survey by Gamu et al. (2015), found that natural resources particularly oil

[28] Education and health

generated income opportunities in other sectors which helps to reduce not only poverty but also inequality.

While empirical studies on the surge in oil production and poverty reduction are very scarce, a recent study by Twaha et al. (2019) found increase in oil production to reduce poverty. Similarly, an earlier work by Page (2007), establishes the relationship between production of oil and poverty reduction though in a different way. In his analysis, Page noted that the reductions in oil production during the periods when Middle Eastern countries-imposed oil trade embargo on the West in the 1970s and 1980s, the world prices of oil increased drastically. With this increase in prices, both oil exporters and non-exporters in the region harvested huge revenues which enabled them to reduce poverty rapidly during that period. A study of the relationship between natural resources extraction and poverty-inequality by Alejandro, Mora, and Taylor (2007), reinforces our findings. It noted an increase in the extraction of forestry (another natural resources) to reduce both poverty and inequality in rural Mexico.

Some studies have similar conclusions like ours when it comes to the link between oil absorption and poverty. For example, Adelowokan and Osoba (2015), in their study on the Nigerian economy, the found increase in oil investment in the country reduced poverty. The study of Karshenas and Hakimian (2007), too, observed evidence of faster poverty reduction as a result of an increase in direct transfer of oil income to households. Similarly, the study of Birdsall and Subramanian (2004), noted that responsible absorption management of oil revenue in Iran, Libya, Saudi Arabia and Mexico greatly helped to reduce poverty significantly in those economies.

There are empirical studies in support of our findings with regards to oil export and poverty. For instance, Twaha et al. (2019), noticed that a boom in oil export reduced poverty in Uganda by though by a small magnitude. Another study by Salehi-Isfahani (2009), on Iran came up with similar conclusions. In his analysis, he found an increase in oil exports after the sanction relieve to have reduced poverty across the country. Further, the work of Agrawal (2007), equally echoes ours. While examining the impacts of oil in Kazakhstan, it was observed that an increase in its export improved economic growth and earnings which enabled the government to enlarge its social security system and consequently reduce poverty.

7.3.3 Impact on Inequality

The results of the discovery on income inequality as measured by various indices are presented in Table 7.6.

Table 7.6: Impact on inequality

	Base	SIM1	SIM2	SIM3
Gini	0.340863	0.31359396	0.315298	0.289734
Theil L	0.276654	0.25452168	0.255905	0.235156
Theil T	0.232254	0.21367368	0.214835	0.197416
Theil S	0.21684	0.1994928	0.200577	0.184314
Hoover's Index	0.247102	0.22733384	0.228569	0.210037
Welfare using TL	471251.5	508951.6211	506595.4	541939.2
Welfare using HI	453745.5	490045.126	487776.4	521807.3
Welfare using TT	1.41E-06	1.52122E-06	1.51E-06	1.62E-06

In SIM1, a decline in inequality is noticed. For instance, Gini Coefficient declines from 0.340863 to 0.31359396, Theil L from 0.276654 to 0.25452168, Theil T from 0.232254 to 0.21367368, Theil S from 0.21684 to 0.1994928 and Hoover index from 0.247102 to 0.22733384. Welfare using TL improves from Sh.471,251.501 to Sh.508,951.6211, that of HI from Sh.453,745.487 to Sh.490,045.126 and that of TT by a very small margin from 1.41E-06 to 1.52122E-06.

From a general perspective, our results are a contrast of the findings of (Karl, 1999; Shaxson, 2007), whose studies concluded that oil rich countries exhibit tendencies of inequality. A recent work by Kim and Lin (2018), found natural resource to reduce inequality via their impacts on the social sectors especially health and education. In the short-run, Goderis and Malone (2011), noted that natural resources reduce inequality. Similar findings and conclusions have been established in the studies of Parcero and Papyrakis (2016) , Fum and Hodler (2010) and Twaha et al. (2019). It is also contrary to the conclusion made by (Karl, 1999), who observed that the oil is an exclusive sector for expatriates with highly skilled labor and high capital. Further, it goes against the conclusions Karl (1999), Luciani (1994) and Yates (1996),who argued that a few elites and politically connected gain the highest rent out of the oil sector leaving the majority poor.

In terms of oil production, the improvement in the state of income distribution in the simulation can be attributed to the aggregate raise in income and consumption (see Table 7.4 and A4). Empirically, studies documenting surge in oil production and inequality are very common. Recently the study by Twaha et al. (2019), noted how a surge in oil production reduced inequality. Similarly, Goderis and Malone (2011), study observed boom in oil extract to reduce inequality in the short run through its positive impact on unskilled labour in the non-tradable sector. The dynamic version of this study however contradicts our findings. It found inequality to increase to the pre-boom period with the passage of time when the effects of the boom vanish and uncertainty in future commodity prices emerges. Another study by Parcero and Papyrakis (2016), takes a general look at the abundance of oil and inequality. It notices that oil is associated with lower inequality in poor oil-rich countries but in case of countries that are very rich in oil and gas resources, it tends to rather increase it on average.

Similarly, the reduction in inequality as a result of surge in absorption is accounted for by increase in income and consumption of some households. This can be supplemented by the spillover effects of oil adoption in other sectors as suggested by the linkage theories (Al-Saqri, 2010) and as noticed in Table 7.2 which improves the distribution.

The nexus between oil absorption and inequality has been largely neglected in empirical work. Nevertheless, an attempt by Farzanegan and Habibpour (2017), focusing on public transfers, replicates our findings. In their analysis, the duo found direct distribution of oil revenue by the Iranian government to reduce not only inequality but also poverty more than if the revenue was simply targeted to the poor in the economy.

