



**ST.MARY'S UNIVERSITY
SCHOOL OF GRADUATE STUDIES**

INSTITUTE OF AGRICULTURE AND DEVELOPMENT STUDIES

**THE CONTRUBUTIONS OF MAJOR MINERALS EXPORT TO THE
ETHIOPIAN ECONOMY**

BY

MERON DEJENE

JUNE, 2015

ADDIS ABABA, ETHIOPIA

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A Thesis Submitted to the School of Graduate Studies of St.Mary's University in Partial
Fulfillment of the Requirements for the Degree of Masters of Science in Agricultural
Economics

JUNE, 2015

ADDIS ABABA, ETHIOPIA

APPROVAL OF BOARD OF EXAMINERS

This is to certify that the thesis prepared by Meron Dejene in titled “THE CONTRIBUTION OF MAJOR MINERALS EXPORT TO THE ETHIOPIAN ECONOMY” and submitted in partial fulfillment of the requirements for the degree of Masters of Science in Agricultural Economics complies with the regulation of St.Mary’s University and meets the accepted standards with respect to originality and quality.

Chair Man (Institute Dean)

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DECLARATION

I declare that this MSc. thesis is my original work; the thesis entitled' "THE CONTRIBUTION OF MAJOR MINERALS EXPORT TO THE ETHIOPIAN ECONOMY" this study has not been presented for the award of any other Degree, Diploma, and Fellowship of any other university or institution and that all sources of materials used for the thesis have been duly acknowledged.

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ENDORSEMENT

This thesis has been submitted to St. Mary's University School of Graduate Studies for examination with my approval as a university advisor.

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ACRONYMS

GDP	Gross Domestic Product
MOFED	Ministry of Finance and Economic Development
MoM	Ministry of Mining
ICMM	International Council and Mining on Metals
OPM	Oxford Policy Management
FDI	Foreign Direct Investment
MCI	Mining Contribution Index
EEITI	Ethiopian Extractive Industry Transparency Initiative
USD	United State Dollar
FDRE	Federal Democratic Republic of Ethiopia
EMDE	Ethiopian Minerals Development Enterprise
COMESA	Common Market for Eastern and Southern African States
DSA	Development Studies Associates
NBE	National Bank of Ethiopia
ASM	Artisianal and Small Mining

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ABSTRACT

The thesis paper investigates the contribution of exporting major mineral resources in the Ethiopian economy. The research approach employed for the study is qualitative and quantitative research. Empirically examining the contribution of macroeconomic variables to economic growth would help the country to formulate conducive policies to foster economic growth to this regard, this study investigated the contribution of major minerals export earnings on economic growth of Ethiopia for the period 1994/95-2013/14 by empirically testing the long run and short run relationship and causality between exporting major mineral resources and economic growth via including another macroeconomic variable i.e. import using popular time series econometric techniques of cointegration, Vector error correction estimation and Granger causality test. The results from unit root test and cointegration shows the existence of long run relations among the variables and volatility of the variables which indicate from year to years the export of minerals is not be constant it is trend is fluctuate but they have great contribution for the country GDP. Furthermore, the Granger causality test conducted indicate that in the short run there is no causality among variables but in the long run there is bidirectional causality among the five variables including: GDP, Export of Opal, Export of Tantalum, Export of Gold and Exchange Rate. The key finding in this study is that export of major minerals positively and significantly affected economic growth and growth also stimulates export of major minerals in the long run and export of minerals fluctuates from year to year. This provided support for the adoption of Export Diversification to Minerals and also from Exporting minerals the income generated from Opal minerals which have recent history is being become increase at increasing rate as a result government give grate incentive for this minerals and effort should be directed towards policies that will expand the volume of a country's major exports Minerals at the same time encourage Artisiane miners to use technology and support exporter of minerals for exporting minerals.

CHAPTER ONE

INTRODUCTION

1.1 Background of the study

Ethiopia has reasonably good resource potential for development-agriculture, biodiversity, water resources, minerals, etc. The mining sector contributes less than 5% to the country's GDP but 20% for forging currency. MoM (2013). Addis Ababa, Ethiopia.

Mining is a major economic activity in many developing countries including Ethiopia. Ethiopia has reasonably good resource potential for development-agriculture, biodiversity, water resources, minerals, etc.

Most metallic mineral exploration has been done in the low grade Precambrian terrains in western, southern and northern Ethiopia. In sedimentary settings geophysical surveys have been conducted for petroleum and coal exploration.

The country's overall economic development strategy has been based on Agriculture led Industrialization Development as a means of promoting development of market-oriented economy. Acknowledgement of export-development with objectives to create adequate markets so as to sustain growth of the agricultural sector, generate foreign exchange necessary for the overall economic development, and ensure promotion of internationally competitive industry seems to count positively towards competition in the country and have the need to import large quantities of food and high value of minerals.

Ethiopia's mining sector is undergoing an enormous transformation with an increase in opportunities for investment. A wide variety of mineral resources are available in Ethiopia, according to recently conducted geological studies. Gold production is considered to have huge potential. Meanwhile, additional explorations have confirmed the presence of deposits of platinum, tantalite, soda ash and phosphate rock. Petroleum and other metallic, industrial and chemical minerals have also been identified. Ethiopia's mineral wealth, combined with its skilled and highly motivated workforce, provide the makings for a thriving and profitable mining sector.

Mining is important to the economy of Ethiopia as a diversification from agriculture. Gold, gemstones (diamonds, sapphires and opal), and industrial minerals are important commodities for the country's export-orientated growth strategy. Tantalum mining has also been profitable. Export of gold, tantalum and opal are a key development sector in the country.

The mining sector in Ethiopia generates revenue from sales, taxes, as well as generates foreign currency earnings and also saving of hard currency in substituting the imported mineral related inputs of the country. The mining service sector activities are also contributing for employment opportunity.

From Export minerals which are found in Ethiopia Gold, Tantalum and Opal are the major one. Gold occurrences are widespread in Ethiopia and exploitation of placer gold dates back at least 3500 years where the Egyptians sailed along the Red Sea and traveled deep into what later became Ethiopia to trade gold. During the following millenniums large amounts of gold were extracted from placer deposits. Today two green stone belt-hosted gold mines in South Ethiopia are in operation and feasibility studies are underway of two other greenstone hosted gold prospects in West Ethiopia.

The placer gold deposit has been mined traditionally by the artisanal miners for several thousand years back to biblical times. The presence of gold and precious stone (gemstone) in Ethiopia has long been known since Biblical time (1 Kings 10: 1 - 13) referring to the Queen of Sheba's gift of gold and gemstones to the King Solomon of Israel. This indicates the placer gold and gemstone deposits in Ethiopia have been mined mainly by the artisanal miners for several thousand years.