Export of oil (SIM3) too, improved inequality standing in our model. As earlier noted, this could have been due to the improvement in income and consumption patterns of household owing growth in some sectors and the economy (Table 7.3 and 7.4). There are a couple of empirical work to support our findings. Twaha et al. (2019), for example observed oil export surge to reduce inequality in Uganda. Similarly, Salehi-Isfahani (2009), found boom in oil export to reduce inequality as well as poverty in rural and urban areas of Iran. Likewise, Moradi (2009), found surge in oil export revenue to alleviate inequality in Iran. A substantial volume of studies however, are contrary to our findings. For instance, the study of Buccellato and Mickiewicz (2009), noted surge in oil and gas exports to increase inequality in regions of Russia. Similarly, Bradshaw and Vartapetov (2003), noted the same effect of oil export on inequality in Russian oil and gas producing region.

7.3.3 Impact on Household Welfare

Table 7.7 presents the equivalent variations which portrays individual welfare of households. All simulations have a positive effect on household welfare with the exception of urban farm households. The results in the Table 7.7, show that there is an effect of a rise in price for all households except urban farm.

Table 7.7: Equivalent variation of Households

	SIM1	SIM2	SIM3
HHD-R-F	18,864.10	74,303.32	86,579.58
HHD-R-NF	282.18	288.98	261.03
HHD-K-NF	489.14	564.86	488.70
HHD-U-F	- 68,961.92	-84,699.27	-53,534.39
HHD-U-NF	143.49	168.30	110.49

Specifically, the results in SIM1 imply that for households' rural farm, rural nonfarm, Kampala nonfarm and urban nonfarm, should have amounts Sh.18864.10, Sh.282.18, Sh. 489.14 and Sh.143.49 respectively taken away for them to remain at the same welfare point as before the rise in price. On the other hand, urban farm shows a case of price fall, therefore, those households should be given an equivalent of Sh.68,961.92 for them to retain the welfare as before the price fall.

In SIM2 and SIM3, the households with positive values of EV, should give away the corresponding amounts resulting from a price rise to maintain their welfare and urban farm household should be offered Sh.84,699.29 and Sh.53,534.39 resulting from price fall for them to have the same welfare as before.

The results of another useful measure of welfare – the Compensating Variation is presented in Table 7.8. In accordance with the results in Table 7.8, it is clear that all households must be compensated at the simulated prices as a result of price increases due to oil related activities. For instance, in SIM1; Sh.29,582.34, Sh.397.83, Sh.640.57 and Sh.228.90 should be given to households HHD-R-F, HHD-R-NF, HHD-K-NF and HHD-U-NF, to compensate for the rise in prices for them to enjoy the same welfare as before the price effect.

Table 7.8: Compensating Variation of Households

	SIM1	SIM2	SIM3
HHD-R-F	29,582.34	84,918.08	97,402.03
HHD-R-NF	397.83	433.46	348.03
HHD-K-NF	640.57	753.15	610.88
HHD-U-F	-68,892.50	-84,614.06	- 53,480.64
HHD-U-NF	228.90	273.49	176.26

Conversely, the negative CV in case of urban farm household imply a fall in price level effects and hence this household is better off warranting it to give away Sh.68,892.50 to remain at the same welfare as before the decline in price.

Similarly, the results of SIM2 calls on HHD-R-F, HHD-R-NF, HHD-K-NF AND HHD-U-NF to be given the relevant amounts in Table 7.8 as compensation for the price rise effect to enable them have the welfare as the original one. And urban farm should give away the amount in Table 7.8 to be on the initial welfare.

Further, according to SIM3 results, HHD-R-F, HHD-R-NF, HHD-K-NF AND HHD-U-NF, should be given the amount as in Table 7.8 as compensation for the price rise effect for them to enjoy the same welfare as before the price increase; while HHD-U-F should part with the amount in the Table to return back to the original welfare.

Taking the economy as a whole, the values of the Compensating and Equivalent Variations are depicted in Table 7.9.

Table 7.9: Economy wide Equivalent and compensating Variations

	SIM1	SIM2	SIM3
TEV	-9836.6	-1874.76	6781.082
TCV	-7608.57	352.8236	9011.312
Notes: TEV = Economy wide Equivalent Variation TCV = Economy wide Compensating Variation			

From the Table, individuals in the country are better off in SIM2, better and worse off at the same time in SIM2 and worse off in SIM3. With respect to TEV in SIM1 and SIM2, imply that individuals are better off and thus have to be given Sh.9836.60 and Sh.1874.76 to bring them to the initial welfare. In SIM3 individuals are worse off and therefore an amount of Sh.6781.08 has to be taken away from them to maintain the original welfare. Regarding TCV in SIM1; individuals are required to give up Sh.7608.57 because they are better off than before; while in SIM2 and SIM3, they should be given Sh.352.82 and Sh.9011.31 because they are worse off than before.

The analysis of oil impacts on household welfare has been largely neglected by researchers, more so, in terms of production, absorption and export. A study by Twaha et al. (2019), found increase in oil production and export to improve household welfare. Unlike the study of Twaha et al. (2019), other studies have focused on other dimensions to explain the link between oil and welfare. Quite a number of studies examining the impacts of oil on welfare have analyzed oil price shocks (Birouke & Zewdu, 2012; De Santis, 2003; Sánchez, 2011). In their study, Birouke and Zewdu (2012), observed that subsiding oil prices improved the welfare of households in Ethiopia while De Santis (2003), found a decrease inworld crude oil prices to reduce welfare in Saudi Arabia. Other scholars have linked oil to welfare via pollution abatement taxes (Bovenberg & De Mooij, 1997; Boyd, Krutilla, & Viscusi, 1995; Wissema & Dellink, 2007). Boyd et al. (1995),concluded that imposition of carbon tax had no impact on welfare, Bovenberg and De Mooij (1997), found this tax to improve it, while Wissema and Dellink (2007), noticed some slight improvements. Finally, other studies have looked at the impacts of subsidy reforms on welfare (Jenseen & Tarr, 2003; Solaymani & Kari, 2014). Solaymani and Kari (2014),observed the removal of subsidies to reduce household welfare in Malaysia while Jenseen and Tarr (2003) found a redistribution of oil subsidy fund to improve welfare in Iran.

With regards to our simulations, we notice a few studies to either directly or indirectly hint at what we are analyzing. Indirectly, the study of Stijns (2006), found natural resources abundancy (by implication, production) to improves household welfare via its positive impact on human capital accumulation.

The impacts of oil absorption on welfare has been dealt with via investment and spending. In a study in Brazil, Caselli and Michaels (2013), found increased income and spending of oil windfall to improve household in form of standards of living.

Similarly, Farzanegan and Thum (2018), noted increased spending of oil rent to improve household access to education. However, in their further analysis, it was noted that an increase in oil rent investment had a negative effect on the quality of education.

As earlier noted, the impact of oil export on welfare is via oil price shocks. Further, international sanctions that have come to define world politics in the contemporary world, do help us in understanding the impacts of oil exports on households. A recent study by Farzanegan, Khabbazan, and Sadeghi (2016), found the sanctions imposed on export of Iranian oil by USA and her allies, had a negative impact on the welfare of households in that country.

In a nutshell therefore, crude oil prices, subsidies, taxes and oil revenue spending options have mixed impacts on welfare. Increase in world crude oil price, imposition of subsidies on oil consumption, and increase in oil expenditure have a positive impact on welfare.

While on the other hand, collapse in oil prices in the world market, subsidy removal and sanctions have a negative one.

7.10 Sensitivity Analysis

Table 7.10 presents the sensitivity analysis. In this study, the sensitivity is performed by either adding or subtraction or both changes in the trade elasticities presented in Table 5.25 in Chapter 5. The effect of changes in these parameters on macroeconomic analysis is close to zero leading us to conclude that parameters used in the model are correct. The results of sensitivity analysis are shown in Appendix B, Tables B1 and B2. As hinted in Chapter 6 section 6.5, we perform sensitivity experiments before the final remark on the results to ascertain their robustness.

Table 7.10: Simulation parameters for sensitivity analysis

Experiment	Change in elasticity
SA0	Original Armington and CET elasticities
SA1	50% rise in Armington elasticity
SA2	50% rise in CET elasticity
SA3	50% reduction in Armington elasticity
SA4	50% reduction in CET elasticity
SA5	50% rise in Armington and CET elasticity
SA6	50% reduction in Armington and CET elasticity
SA7	50% rise in Armington and 50% reduction in CET elasticity
SA8	50% reduction in Armington and 50% rise in CET elasticity

Selection of elasticity parameters in CGE based models is of utmost importance. Most modelers heavily rely on parameters from previous studies due to limitations in data to estimate them using available econometric techniques, this therefore calls for sensitivity analysis to check the influence of parameters used on the results. The fundamental idea is to substitute the value of elasticities with the values used in previous studies or make changes within a specified interval. In case the changes in the substituted elasticities do not bring a significant change in the results, we can conclude that our results are reliable and robust.

7.11 Summary

The study analyzed three aspects related to oil discovery namely production, absorption and export. The results that emerged from our model conform and, in some cases, go against previous studies. From a general perspective, the results of the three simulations were same in terms of signs with minor differences in the magnitude of percentage changes.

Shocks to oil production, absorption and export had a positive spillover effects on agriculture, education, industry and health. On the other hand, the shocks left manufacturing and services plummeting. Out of the ten variables used to represent the macro-economy in our model, more than half (six) emerged with negative signs. GDP which in theory is supposed to be balanced across all approaches one uses to measure it, only the income expenditure approach yields positive sign. The remaining measures (GDP at factor and market prices – income approach) were negative. Increase in expenditure approach is corrected with the increase in another macro variable – private consumption which too, increased. Similarly, the negativity of factor and income-based GDP correlates with the decline in factor and household incomes respectively. Exports increased but they were crowded out by increases in imports that created unfavorable balance of payment position for the country and reduced the country’s foreign reserves (FS). Investment reduced and so was government surplus, all because of falling household incomes. Only rural farm households had their incomes increasing while the rest, it reduced. Taken together, household income had an insignificant positive impact from oil discovery. This explains why oil discovery had little impacts on poverty, inequality and welfare.

Chapter 8

Conclusion, Recommendations and Direction for Future Research

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This is the final chapter summarizing the entire study.

8.1 Conclusions

We present two issues in this section, the conclusions in general and contribution of the current study.

8.1.1 Main contribution of the study

Unlike other studies on oil impacts on the economy, ours put emphasis on finding out the channels through which oil affects households. Different from other studies, we decomposed oil discovery in terms of production, absorption and export. Similarly, the effects on households are also broken down in form of poverty, inequality and welfare. First, we explored how oil production or absorption or export could affect the sectoral structure which in turn affect household incomes or consumption patterns and hence poverty, inequality and welfare. Second, we searched how oil production or absorption or export could affect the wider macro economy and consequently household incomes or consumption and thus poverty, inequality and welfare. In our review of related empirical literatures, we did not come across studies that used such details in the analysis.

8.1.2 General Conclusions

Generally, oil production is good for the economy as per our results. It expanded many sectors some of which are traditionally very vital for the economy, the most notable one being agriculture. Other sectors which expanded as a result of production shock included industry, education and health. The spillover effects especially on the agricultural sector is good news, given the fact that it is the sector that employs a majority of Ugandan. This could explain why poverty declined despite the negative impact of the discovery on incomes of most households. The contracting of manufacturing is characteristics of oil in most studies. However, the reduction in the service sector is a new phenomenon as in most of the previous studies, this sector has always been positively affected by oil activities. Given the fact that service is the largest contributor to the country's GDP, this could have resulted in the negative impacted experienced in the macro economic variables.

Absorption of oil portrayed similar pattern in the results implying that oil consumption, investment and transfers in the country had a spillover impact on agriculture, industry and sub-sectors of service. On the contrary, the investments and consumptions resulting from the discovery decreased manufacturing and the larger service activities in the economy. The conclusion could be deduced from the fact that migration of labour from these sectors into the oil sector which was booming. Additionally, the focus of private and public consumption and investment shifted from those two sectors to the petroleum.