The other major export minerals are Tantalum its occurrence is recent at least ten years and above it is a strategic metal being a key metal in one of the most used gadgets in modern society, the mobile phone. Tantalum is also used in other types of electronic equipment's and is thus high in demand. The trade name for the most common tantalum-bearing mineral is coltan whereas the mineralogical name is columbite. Ethiopia presently supplies close to ten percent of the World production of tantalum and has a good potential for a considerable expansion of the percentage.

Generally the economic contributions of exporting mineral resources in Ethiopia are different and in scientific research outcomes related to mineral resources are limited. This Research presents assessment of the economic contribution of major exporting mineral resources such as Gold, Tantalum and Opal in Ethiopia on twenty years trend analysis. There is an extensive body of theoretical and empirical literature on the role of mineral resources in economic development. The schools of thought are divided between those who argue that mineral resources are a curse and that, in general, growth in mineral-rich and dependent economies has been worse than in less endowed countries and scholars who consider mineral resources an endowment that has the potential to spur growth and development in developing countries. Generally this paper was tries to show the economic contribution of major exporting mineral resources in Ethiopia on twenty years trend analysis.

1.2 Statement of the Problem

Ethiopia's revenue from mining operations is expecting to surge in coming years following the granting of 24 new concessions in 2006-2007. The Government has made development of Ethiopia's mineral wealth one of its leading economic objectives. Mining operations within the country are expecting to be an important economic catalyst for the Government's export-orientated development strategy. The goal is to bring the minerals sector up to 10 percent of GDP within 10 years. Embassy of Ethiopia (2008) Washington, D.C.

The Problem is that there is no efficient literature which is done about Ethiopia mineral resources the government of Ethiopia the leading economic objective is development of mineral wealth but there is no extensive assessment about the country mineral resources and there is no efficient use Of their mineral resources for export purpose and for the country economic development and also exporter don't have deep knowledge for the capacity of the country and their mineral resources.

Despite the fact that Ethiopia has a long mining history, the development of the mining industry and its contribution to the national economy stayed at lower level. it has low contribution for the country export from year to year In the Search of mineral resources accurate and up- to- date assessment of the country mineral resources and assessment of Exporting mineral resources for

Economy is necessary because it helps to create the exporter full knowledge about the country minerals resource capacity and the export environment and it help to show it is contribution for country economic growth. Therefore this study tries to show the long run and short run economic contribution of exporting minerals in Ethiopia.

1.3 Objective of the study

General Objective

The general objective of this paper is to assess the contribution of major Mineral Exportto the Ethiopian Economy.

Specific Objectives

- ◆to analyze trend of gold, tantalum and opal Export.
- ◆to assess long run and short run relationship between economic growth and Gold, Tantalum. And Opal Export.
- ◆to analyze the contribution export minerals for the country GDP.

1.4 Research Questions

In order to address the issues rose under the specific objectives part of the study, the following Basic research question is a guiding frame:

- * Why fluctuate export of gold, tantalum and opal from time to time?
- * Is there a long run relationship between economic growth (real GDP) and mineral Export (Gold,Tantalum and Opal)?
- * Is there a short-run relationship between economic growth (real GDP) and mineral Export (Gold,Tantalum and Opal)?

1.5 Definition of Terms

In this section Relevant terms and concept of a study are define .this definition are found from different sources.

Conceptual definition of terms

Artisanal and Small-scale mining (ASM) refers to informal mining activities carried out using low technology or with minimal machinery by individuals, groups or communities often informally (illegally) and in developing nations. According to Ethiopian law Article 2.2 of the proclamation reads "Artisanal mining means a mining operation carried out by individuals or cooperatives which is mostly of manual nature and that does not involve the engagement of employed workers". Article 2.35 on the other hand defines small-scale mining on the basis of run-off mine ore. (Proc.678/2010)

Artisanal Mining is defined as non-mechanized mining operation (mainly manual in nature) of gold, gemstones, tantalite, salt, clay, industrial and construction minerals/ rocks, & others;

- It is an activity worked less than 15m vertical depth;
- It should be carried out only by Ethiopian individuals or groups;
- Possessions of financial resources, technical competence, professional skill and experience are not required to acquire an artisanal mining license. (Ministry of Mines, October, 2012)

Mining: Any operation or activity directed at extracting minerals from a mineral deposit onin the earth, water, any residue deposit or residue stockpile by any method, any operationIncidental there to, such as storage, treatment, processing (excluding smelting and refining),Transportation and disposal .proc. (678/2010).

Small Scale mining: means any mining operation of which the annual run-off mine ore does not exceed:

- A) Regarding gold,platinum,silver and other precious and semiprecious minerals
 1. 100,000m³ forplacer operations.
 2. 75,000 tons for primary deposit mining.

B) Regarding metallic minerals such as iron, lead, copper and nickel:

1. 150,000 tons for open pit mining.
2. 75,000 tons for underground mining operation.

C) 120,000 tons for industrial minerals such as kaolin, bentonite, diatomite, quartz and coal.

D) Regarding construction minerals;

1. 80,000m³ for sand, gravel, pumice, ignimbrite, clay and the like
2. 10,000 m³ for dimension stones such as marble and granite

E) Regarding geothermal deposit;

1. 2,000,000 m³ for bathing, recreational and medicinal purpose;
2. 25 mega watt or geothermal steam capable of generating equivalent power for industrial and other purposes;

F) 14,000 tons for salts extracted from brines

Large Scale Mining: means any mining operation of which the annual run-of-mine ore exceeds the limit stated above in small scale mining meaning, proc. (678/2010)

Mineral: Mineral substance of economic value, whether in solid, liquid or gaseous form, occurring naturally on within the earth in under water which is formed by or subjected to a geological process, and includes any mineral occurring in residue stockpiles or in residue deposits, but excludes a water other than water used for the extraction of any mineral such as brine, natural gas and petroleum as defined in the relevant petroleum law, top soil and oil shale; proc. (678/2010)

"Exploration" means to look for minerals as well as collecting earth science information by applying geological, geophysical, and geochemical or any other suitable methods. (Federal Negarit Gazita, (2000)

"Mineral deposit" means any concentration of prospective mineral or group of minerals naturally accumulated (deposited) within a specific area of the earth's crust and which has grade and quantity of mineral in excess of its surrounding. Federal Negarit Gazita, (2000)

1.6 Significance of the study

The research questions and the findings are relevant to identify factors affecting mineral Resources Export in Ethiopia. Theoretically In light of the scarcity of reference materials pertaining to the Ethiopian mining sector, the study is expect to encourage future researches.

Moreover, the study is expecting to be shed light and draw attention of policy makers as to require interventions to mitigate problems or issues that hinder export of Mineral Resources and Create Awareness of the Investor about the country Mineral Resource.

1.7 Scope and Limitation of the Study

The study was examine the contribution of gold, tantalum and opal export in Ethiopia and its economic performance on twenty year trend analysis (1994/95-2013/14). The limitation of this study will unavailability of Research papers and different published dates which done around this title to revise what is done on this area, the closeness of the door of different institutions which help for collecting data of this paper and the genuinity of the data is not confident most of the country's institution concerning about this gold, tantalum and opal export have ambitious data.