Oil export surge had a positive spillover on agriculture, education, industry and health. Particularly for agriculture, this could have been due to the fact that export equally expanded the country's overall exports of the major goods particularly agriculture (coffee, cotton, flower, tea). On the other hand, oil trade crowded out manufacturing possibly as a result of the appreciation of the dollar which rendered it uncompetitive.

In classical macroeconomic theory, all the different measures of GDP have to produce similar results. The results with regard to surge in oil production, absorption and exports showed GDP as measured by expenditure approach increasing but other measures such as income and factor prices reduced. This is due to the very fact that oil related activities increased overall consumption by households and the public sector, thus boosting expenditure-based GDP. On the contrary, the results on household earnings were largely negative in the model with the exception of rural farm. Hence, because oil negatively affected household income – this clearly account for the reduction in GDP as measured by income. Further, because a larger proportion of household revenue is derived from factors particularly labour and capital, this could account for the decline in GDP at factor prices as a result of oil discovery. Net indirect tax equally reduced across the three simulation. In some literature, constitutes the differences between indirect taxes of GDP at factor costs and money market prices (income). In the model, these two measures of GDP were negative consequently, and consequently, this variable had to take the same sign. Hence, the inverse relationship between oil activities and net indirect tax was largely due to the negative impact of the discovery on GDPMP1 and GDPFC in the model. Overall investment in the country reduced as a result of the boom in oil production, export and absorption. This is possibly due to the large capital requirement in the oil sector which could have diverted all resources into the new sector, hence depriving other sectors of vital investment resources.

With the exception of rural farm households, all others namely rural nonfarm, Kampala nonfarm, urban farm and urban nonfarm all had their incomes reduce as a result of oil related activities. The reason for this rest upon three facts in the model results. First, oil activities expanded the agriculture sector which is the dominant sector for the rural folks. Second, the discovery increased the average factor prices of self labour which is predominantly used in agriculture. Third, oil related activities increased the average price of land, which is 100% used by the agricultural sector and the rural households.

As a result of oil absorption, production and marketing globally on the structure and the macro - economy and consequently on household incomes; absolute poverty (P0), severity (P1) and vulnerability (P2) declined. In particular, the discovery had a significant spillover effect on the incomes of rural households who accounts for the largest percentage of poor worker-force. Further, the positive impact on consumption (another measure of income poverty), was quite substantial and henceforth a sign of improvement in these indices.

Surge in the production of oil reduced inequality as measured by Gini coefficient, and other entropy measures and as a result, household welfare improved. The results show that the poor are participating in the production processes despite the fact that the oil sector requires highly specialized skills and enormous capital investment. Hence, slightly narrowing the gap between the rich and the poor.

Absorption and export of oil equally reduced income inequality and enhanced welfare. This is basically due to increased consumption of oil which is a component of absorption, inequality as measured by mean expenditure reduced. Further, the income derived from oil absorption and export increased household consumption in terms of imports, which increased overall expenditure. Hence, since inequality in the model was computed using household expenditure, increase in expenditure on domestic and import products mirrored a reduction in inequality in the simulations. Obviously, with a reduction in inequality and poverty, welfare had to equally improve as witnessed in the results.

Overall however, household welfare witnessed improvements with the exception of urban farm households. The simple explanation is the fact that the discovery surged household consumption and utility as proved in the model results. Contrary, utility and consumption of urban farm households declined in the simulations. The best policy or rather simulation based on the magnitude of changes is oil export. This could be due to its larger share in SAM in comparison to production and absorption.

8.2 Recommendations

The conclusions are premised on oil impacts spill over on the sectors of the economy, the macro- economy and in turn, household income/ expenditure. In the discussion that follows, we look at three major stakeholders: the government, households, the international community and the poor oil-rich economies.

8.2.1 Policy Makers

The results in general have far ranging public policy implication both fiscal and monetary. In the context of sectoral impacts, the government should optimally invest a reasonable share of her rent from oil into sectors like agriculture, industry, health and education. The bottlenecks impending growth and modernization of agriculture should be resolved in order to have a significant impact on both poverty and inequality in the country. While government has attempted to modernize this vital sector, it should be careful not to repeat the mistakes that has characterized past efforts to improve and increase agricultural productivity. Earlier efforts such as the 1987 farmers' scheme, 1995 initial capital scheme and 2001 prosperity for all scheme, were largely political and benefited just a few despite the large sums of money involved. The national agricultural advisory and wealth creation program going on in the country, seem too, to be political and is marred with massive corruption in input provision, and thus, benefiting mainly the contracted suppliers, - who are largely political and military elites.

Part of the wealth derived from oil should be used in the country's strategic industrialization to some create jobs and improve the incomes and welfare of the masses. However, agricultural – industrial linkages, particularly agriculture-processing and value added has to be emphasized in industrialization. This will further stimulate agricultural production and hence ensure sustained employment and income particularly of the poor masses. Tax holidays and grace periods apparently accorded to foreign investors, should be extended to all investors in the country's industrialization drive. The current policy is not sustainable particularly with regards to the country's fight against inequality.

Improvement of the educational and health sectors should also be considered via oil-revenue injection in these sectors to create jobs and a productive human resource. However, emphasis of public investment in education should be focused on the acquisition of technical skills to build up the human capital that will pilot the country into the middle-income club and beyond. However, a balance should be made while investing in education; with some funds directed in accumulating managerial skills to increase the pool of skilled entrepreneurs A reasonable amount of funds should be used to increase the pay of teachers and to provide them with essentials such as accommodation, transport and other basic utilities to enhance their motivation towards work and in turn raise the appalling standard of education. However, to have any meaningful achievements in this sector, efforts and commitment by government to stamp out corruption and inefficiency currently engulfing this sector must be made. Similarly, injections through the budgetary system should be expended to the health sector to motivate the health workers, provide medical supplies and avail medical facilities, just like those suggested for the educational sector.