1.8 Organization of the Research Paper

This paper contains five chapters. The next chapter presents a review of literature, while chapter three discusses the methodology of the study. The fourth chapter presents the data analysis and discussion of the results. Chapter five presents the conclusions and recommendation based on the study findings.

CHAPTER TWO

LITERATURE REVIEW

2.1. Theoretical Literature

2.1.1 The role of mining in national economies

In 2010, the nominal value of world mineral production was nearly four times higher than it had been in 2002. During this period, growth in value has been significantly greater than growth in world gross domestic product (GDP). This increase has in large part been driven by the unprecedented growth in China, India and other emerging economies coupled with the associated sharp rise in commodity prices. In contrast, the preceding decade (1992–2002) saw no nominal growth – but rather a reduction in real terms, when adjusted for inflation.

2010 there were 40 countries that could be defined as relying on non-fuel minerals for over 25% of their merchandise exports. Of these, 75% are low and middle income countries. This number represents a considerable rise over time: in 1996 there were only 29 mineral reliant economies and, as recently as 2005, there were 33. Dramatic changes in this indicator have occurred since 2005 when commodity prices started to rise rapidly. In the years to 2010 eight additional countries have entered the ranks of mineral reliant countries including Bolivia, Burkina Faso, Georgia, Ghana, Guyana, Lao PDR, Montenegro and Somalia. ICMM (2012)

Ten case studies conducted by ICMM and the consultancy firm Oxford Policy Management (OPM) using the ICMM Mining: Partnerships for Development Toolkit, give valuable context-specific insights into the macro-economic contributions of mining. This in turn provides the basis for assessing a broader range of impacts on national economies than is possible using export and production data alone.

The case studies are: Brazil, Chile, the Democratic Republic of Congo, Ecuador, Ghana, Guinea, Lao PDR, Peru, Romania and Tanzania. They clearly show that contributions are multifaceted within countries. Mining provides vastly different levels of contribution in relation to the different macro-economic aggregates of most economies. Contributions also vary across and within countries. For example, the contribution of mining to government revenues and

employment can differ quite significantly from one country to another depending on a range of factors.

In most cases the contribution of mining to the case-study countries' total FDI has been very high – typically more than half of total annual FDI. This contribution is especially significant in low income countries, pointing to their ability to attract mining investment even when FDI into other sectors appears unattractive.

Mining makes a very significant contribution to national investment totals especially when mining activity is building up from a low base (e.g. Tanzania 1999–2006). In the case of Brazil, Vale's investments alone are the equivalent of almost 5% of total annual national investment. ICMM (2012)

The mining sector generates significant foreign exchange earnings. A substantial proportion of these do not, however, enter the national economy as they are used by mining companies to import goods and services during construction and operation. Nevertheless, the case studies point to a significant net foreign exchange contribution in the operational phase – even when imports are factored in. During the construction phase the high-import content is typically almost fully accounted for by the inflows of foreign equity and loan capital. The time sequence of the various different foreign exchange effects are well illustrated by the examples of Tanzania (ICMM, 2009) and Romania (OPM, 2009a).

Similar findings have been obtained in relation to mining's contribution to employment. New direct jobs created by large mining companies are normally well-remunerated compared to prevailing national average income levels, though the numbers of such jobs are relatively small – rarely more than 1.5% of total national employment.

Analysis from the case studies shows that mining may be successful in generating indirect employment in the supply chain, as well as induced employment as the salaries of direct employees or supplier employees are spent within the wider economy. Such employment multiplier effects can often be significant. One direct mining company employee may correspond to three or four employees elsewhere in the economy. In poorer regions where mining is the dominant activity, these indirect employment effects can be especially important (Pará state in Brazil is a good example).

There is no economic study group – including from within the World Bank or the International Monetary Fund – that systematically captures the important role of the extraction and production of mining, minerals and metals in the economies of each country of the world. Until now, this data limitation has prevented a country-by-country assessment of the varied macro-economic contributions of the mineral sector to national economies.

The MCI provides a reasonable first approximation of the relative importance of mining and metals to each national economy, however, as highlighted by the case study evidence above, there are many more direct and indirect potential contributions from the mining sector.

The rapid expansion of mining activity in recent years has made many low and middle income countries more reliant on mining for generating foreign exchange earnings. The rising importance of mining challenges both the critics of mining and its supporters to improve their understanding of the mechanisms that allow mining to have increasingly positive developmental effects. Mining in recent years has been the single most dynamic component of many poorer countries' total productive activity. Thus it has become a potential source of both direct and indirect incomes and a potential catalyst force for faster overall economic growth. In many countries, the mining and metals industry can and should be recognized as an important potential contributor to the critical policy objectives of both job creation and poverty reduction. ICMC October, (2012)

2.1.2 Mineral Resources in Ethiopia

According to the Ministry of Mines, Ethiopia has a substantial deposit of gold, tantalum, platinum, nickel, potash and soda ash. Among construction and industrial minerals are marble, granite, limestone, clay, gypsum, gemstone, iron ore, coal, copper, silica, diatomite, etc. Geothermal energy resource also exists in good quantity. With regard to fossil energy resources, there are significant opportunities for oil and natural gas exploration and development in the major sedimentary basins, namely the Ogden, the Gambella, the Blue Nile and the Southern Rift Valley. (Ethiopia Investment Guide, 2012)

According to studies so far conducted, there are diversified mineral deposits available in many parts of the Country, most of which can meet export standards. Minerals so far supplied to export

markets include gold, platinum, marble, granite, and tantalum, though in a very limited scale as compared to the immense potentials. Other metallic and non-metallic substances, including copper, lead; zinc, silver, gypsum, limestone, quartz and pyrite are also identified in various parts of the Country.

Ethiopia's mining sector was undergoing an enormous transformation with an increase in opportunities for investment. A wide variety of mineral resources are available in Ethiopia, according to recently conducted geological studies. Gold production is considered to have huge potential. Meanwhile, additional explorations have confirmed the presence of deposits of platinum, tantalite, soda ash and phosphate rock. Petroleum and other metallic, industrial and chemical minerals have also been identified. Ethiopia's mineral wealth, combined with its skilled and highly motivated workforce, provide the makings for a thriving and profitable mining sector.