Public funds should equally be injected in manufacturing and services to mitigate the Dutch Disease syndrome there in, in order to maintain and expand job opportunities and wage incomes in those sectors. However, proper systems should be put in place to scrutinize, identify and bail out businesses that are actually deserving, particularly given the rampant corruption and weak institutions in the country. Holding other factors constant, these and others at large could go a long way in easing the burden of poverty and inequality in the country.

With regards to the impacts of oil on the macro economy, the government should take this opportunity to boost and diversify the country's exports using resources from the new wealth. Since 1987, the government has attempted to boost exports and hence strengthen the country's foreign reserves, balance of payment and raise farmers and exporters income, through abolition of export taxes, simplifying export procedures, encouraging value-addition and diversifying exportable. More public resources, possibly out of oil-revenue should be injected in the export sector to boost the volume, value and type of exports in order to reduce the widening unfavorable balance of payment, enhance foreign reserves, stabilize the exchange market and above all improve household income. Potential exporters particularly in the European union and US. face the challenge of improving the quality and standards of their exports. The government should come to their aid. Similarly, exporters especially those dealing in perishables such as flowers and fruits have hurdles in their businesses. They lack cooling and preserving facilities at the airports at home and abroad, leading to spoilage and waste and hence losses. Some intervention is required by the government. The government should also look at the possibility of reviving the defunct cooperatives and marketing boards to help poor farmers who are losing out to middlemen and large entrepreneurs.

With regard to increasing level of imports that are increasing the negative net-export, policies to discourage luxurious imports should be put in place in order to improve the country's balance of payment position in the model. As part of the industrialization drive, capital importation should be given priority in order to set up domestic industries and manufacturing of what is currently being imported, more so, oil refinery to reduce on the 22 percent export bill currently being directed at its import. The government should also increase bursary and financial assistance in the educational sectors to enable households improve on their skills in order to turn around the negative impact witnessed on GDP at factor and market prices. It is hoped, such efforts will facilitate in overcoming the menace of inequality and poverty.

Household income is a critical issue as per the results. Oil related activities reduced earnings of almost all households. The government needs to put into place policies to improve sectoral investments to create more jobs and improve household earnings. In the recent economic history of Uganda, to ensure its survival and consolidation of political power and legitimacy, the government under president Museveni has been dishing out money directly to poor masses during election periods. Further, the president is currently moving across the country with sacks of money, dishing out to individuals and politically created associations and groups. This method of transfer of public resources is neither sustainable nor pro-poor.

Through the budgeting system, public funds - possibly from the new oil wealth should be allocated to the different sectors of the economy, with special emphasis on those that are employing a large section of the population. In addition to this, those sectors that witnessed negative growth, some interventions in form of cash should be made to help them expand and continue providing jobs and hence income to households. Resources should also be directed at skilling and productivity enhancement of labour by government to improve household income from labour. To improve household income from capital, household must inculcate the culture of saving, change the natural of saving (currently, majority save in-kind, and redirect the purpose of saving (apparently- save for unforeseen problems and consumption). Public transfers should come in the form of targeting, particularly self-targeting as suggested van de Walle (1998). This scheme also has an additional benefit of reducing incentives towards corruption and favoritism that is rampant in today's Uganda. In addition to targeting, the government should diverse a way to provide concessional loans to small and other local investors particularly in the agricultural sector, cottage industries and those sectors that have reduced due to oil discovery.

8.2.2 Households

In the recent past, a majority of household have been deriving a large share of their income from farm employment (agriculture). This is seemingly changing. This trend should continue to the extent that non-farm income supersedes farm-income. This can be achieved via household investment in education to enhance their skills to be employable in off the farm employments, whose income is high and stable.

To sustain their employment and income flow from the expanding agricultural sector, they should shift from the current subsistence farming to commercial farming by adopting modern farming techniques and diversify crops to earn more income throughout the year to overcome poverty and inequality. Those in sectors being crowded out by oil discovery should seek financial bailout from the government and other financiers particular, the international community to mitigate the adverse impact on their sources of livelihood. These and others could prove thrilling to poverty and inequality alleviation.

With regard to the macro-economic impacts, households should diverse and increase on the volume and quality of their export goods particularly agriculture to earn more income for themselves and the country at large thereby contributing to the improvement of the worsening foreign saving position (FS). This can achieve this via value-addition and diversification of their exportable. They need also be get united in the form of farmers association to farm and export their products directly thereby getting rid of middlemen who are currently enjoying the most fruits of this sector.

Private consumption by households largely expanded in the simulations. They should cut consumption especially on imports and luxury such as toys and doll from China and elsewhere, in order to save more money to improve on the deteriorating private investments levels and improve on the country's balance of payment position in the model results. These measures will go a long way in improving their livelihood.

Income source was a crucial factor in determining the incomes of households. Wage income should be boosted through increased investment in education by household to move from self-employed and unskilled labor force. While capital income should be enhanced via acquisition of more capital assets especially land, increased saving (by consumption reduction) and re-investing of retained earnings.

From the above discussion, improvements in household income can be mitigated by households themselves. They should get engaged in expanding sectors such as agriculture that have positive impacts with oil. They should reduce on their consumption in order to have enough funds to invest in productive activities and improve on their skills to boost their incomes.

8.2.3 International Community

They should take keen interest in the country's new sector. First, foreign governments particularly those rich in natural resources should share their experiences in formulating policies to manage this new found wealth. Without proper policies that can ensure prudent management of resources like oil, the possibility of resource curse is very possible in Uganda that could have adverse impact on the economy particularly the poor households.

Second, the global community should abate politics in the country's emerging sector. Issues like who should and who shouldn't invest in this should among international players must be shelved, for the sector to takeoff. The major stakeholder in the country's oil refinery–a Russian based firm, was force out due to United States sanctions on Russian entities. This put a break on the refinery construction thereby stalling the marketing of oil. Additionally, if what happened to Iraq and regularly happening to Iran where oil is being used to settle purely political issues crops up in Uganda. The anticipated gains won't materialize. Thus, Uganda's oil should be saved from settling political issues such as regime change for it to have a significant impact on households.

Third, there are issues on the ground regarding transparency in this new sector. Agreements between oil companies and the government are off limit public domain including the country's parliament. The wider community should encourage the government to have a wide public consultation regarding the optimal allocation of this wealth for intertemporal generation. Further, the oil companies should come clean on this issue that is creating mistrust between them and the wider public.

Forth, oil companies should play a significant role in ensuring that oil has maximum benefits to the masses. They should adopt a social responsibility strategy aimed at giving back to the community via investment in the communities they are operating and offering more jobs to Ugandan. On the ground, oil companies are building roads, schools and health facilities. This and others should not stop. They should also be responsible in fulfilling their royalty and tax obligations. The area where oil has been discovered is home to many wild life, fauna and other wildness bringing in tourist income to the government and the local. Efforts should be made by the companies to minimize the impacts on the natural environment.

In light of the results, these suggestions and recommendations, the discovery could usher in massive economic growth and development that could have far reaching impact on households. Given the country's pro-growth record, this could have the country make greater stride in the direction of overcoming poverty, inequality and other socio-economic challenges facing it today.

8.2.4 Other oil-rich developing countries

Oil has the potential to help in solving the country's socio-economic challenges including poverty and inequality. The extent to which this is possible is anchored on its sectoral, and macro-economic effects. The government need to put into place policies aimed at maximizing these impacts for a substantial gain of these effects on poverty and inequality. In our study, the discovery expanded among others the agricultural sector. That is good news for oil rich countries especially in Sub-Sahara Africa whose majority of the population live in rural areas engaging mostly in agricultural activities. If these governments use oil resources to modern agriculture, it will help in solving poverty and inequality, food insecurity in addition to saving the much-needed foreign currency used on farm product imports. The service sector is very vital in modern economy. In the results, oil reduced this sector, which on average is the highest contributor to GDP in much of the developing world. Manufacturing too, reduced. Much of the domestic consumption and import is in the form of manufactured goods. Thus, boosting domestic manufacturing is vital since domestic market for manufactured goods is there. It also saves the much vital resources used in importing manufactured products. Thus, developing countries abundant in oil resources should put in place an oil fund to mitigate the negative effects of oil on these sectors for them to continue playing their role in the countries' growth and development. GDP measured by factor prices and income reduced in our analysis. This was so because, the agents received very little income from factors (labour and capital). Income from factors depends on the shares and the productivity of particular factor. Governments with oil and gas resources in the developing countries should enhance the productivity of labour through increased investment in education and health. Shares in the production should be increased by encouraging agents particularly households to develop a culture of saving aimed at increasing investment.

8.3 Way forward for Future Research

Oil and other depletable natural resources have the potential to provide the much-needed revenue to solve poverty, inequity and other challenges prevalence in developing countries. Scholars examining oil impacts should pay particular attention on the following:

8.3.1 Type of Model

In our analysis, we utilized a static version of CGE. This type of model simply provides a comparative analysis between the base and shocked period. Given the nature of this industry, follow up studies on oil in Uganda needs to use a dynamic CGE model to retrace the impact over time.

8.3.2 Scope of the Model

The scope of the model used in this dissertation is limited in terms of detailing the sources of income and expenditure. This limits the decomposition of household poverty and inequality in many dimensions such as source of income and group. In follow up studies, household earnings and spending should be detailed in terms of groups, sources, region, quantile and any other form.

8.3.3 The Social Accounting Matrix

First, in the latest available Social Accounting Matrix, the estimations for oil (production, absorption and exports) are very small compared to other oil exporting countries. That greatly affected the magnitude of our results. A better estimate is warranted in future research to get the true picture of the impacts. Second, the data source is equally limited in the sense that it does not include the different transfers made by public to households published in official statistics. Such important variables are paramount in future studies on Uganda's oil sector to affect a proper distribution. Moreover, there is need to disaggregated labour and households further to widen the scope of the analysis. Even the newly published 2013 Social Accounting matrix for the country does not put into consideration the different much needed transfers and the oil sector remains very small. Future modeler of Uganda's oil sector should take into considerations the major features characterizing the oil sector in other African oil rich countries. Studies by Robichaud et al. (2014)and Wiebelt, Pauw, et al. (2011)incorporated in Uganda SAM 2007 the intermediate production coefficients of the 2006 Nigerian SAM. Before the country formally begins production and exporting of oil, future researchers need to go beyond that by looking at the shares of oil in production, export, and total government revenue. These will render the results to be significant and meaningful.

8.3.4 The Analysis

Currently, we analyzed oil discovery using production, absorption and export. There are however certain factors that characterize global oil markets such as price fluctuations, sanctions and corruption among others in oil rich nations. Further, regime changes, governance structure and institutional set-up have been noted in literature to have varying impacts on economies with oil and other natural resources. Future researchers should make effort to incorporate some of these issues in the analysis, to understand their impact on the economy of Uganda. Given the fact that Uganda government aims to use oil for infrastructural development and to achieve a middle-income status. Future analysis should equally incorporate such issues in the examination of oil impacts.

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10 Appendices

Appendix A: Factor average price, household consumption and utility results

Table A 1: Impact on Household Consumption (billions of Uganda Shillings)

	Base	SIM1	SIM2	SIM3
HHD-R-F	9,609,303.03	9,989,831.43	10,302,133.78	10,078,237.02
HHD-R-NF	2,637,611.03	2,883,172.61	2,824,881.41	2,901,372.13
HHD-K-NF	3,328,180.32	3,650,015.35	3,577,793.84	3,727,561.96
HHD-U-F	1,437,736.18	1,363,404.17	1,375,094.47	1,354,633.97
HHD-U-NF	1,796,751.19	1,963,669.37	1,944,084.79	2,014,158.08

To compute poverty and inequality indices, we one can use either household income or consumption. Average consumption, is good because most households do not want to reveal their total income but can freely offer information regarding their expenditure. In our analysis, household consumption was mostly positive with the exception of urban farm households (HHD-U-F). Household consumption was reflected in increases in commodity demand by households and increases in their savings during the analysis. In the macro-economy, GDP (expenditure approach) and imports increased, issues that provide an additional evidence as to why consumption on average increased.