Ethiopia is a producer of minerals, rocks, and Semi manufactured goods, such as brick clay, cement, columbium (niobium), diatomite, feldspar, gold, gypsum and anhydrite, kaolin, lime, pumice, salt, scoria, soda ash, sandstone, and tantalum. Ethiopia's main mineral export was gold. Other metal deposits included copper, iron ore, manganese, molybdenum, nickel, platinum, and zinc. Other industrial mineral occurrences included apatite, bentonite, dolomite, gemstones, granite, potash, quartz, and talc. Ethiopia's primary mineral export is gold. Abay Natural Resources Development Plc. produced fire opal in North Shewa; five other companies were engaged in exploration and mining. Sales of fire opal were concentrated in Asia, especially in Japan. Ethiopia's plans to expand infrastructure may increase the economic viability of its metals and industrial minerals deposits. (Thomas R. Yager, 2001)

Other mineral products including platinum from laterite, industrial minerals, gemstones (opal, peridot and other precious stones) and decorative and construction materials are also produced by licensed foreign and local mining companies in the southern, western, central and northern regions of the country. There are also some other advanced stage primary gold exploration and Development activities in different parts of the country which so far has identified close to 100 tons of indicated reserve of gold and other precious metals.

A gemstone or gem, also called a precious or semi-precious stone, is a piece of attractive mineral which when cut and polished is used to make jewelry. Although not grouped as minerals, some

organic materials like amber, coral, ivory, pearl etc.; are also used as gemstone. Opal, aquamarine, garnet, olivine, tourmaline, topaz, sapphire, ruby, amethyst, agate, jasper etc, are some of the minerals used as gem. Their value generally depends on four elements: the beauty of the stone itself, play of internal color its rarity, hardness and toughness, and the skill with which it has been cut and polished. In Ethiopia gemstones occur in many parts of the country. Amhara and Oromia National Regional States are well known by their potential resources. (Geological Survey of Ethiopia, 2009)

From mining area in Ethiopia Dallol area is the one located in Afar region of north eastern Ethiopia. From west to east, the geology of the area is characterized by: i) Neoproterozoic meta volcanics and metasediments, ii) Quaternary alluvial fan deposits and red beds, iii) a transitional zone of mud and salt mixture, and iv) evaporates, which consist of rock salt (commonly halite and potash) and sulfur/sulfides. The meta volcanic-sedimentary rocks of the area are sheared and locally affected by pervasive chloritization, silicification, and carbonatization as well as quartz-carbonate veining suggesting that it has a good potential for orogenic gold mineralization. Around 5 m thick alluvial sediments of Gehartu and Musely Fans are also favorable for the occurrence of placer gold deposits. This reveals that industrial minerals such as kaolin and mica are also encountered in the Dallol area in addition to the already known sulfur and salt deposits. In surrounding areas of mount Dallol, hot springs of varying temperature and extent are being erupted forming semicircular to circular pond. Two types of hot springs, light-yellowish and yellowish brines are recognized which are contaminated with mud. (Tadesse et al, 2003)

Currently, a detailed exploration work is being carried out for potash in the Musley/Dallol area by Indian, Canadian and German companies to properly calculate its reserve and possibly establish a mine that could produce raw materials necessary to produce fertilizers and chemicals the regional geological setting of the region is defined by the exposure of Neoproterozoic basement rocks at the western margin of the rift. The basement rocks are of mainly met volcanic and Meta sedimentary varieties. They are considered as the southern domains of the Arabian-Nubian Shield .These basement rocks are overlain by Permian to Palaeogene sedimentary rocks, which were deposited in continental and shallow marine environment. Marine successions were produced during Jurassic transgression of sea by the Indian Ocean after the intra-continental

rifting caused by breakup of the Gondwana Supercontinent (Davidson et al., 1994; Drury et al., 1994).

Kaolin is one of the minerals which are found in Ethiopia widely used as filler in the plastics industry because of its inert chemical nature and its unique size, shape and structure. Kaolin is used in paint to: 1) reduce the amount of expensive pigments, such as titanium dioxide; 2) assist with desired rheological properties that help maintain proper dispersion; and 3) provide bulk to the product. Limestone - The limestone unit is dominantly thick formation with many microfossils and containing a little sand. It also consists of minor layers of marl, clay and dolomite. This unit is unconformable overlaying the Lower sandstone unit and forms the prominent ridge in the area. Depending on the fossil content and color variation, this unit can be subdivided into upper parts and the lower parts. Based on the intensity of jointing, the limestone unit may use as a dimension stone production.

From the above minerals next to gold the major export mineral which is found in Ethiopia is Tantalum. The Kenticha tantalum bearing pegmatites were first discovered during a 1:250,000 scale geological mapping program carried out by Ethiopian geologists in close cooperation with Soviet geologists in 1980. A major mapping and evaluation program financed by the Soviet Union was carried out in 1981 to 1985. The project aimed at determining the extent of the tantalum-bearing rocks and to establish whether they were of commercial interest.

Ethiopia is blessed with an abundance of natural minerals and resources. Gold is considered to possess the most potential for mining investment, and the Government estimates that production could rise to 30 tons per year given sufficient income. Ethiopia produced an estimated 8,600 pounds of gold in fiscal year 2004-2005 (valued at \$90 million) compared to 7,590 pounds in fiscal year 2003-2004. One story that illustrates the Government's commitment to encouraging private investors in the mineral sector is the Legedembi primary gold mine, which was recently privatized by signing a sales contract with National Mining Corporation, a foreign-owned mining company. Embassy of Ethiopia, (2008) Washington, D.C.

Between 1974 and 1991 private investment was not allowed in the mineral sector rather government institutions were given the right to explore and develop the mineral wealth of the country. As a result of the political change that took place in 1991, a new market oriented

economic policy was introduced in the country. In the mining sector, the government promulgated a new mining proclamation and mining income tax proclamations to encourage the participation of private capital in mineral prospecting, exploration and development activity. Presently a number of junior exploration and world class mining companies are operating in Ethiopia for different mineral commodities. Apart from these there are wide ranges of future investment opportunities found in Ethiopia that hope to be of mutual benefit to the investors and the speedy socioeconomic development of the country. (Ministry of Mines and Energy, Addis Ababa, November 2009)

There are different minerals which are found in Ethiopia i am assessing generally those minerals on the above paragraphs from those minerals the major export mineral is gold, tantalum and Opal. They are important for the country export orientation strategy and they have great economic contribution for the country development.

2.1.3 Economic Contributions of Exporting Minerals in Ethiopia

Mining activities as sources of primary export income play an important role in the economic and social political development of many developing countries, and many of these countries largely depend on mining for their economic development. Not only does mining offer a source of foreign exchange earnings, the industry is an important source of income for people through direct and indirect employment. Indirect employment created by the mines includes mine contractors and suppliers who feed the mining industries thus the total effects of the operations on local and regional employment is significant. (Priscilla KaelaKangwa, May, 2008)

The major export of the country also comes from this sector. The mining sector is becoming a significant source of foreign currency earnings. After a major policy change in 1991, the government adopted a free market economic policy, limiting the role of the public sectors in economic activity. In accordance with the new economic policy, mining proclamations are promulgated to permit & encourage the investment of private capital in the development of the mining sector. Growth rates of double digit are recorded for the past seven consecutive years. Even though the mineral industry isn't yet well developed and its contribution to the GDP still

remains below 1%, the extractive sector is playing a role in poverty reduction and making significant contribution to the economy of the country through foreign currency earnings, job creation and contribution to the livelihood of citizens in Artisanal and Small Scale mining. Gold, tantalum, platinum, gemstones and dimension stone are the major export minerals. More than half a million people in the rural area are engaged in artisanal mining of minerals mainly gold & gemstones. (HundieMelka, August, 2010, Addis Ababa)

The mining sector during July 8,2005 to July,2010 create job opportunity for professionals in the small scale and large scale mining has increased to more than 3000 from less than 1000 and a significant number of citizens (in tens of thousands) have got temporary job opportunity for unskilled and semi-skilled labor. More than half a million people are engaged in the artisanal mining sector. The artisanal mining sector which was an illegal operation prior to 1991 is becoming a means of livelihood for more than 5,000,000 people after its legalization; The gold and tantalum export which was 3,439 kg and 92.5 tons respectively in the year July 8, 2005/July 7, 2006 has increased to 4500kg and 220 tons respectively at the end of the period (July 7, 2009/July 8, 2010) it is trend increase from time to time. The foreign currency earnings from the export of gold, tantalum and gemstones have reached about 295 million USD. (Hundie Melka, August, 2010, Addis Ababa)

The amount of foreign currency earning is About 135 Million dollars every year for the last recent years from the sales of export of minerals such as gold,Tantalem, platinum, decorative dimension stones and gemstones. This export earning contributes up to 7-10 % of the total export foreign currency earnings of the country. Mineral sector employment opportunity is becoming significant for the local communities where there are mineral development activities in their nearby areas, as well as for skilled and semi skilled citizens. The total estimated direct employment of skilled and unskilled human resource in the mineral sector is in hundreds of thousands of people of the country. This employment record is revealed in construction and industrial minerals quarries, open pit and underground gold mine, production of salts from brines and rock salts and the gemstone mining that the distribution of such activities are found all over the country. The formal artisanal mining activity also reduces the poverty level of millions daily life including 30 to 40 percent of the women participation.(Ministry of Mines and Energy Addis Ababa, November 2009)

The vision for the coming 15 to 20 years for the Mineral Sector is to establish a diverse, world class, competitive and environmentally sound private sector led mining industry, based on transparent free market principles, contributing not less than 10% of the GDP thereby enhancing the socioeconomic development and eradication of poverty in Ethiopia.

Generally the mining sector in Ethiopia generates revenue from sales, taxes, generates foreign currency earnings and also saving of hard currency in substituting the imported mineral related inputs of the country. The mining service sector activities are also contributing for employment opportunity.

2.1.4 Major Exporting Minerals in Ethiopia

In Ethiopia, over 80% of the population is engaged on Agriculture and related activities. The major export of the country also comes from the agricultural sector. Even though the country is believed to have wide mineral potential, the contribution of the mining sector to the national economy has so far reached a maximum of 6%.

The Ministry of Mines in collaboration with different stakeholders has carried out different activities to formalize informal miners and smugglers by introducing new precious minerals and transaction proclamation or directive. Accordingly, the target for 2010/11 was to establish 50 legal artisanal mineral miners' cooperative associations in six export mineral producer regions; the achievement indicated that 53 cooperative associations were established at the end of the fiscal year. These cooperative associations consist of 1542 male and 227 female a total of 1769 members. This raises the number of cooperative associations to 400. In addition, it was planned to supply 4606 kg gold to the National Bank of Ethiopia; it was possible to supply 7,296 kg gold to foreign market by artisanal miners through the National Bank of Ethiopia; as a result 322.5 million USD has been secured. The same performance has been achieved in other minerals. It was planned to supply 7,315 kg gemstone mineral to foreign market and 17,146 kg gemstone mineral has been supplied to foreign market by artisanal miners and 5.6 million USD has been secured. It was also planned to supply 105 tons of tantalum to foreign market and 124 tons of tantalum has been supplied by artisanal miners so that 5.7 million USD has been secured.

Generally, in the fiscal year 509 million USD has been secured from minerals exported by different companies and artisanal miners. (FDRED, Annual Progress Report, 2010/11)

In order to enhance the export sector, the Government has established the Ethiopia Commodity Exchange (ECX). ECX is a marketplace where buyers and sellers come together to trade, assured of quality, delivery and payment. ECX assures all commodity market players the security they need in the market through providing a secure and reliable end-to-end system for handling, grading, and storing commodities, matching offers and bids for commodity transactions, and a risk-free payment and goods delivery system to settle transactions, while serving all fairly and efficiently. (Ethiopia Investment Guide, 2012)

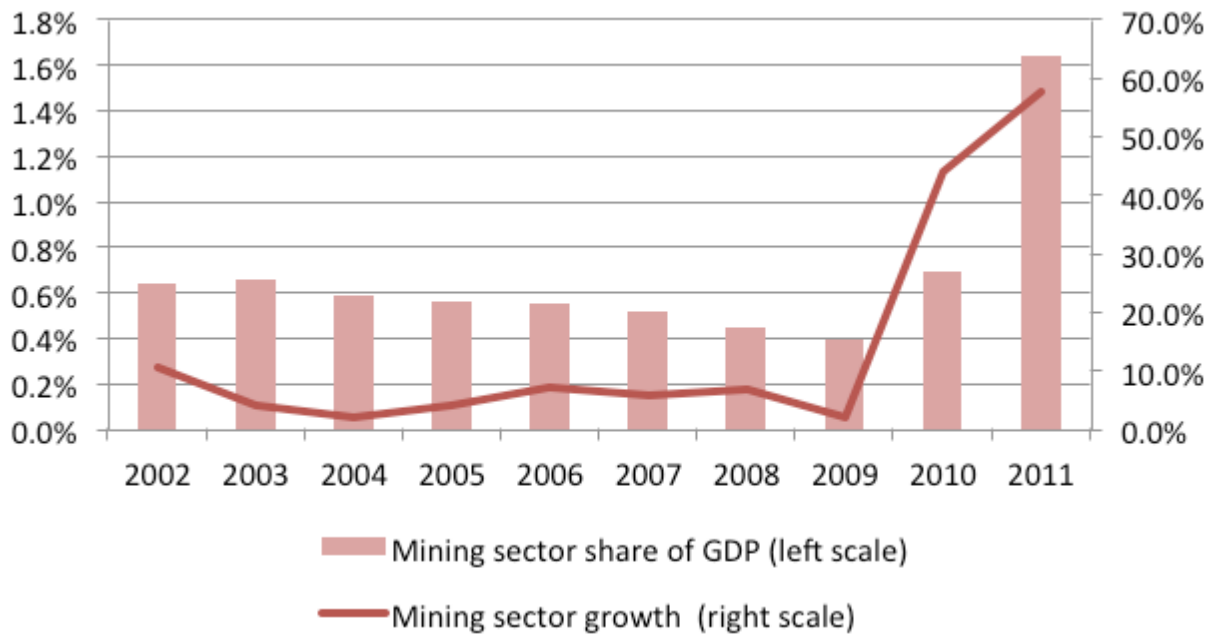


Figure 2.1: Mining Sector GDP and Growth

Since 1990 ranks second to gold in terms of foreign exchange earnings, is tantalum. Although this mineral is believed to exist in other parts of the country as well, it is now being exploited only in Kenticha, which is in Oromiyaa region. Studies carried out at this place indicate the existence of 25000 tons of Colombo Tantalite deposits. The contribution of gold, tantalum and silver to the country’s foreign exchange earning capacity is continuously increasing. For example, the following table shows 1997/98 to 2000/01 production and sales figures of Tantalum and Gold minerals.