Table A 2: Impact on Household Utility (billions of Uganda Shillings)

	Base	SIM1	SIM2	SIM3
HHD-R-F	9,242,771.44	9,411,914.16	9,935,979.30	10,074,620.87
HHD-R-NF	2,549,767.59	2,785,876.07	2,771,597.37	2,804,744.35
HHD-K-NF	3,369,478.15	3,696,654.47	3,662,622.74	3,773,815.52
HHD-U-F	1,454,849.41	1,437,505.01	1,449,648.83	1,429,096.99
HHD-U-NF	1,802,335.56	1,970,673.70	1,960,941.09	2,036,639.18

Just like consumption, the utility of households followed the same pattern. It increased for all except urban farm households. This consequently affected their welfare differently; whereby those households with increase in utility had their welfare improving and that with negative utility had its deteriorating.

Table A 3: Impact on Domestic Prices (PD) (billions of Uganda Shillings)

	Base	SIM1	SIM2	SIM3
C-AGR	1.162	1.2111526	1.20848	1.22591
C-PETR	1.027	1.0922145	1.07835	1.102998
C-MAN	1.149	1.1136731	1.12639	1.09192
C-IND	1.149	1.2057606	1.205301	1.211046
C-EDU	0.75	0.7485	0.74725	0.7425
C-HEAL	0.751	0.7329689	0.730791	0.741305
C-SER	0.861	0.8377979	0.836162	0.836162

The prices of agriculture, petroleum and industry commodities increased across all the three simulations while those of manufacturing, service and its subsectors reduced. This had a bearing on poverty, income distribution and welfare in the process. If all prices had increased, there would have been much more gains in welfare than actually realized.

Table A 4: Impact on Average Price of Factors (billions of Uganda Shillings)

	Base	SIM1	SIM2	SIM3
LAB-SELF	1.27	1.37922	1.29159	2.4511
LAB-UNSK	1.048	1.0142528	1.012786	1.012576
LAB-SK	0.736	0.7117024	0.710304	0.730912
K	1.068	1.111788	1.07868	1.13208
LN	1.264	1.499104	2.19936	1.5168

With the exception of self-employed labour, all other types of labour had their remunerations reduced in all the simulations. On the other hand, the prices of all types of capital increased across the board. These fluctuations in the pay for factors greatly affected the earnings of the different households depending on the shares they had. Labour being a dominant source of earning for almost all households, the reduction in its pay meant a decline in earnings that was witnessed. This in turn, affected the likely big impact that was expected on the alleviation of poverty and inequality.

Appendix B: Sensitivity Analysis Results

Table A 5: Effects of Sensitivity Experiments on Macroeconomic accounts (% change from base)

	SA0	SA1	SA2	SA3	SA4	SA5	SA6	SA7	SA8
GDPFC	-1.92E-09	-1.31E-09	-1.98E-09	-1.06E-09	-1.21E-09	-1.40E-09	-2.15E-10	-1.57E-09	-1.10E-09
GDPMP1	9.10E-14	2.78E-10	4.97E-11	4.36E-10	8.04E-11	1.56E-10	6.81E-10	1.40E-10	5.90E-10
GDPMP2	-1.74E-09	-1.30E-09	-1.81E-09	-8.59E-10	-1.05E-09	-1.39E-09	-2.83E-11	-1.40E-09	-1.07E-09
INVEST.	-1.58E-08	-6.09E-09	-1.46E-08	-1.27E-08	-1.38E-08	-6.26E-09	-1.24E-08	-1.67E-08	-2.21E-09
EXPORT	2.92E-10	2.80E-10	7.12E-10	-4.59E-10	-4.25E-10	5.17E-10	-9.79E-10	-1.95E-10	-1.70E-10
IMPORT	7.31E-04	6.97E-04	6.81E-04	4.25E-04	5.36E-04	6.84E-04	3.51E-04	7.17E-04	5.22E-04
NITAX	-1.53E-10	-1.27E-09	-2.83E-10	9.50E-10	3.78E-10	-1.30E-09	1.63E-09	1.58E-10	-7.53E-10
PRVCON	4.03E-09	-3.38E-10	3.55E-09	4.44E-09	4.35E-09	-3.59E-10	5.07E-09	4.64E-09	-9.85E-10

All the results show that the changes are very close to zero, thus, this shows that the trade parameters utilized in the model are valid, reliable, accurate and consistent with it and consequently, the simulation results are robust.

Table A 6: Effects of Sensitivity Experiments on Household Income (% change from base)

	SA0	SA1	SA2	SA3	SA4	SA5	SA6	SA7	SA8
HHD-R-F	3.06E-10	-2.67E-10	2.13E-10	5.68E-10	4.52E-10	-2.81E-10	8.15E-10	4.69E-10	-3.05E-10
HHD-R-NF	-4.03E-10	-3.71E-10	-4.32E-10	-1.62E-10	-1.98E-10	-3.97E-10	8.23E-11	-2.90E-10	-3.37E-10
HHD-K-NF	-4.13E-10	-3.80E-10	-4.43E-10	-1.66E-10	-2.04E-10	-4.07E-10	8.39E-11	-2.97E-10	-3.46E-10
HHD-U-F	-4.42E-10	-5.64E-10	-5.07E-10	-5.78E-11	-1.25E-10	-6.03E-10	3.44E-10	-2.42E-10	-5.37E-10
HHD-U-NF	-4.34E-10	-4.03E-10	-4.66E-10	-1.74E-10	-2.12E-10	-4.31E-10	9.26E-11	-3.11E-10	-3.67E-10

Appendix C: Social Accounting Matrix

Table A 7: 2007 Uganda Social Accounting Matrix (billions of Uganda Shilling)