Year	Amount Produced		Sales Value	
	Gold (kgs)	Tantalum (tons)	Gold (in \$)	Tantalum (in Birr)
1997/98	840	63	6,422,059	38,770,000
1998/99	2809	50	20,010,378	24,620,000
1999/2000	4365	65.7	30,435,035	47,003,000
2000/01	4121	46.9	*12,904,770	38,770,000

*** Sales value of 1950 kgs only.**

Table 2.1 Gold and Tantalum Production and Sales (1997/98 to 2000/01)

Source: Ministry of mines, 2003

Despite its mineral potential, Ethiopia only very recently became a significant mining region. The accelerating mining sector boom is driven by several factors. First, the rich resource base is only now being discovered through systematic mapping: geological-related mapping will be increased from 50% to 100% second; global demand for resource products is expanding exploration. Given Ethiopia's attractive mining sector investment terms and incentives, has been strong private sector engagement, including entry by major global mining industry players.

Reflecting these developments, mining is the economy's fastest growing sector in recent years, with output more than doubling between the intensified explorations uncovered several new deposits, including of gold, tantalum and opal positioning Ethiopia to strengthen output growth as new Production sites come on stream. The mining sector is strategically important to Ethiopia's growth. The Government of Ethiopia's goal is to facilitate the establishment of a large and diverse private-sector-based minerals industry.

In the Mining sector, the government main attention is to create conducive environment for private investors to participate in exploring and developing the mineral resources by gathering, compiling and interpreting basic geo-science information to deliver to the customers. Furthermore, it also designs policies, laws and new regulations that creates conducive environment for the development of the sector's economy. Besides, the expansion of private investment will enhance the mineral exploration and exploitation of high value minerals and hence increases the opportunities of finding additional deposits and increase the foreign currency earning of the country. Accordingly, by formulating enabling and competitive mining policies and laws that are taking into account the international situation and national interests within the development plan period has a paramount importance. (MOFED, September 2010, Addis Ababa)

The economic liberalization process being undertaken in the Country and the strong commitment of the Government to create a supportive environment for the development of the private sector have positively affected export growth. Exports increased by 24% in 1996/97 over the preceding year. Apart from the conducive and continually improving free market oriented policy environment, Ethiopia has various advantages for the development of its export sector. These include the abundant and capable labor force, low wage levels, a wide-ranging weather and soil conditions, preferential access to the European Union markets and proximity to the Middle-East markets. The preferential access to the Common Market for Eastern and Southern African States (COMESA) with a total population of more than 260 million also offers substantial market opportunities for several export items from Ethiopia.

The contribution of the mining sector to the national economy has been minimal at less than 1% of the gross domestic product (GDP). The main export mineral is gold. In recent years, however, the contribution of mining to the national economy is showing some progress (5.8% of GDP) due to improvement in policy measures, favorable commodity prices and the introduction of other minerals in the export list.

Midroc Gold Mine Pvt. Ltd. Co. exported about 3,500 kg of gold from the Lega Dembi Mine in fiscal year 2011. In July, Midroc announced the discovery of 33,000 kg of contained gold resources at Jillaye. The state-owned Ethiopian Mineral Development Share Co. produced about 220 metric tons (t) of columbite-tantalite at the Kenticha Mine in fiscal year 2011, of which

about 80% was exported to China. Ethiopia played a significant role in the world's production of tantalum; the country's share of global tantalum mine production amounted to 12%. Other domestically significant mining and mineral processing operations included cement, crushed stone, dimension stone, and gold.

Generally the mining sector is becoming a significant source of foreign currency earnings. Gold, tantalum opals are the major export minerals of Ethiopia.

2.1.4.1 Gold Export and its Economic Contribution in Ethiopia

The history of gold mining in Ethiopia dates back to biblical times. Gold has been traditionally mined from placer deposits. Semi-mechanized gold mining began in 1930's after the discovery of placer gold in Bedakessa valley in the Adola belt. Since then a substantial amount of placer gold deposits have been discovered and mined in the Adola belt, western and northern parts of the country by government enterprise and artisanal miners employing semi-mechanized and traditional mining methods respectively. Studies have revealed that more than 3 tons of gold is mined and illegally exported. As a result of the coordinated efforts of the ministry and the stakeholders more than 2800kg of gold mined by artisanal miners has been purchased by the National Bank of Ethiopia. The placer gold deposit in Akobo area within the western green stone belt has been licensed to a private company and will commence mining soon. The only large scale primary gold mine in the country is the Lege Dembi gold mine that started production in the late 1980s with an annual production capacity of 3 tons of gold. The Lege Dembi Gold Mine was privatized in 1996 and is upgraded to produce about 4 tons of gold per year. The company has explored the underground potential of the mine and carried out detailed exploration work on the Sakaro and Warseti prospects west and south west of Lege Dembi mine respectively. The Company has planned to produce about 70 tons of gold from these areas in the coming years. Currently, the company has started underground mining at Lege Dembi and Sakaro gold deposits. The upcoming of both resources into production will increase the annual production to an average of 5 tons of gold. (Hundie Melka, August 2010, Addis Ababa)

The mining sector has been underexploited in Ethiopia, even if gold is one of the major export commodities. Despite the often unfavorable relative price changes of raw materials, several of the products can generate huge income, diversify exports and bring badly needed foreign currency. Moreover, such development contributes to industrial development and employment opportunities in the small-scale mining sector that give the workers far higher incomes than traditional agriculture. (EspenVillanger, 2006)

Export revenues have more than doubled since 2004, reaching US\$ 2 billion in 2010. The share of non-traditional exports, notably flowers, gold, meat and leather products increased to 74.6% in 2010 from 60%. (Peace Nganwa, Februry, 2013)



Figure 2.2: Small-scale gold miner in Ethiopia. Photo kindly provided by Mr. Kevin P.C.J. D'Souza

Source: MoM

Ethiopia hosts numerous placer gold deposits, which have been exploited for several thousand years by small-scale miners using rudimentary techniques. Present day small-scale mining uses virtually the same technique as was used a thousand years ago. Today an estimated 350,000 small-scale miners extract gold from placer deposits. The miners extract gold from most rivers crossing all major green stone belts of Ethiopia. Statistical information for the period 1942-96 indicates that a total of 28 tons of gold was extracted from placer deposits in the Adola area by small-scale miners. This is just one of the many areas where gold is extracted from auriferous placer deposits by small-scale miners.