		A1	A2	A3	A4	A5	A6
		A-AGR	A-PETR	A-MAN	A-IND	A-ED	A-HEAL
A1	A-AGR	0	0	0	0	0	0
A2	A-PETR	0		0			
A3	A-MAN	0	0	0	0	0	0
A4	A-IND	0		0			
A5	A-ED	0		0			
A6	A-HEAL	0		0			
A7	A-SERV	0	0	0	0	0	0
C1	C-AGR	360841.7	0	1345717	0	0	0
C2	C-PETR	87373.38	98.64017	17283		100198.1	13122.17
C3	C-MAN	477855.6	164.3974	2119564	8714.702	188588.8	131601
C4	C-IND	0	21362.98	26785.71			
C5	C-ED	0		0		166595.9	53932.3
C6	C-HEAL	34463.98		0			
C7	C-SERV	263795.6	1282.323	597825	7861.444	303654.8	99835.63
F1	LAB-SEL	571396.4		0			
F2	LAB-USK	827026.4	149.4603	240867.3	9154.417	144379.7	24547.74
F3	LAB-SK	0	212.2218	127107.1	2078.806	1197302	203567.7
F4	K	1185306	1208.707	1265875	52368.33	293812.9	140303.9
F5	LN	2241318		0			
H1	HRF	0		0			
H2	HNRF	0		0			
H3	HKNF	0		0			
H4	HDUF	0		0			
H5	HDUNF	0		0			
ENT	ENT	0		0			
GOV	GOV	0		0			
ROW	ROW	0		0			
TRC	TRC	0		0			
DTX	DTX	0		0			
STX	STX	0		0			
MTX	MTX	0		0			
SAV	SAV	0	0	0	0	0	0
TOT	TOT	6049377	24478.73	5741023	80177.7	2394532	666910.5

+

A7	C1	C2	C3	C4	C5	C6
A-SERV	C-AGR	C-PETR	C-MAN	C-IND	C-ED	C-HEAL
0	6049377	0	0	0	0	0
0	0	24478.73	0			
0	0	0	5741023	0	0	0
0	0		0	80177.7		
0	0		0		2394532	
0	0		0			666910.5
0	0	0	0	0	0	0
0	0	0	0	0	0	0
489866	0		0			
2057514	0	0	0	0	0	0
83650.5	0		0			
147367.3	0		0			
0	0		0			
3050569	0	0	0	0	0	0
0	0		0			
1316694	0		0			
1352336	0		0			
10104655	0	0	0	0	0	0
0	0		0			
0	0		0			
0	0		0			
0	0		0			
0	0		0			
0	0		0			
0	0		0			
0	0		0			
0	260418.1	600145.7	4462624	67917.26		
0	1117478	58096.14	2977310	55403.84		
0	0		0			
0	100051.8	27718	340856.8	4343.821		
0	1845.363	483071.5	551104	9087.944		
0	0	0	0	0	0	0
18602652	7529171	1193510	14072917	216930.6	2394532	666910.5

+

C7	F1	F2	F3	F4	F5
C-SERV	LAB-SEL	LAB-USK	LAB-SK	K	LN
0	0	0	0	0	0
0				0	
0	0	0	0	0	0
0				0	
0				0	
0				0	
18602652	0	0	0	0	0
0	0	0	0	0	0
0				0	
0	0	0	0	0	0
0				0	
0				0	
0				0	
0	0	0	0	0	0
0				0	
0				0	
0				0	
0	0	0	0	0	0
0				0	
0	545526.7	1111109	666701.7	212996.7	2158852
0		422546.1	531849.7	0	
0		560782.5	688893.3	0	
0	25869.73	178306	574148.2	21385.48	82466.5
0		290076	421010.9	0	
0				12809147	
0				0	
1876702				0	
0				0	
0				0	
186842.9				0	
70.94071				0	
0	0	0	0	0	0
20666268	571396.4	2562820	2882604	13043529	2241318

+

H1	H2	H3	H4	H5	ENT	GOV	ROW
HDRF	HDRNF	HDKNF	HDUF	HDNUF	ENT	GOV	ROW
0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0
0	0	0	0	0	0	0	0
2950131	689251.7	445300.2	275513.2	273956.7	0	0	1188460
205558.2	129545.3	47911.75	64984.15	37807.47			
3375431	1086801	1263400	515729.4	754917.3	0	0	938149.5
39068.44	11144.47	3568.043	2711.213	3123.764			25490.73
469900.7	97254.94	240294.5	157177.8	121465.3		940543.2	
219654	40192.73	33917.99	17768.96	23597.38		297270.4	
2016387	702450.9	1255225	511549.5	659848.6	0	1451138	1614895
0	0	0	0	0	0	0	0
					5438961		
					2081415		
					2632372		
					845259.6		
					1387943		
					124818		1384207
50105.84	33669.94	234006.9	35768.28	41706.1	298378		
807910.6	245499.9	358423.9	146233	182607.2	0	1218701	2116605
10134146	3035811	3882048	1727436	2099030	12809147	3907653	7267807

+

TRC	DTX	STX	MTX	INV	TOT

TRC	DTX	STX	MTX	INV	TOT
0	0	0	0	0	6049377
				0	24478.73
0	0	0	0	0	5741023
				0	80177.7
				0	2394532
				0	666910.5
0	0	0	0	0	18602652
0	0	0	0	0	7529171
				-238.143	1193510
0	0	0	0	1154486	14072917
				24.71592	216930.6
				0	2394532
				45.09591	666910.5
4208288	0	0	0	3921663	20666268
				0	571396.4
				0	2562820
				0	2882604
0	0	0	0	0	13043529
				0	2241318
				0	10134146
				0	3035811
				0	3882048
				0	1727436
				0	2099030
				0	12809147
	693635.1	659813.3	1045180	0	3907653
				0	7267807
				0	4208288
				0	693635.1
				0	659813.3
				0	1045180
0	0	0	0	61950.12	5137930
4208288	693635.1	659813.3	1045180	5137930	

The analysis of this SAM has been done in details in Chapter 5 in order to use it as a basis in the discussion of the findings.