Epithermal gold The East African Rift valley transecting Ethiopia hosts a large number of geothermal fields which are used for power generation. A low grade epithermal gold deposit was discovered at Tendaho in the Afar region in northern Ethiopia. Geothermal drilling revealed highly silicified zones returning grades of 1 g/t gold. Currently foreign investors are intensively exploring to define best targets of epithermal gold around the Tendaho region. (Minister of Mines and Energy ,December, 2010)

2.1.4.2 Tantalum Export and Its Economic Contribution in Ethiopia

The development of the mining sector is very important for domestic resource based industrial sector development; export diversification and generation of employment opportunities. Based on the mineral prospecting and exploration works conducted so far, placer gold, primary gold and tantalum deposits have already been under development. In addition, to the employment opportunities created by gold and tantalum mining operation, the country is earning quite sizable amount of foreign currency every year. The contribution of gold and tantalum to the total export value of the country for the FY 2000/01 was 5.9 %.(Mr. Horst Kohler)

The mining sector is becoming a significant source of foreign currency earnings. Tantalum is the major export minerals of Ethiopia. Ethiopia's tantalum mining sector is a case in point: in March 2012, the Ministry of Mines ordered production of tantalum ore to be shut down pending the construction of a downstream processing plant to develop processed products such as bar and wire. However, with no foreign partner engaging, and the Ethiopian company involved – Ethiopian Minerals Development Enterprise (EMDE) – lacking sufficient capital to proceed with

the downstream enterprise without current earnings, the mine is reportedly to re-open prior to the processing plant being built. African Review of Economics and Finance, Vol. 4, No.2 (June 2013)

Tantalum is a strategic metal being a key metal in one of the most used metals in modern society for the mobile phone. Tantalum is also used in other types of electronic equipment's and is thus high in demand.

In 2011, Ethiopia played a significant role in the world's production of tantalum; the country's share of global tantalum mine production amounted to 12%.

The state-owned Ethiopian Mineral Development Share Co. produced about 220 metric tons (t) of columbite-tantalite at the Kenticha Mine in fiscal year 2011, of which about 80% was exported to China. Between 45% and 60% of the mine's production was tantalum pentoxide (Ta_2O_5) and between 10% and 20% was niobium pentoxide (Nb_2O_5). By fiscal year 2014, the Government planned to increase the capacity of the Kenticha Mine to 300 metric tons per year (t/yr). The life of the mine was estimated to be at least 15 years. Ministry of Finance and Economic Development (2010).

2.1.4.3 Opal Export and Its Economic Contribution in Ethiopia

Stones like ruby, sapphire, emerald, and opal are gemstones where Amhara region (particularly DebreBrehan) is known to have opal in ample quantity. Opal's mineral/chemical name is hydrated silicon dioxide where the most essential feature of opal is its color, clarity and carat weight. The varieties of opal base color include chocolate, white, yellow, orange, dark red, root beer, and caramel.

Opal is located within Oligocene-Miocene-age Trap series of flood basalt sequence with rhyolitic volcanic interbeds. The opal bearing rocks are found within the Ambalege Formation which consists of "transitional and subalkaline basalts with minor rhyolites and trachite eruptions". The opal comes from light grey, welded and glassy volcanic tuffs those crops out along the north face of Yita Ridge, Mezezo, North Shewa. The opals occur as nodules within a 9 to 15 feet thick zone along the base of the tuff.

The name opal probably is derived from the Indian Sanskrit name for precious stone; upala. It has been mined for centuries, at least since Roman times, in several areas of Czech Republic. Opal is reported to occur in central Ethiopia, in Amhara Regional State, Northern Shoa, around Menze and Gishe and Bulga zone, Mezezo and Sela Dingaywareda at: Yita, Koste Amba, Gift Bahir, Gift Gaymeda, Lay Beret, Wenze Midir, Gorat and Wedera Kebeles. These localities (Kebeles) are about 225 km NNE of Addis Ababa and 5 to 6 km NNW of Mezezo at the flank of Debrebrehan-Mehalmeda road. MoME, (2009)

Opal is a mineraloid gel which deposited at a relatively low temperature and may occur in the fissures of almost any kind of rock, being most commonly found with limonite, sandstone, rhyolite, and basalt (Mineral Development Share Company, 2005). The special characteristic of opal is their play-of color, a display of rainbow-like hues which change with the angle of observation. Opal is sensitive to heat, pressure and knocks and being affected by acid and alkaline. Opal has been a popular gem for many centuries possessing a very interesting structure.

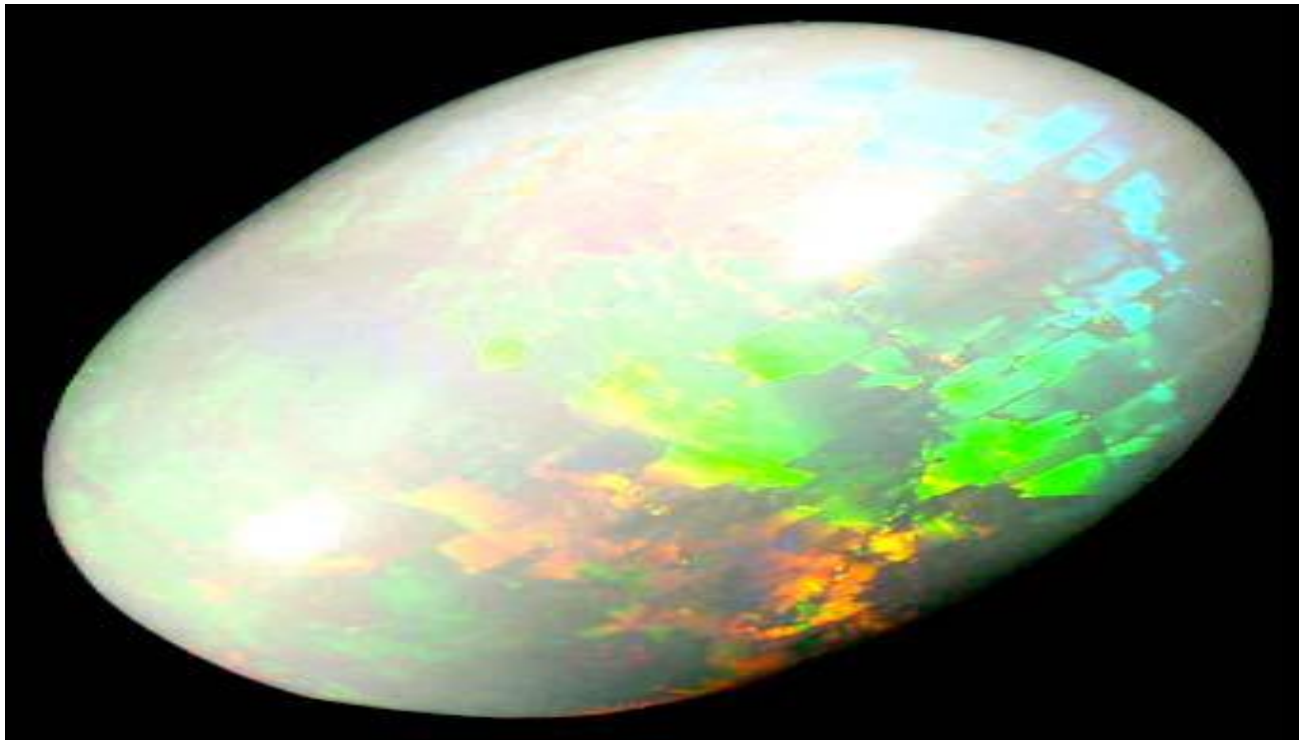


Figure 2.3: Oval cabochon of white precious opal with brilliant green-orange internal fire, from Menz Gishe District, Mezezo. Source: <http://www.johnbetts-fineminerals.com/>

According to official report of the sector, the total global gemstone exports has been USD 46.4 billion in 2002, USD 48.4 billion in 2003 and USD 57.9 billion in 2004. This suggests the presence of huge and growing demand in the market. Information obtained from Riftvally Gemstone Pvt. Ltd. Co. divulges that the annual sale of the firm is less than 1 million dollar per annum indicating how insignificant (less than 0.02%) the plant is compared to the world demand. On the other hand, studies show that Ethiopian gemstone such as opal is quite unique and different from more common Australian and Mexican opal. This confirms the presence of potential demand provided standard products are delivered to the market. DSA (October, 2008), Addis Ababa

Mining Opal is an important and measure source of income for increasing the wealth of rural population and providing opportunities for alternative livelihoods; contributing to poverty reduction. It has proved to be a primary source of employment for job seekers from various parts of the country who are relatively disadvantaged in the labor market (e.g. unskilled, low skilled, women, disabled, etc.);

–The No. of people entering to this sector is significantly increasing;

–Therefore, it is a source of job opportunity for a lot of people. (MoM, October, 2012)

2.1.5 Mining Policy and Legal Regime

2.1.5.1 Legal regime

Between 1974 and 1991 private investment was not allowed in the mineral sector rather government institutions were given the right to explore and develop the mineral wealth of the country. As a result of the political change that took place in 1991, a new market oriented economic policy was introduced in the country. In the mining sector, the government promulgated a new mining proclamation and mining income tax proclamations to encourage the participation of private capital in mineral prospecting, exploration and development activity.

The Mining Proclamation No. 52/1993, Mining Regulations No. 182/1994 and Income Tax proclamations No. 53/1993 were issued to attract private investment. The proclamations were consecutively amended so as to be competitive internationally and in favor of the investors.

The major issues addressed in the legislations are:- they invite private investment in all kinds of mineral operations, Provide exclusive license right (a one-year prospecting license, three years exploration licenses, with two renewals of one year each, and mining license for ten or twenty years with unlimited renewals of 10 years each), require adequate health and safety of employees and environmental protection and environmental impact study depending on type and nature of a project, guarantee the licensee's right to sell the minerals locally or abroad, provide exemption from customs duties and taxes on equipment, machinery and vehicles necessary for any mineral operations, guarantees the opening and operation of a foreign currency account in Ethiopia and retention of portion of foreign currency earning and remittance of profits, dividends, principal and interest on a foreign loan etc. out of Ethiopia, require relatively low royalties of 2 % (Mineral water and construction materials) to 5% (for precious stones) and valorem on production site, dispute settlement through negotiation and international arbitration, and provide loss carry forward for ten years.

Strategic Directions

In the Mining sector, the government main attention is to create conducive environment for private investors to participate in exploring and developing the mineral resources by gathering, compiling and interpreting basic geo-science information to deliver to the customers. Furthermore, it also designs policies, laws and new regulations that creates conducive environment for the development of the sector's economy. Besides, the expansion of private investment will enhance the mineral exploration and exploitation of high value minerals and hence increases the opportunities of finding additional deposits and increase the foreign currency earning of the country. Accordingly, by formulating enabling and competitive mining policies and laws that are taking into account the international situation and national interests within the development plan period has a paramount importance.

Objectives

Exploration and reserve estimation of coal industrial minerals (phosphate, potash, limestone etc) to increase agricultural production through improving soil productivity. Exploration and determination of ground water quality and quantity for domestic consumption and irrigation, exploration for import substituting minerals for construction and industrial input. Exploration and exploitation of gold, platinum, tantalum, gemstone etc. to increase foreign currency earning; exploration and exploitation of clean and renewable geothermal resources; substituting mineral imports of the country through increasing the volume and type of minerals production from both large and small scale licenses; promote the artisanal miners in producing huge mineral resource by improving the mining methods and facilitating market access to minerals, so that, the miner and the people of Ethiopia benefited from mineral resource; and, expand the geo-science data coverage of the country.

Implementing Strategies

- Enhancing of Geo-science Data Coverage and Mineral Exploration
- Mineral and Petroleum Investment Expansion
- Undertake Artisanal Mining and Marketing Promotion
- Undertake Geosciences and Energy Sector Research and Development (MOFED, September, 2010)

2.1.5.2 Mining Policy

The Mining laws of Ethiopia have been issued in 1993 and amended recently, in 1998 that they invite private sector investment and believed to be competitive and attractive as compared to other developing countries mining codes. Subsequent to the Mining code, the mining regulation was also issued in 1994 and makes all licensing and administration procedures as transparent as possible. Encouraging foreign and local mineral development investments have been shown since late 1990's. The total investment amount registered by the private sector to date is about 1.1

Billion US Dollars where by 95 % percent of it is direct foreign investment for the development of precious and industrial minerals. (MME, Addis Ababa, November, 2009)

The 2008 new mining policy of Ethiopia has also been prepared and the final draft is sent to the Council of Ministers for approval and following the approval of this policy it is intended to introduce some up to date concepts in the provisions mining legislations soon after.

Presently a number of junior exploration and world class mining companies are operating in Ethiopia for different mineral commodities. Apart from these there are wide ranges of future investment opportunities found in Ethiopia that hope to be of mutual benefit to the investors and the speedy socioeconomic development of the country.

The goal of the Government of Ethiopia is to facilitate the establishment of a large and diverse minerals industry in Ethiopia, which would underpin industrial development in the country, the well-being and employment of Ethiopian citizens in line with gender equality principle, the earning of foreign exchange and the reduction of poverty, and the establishment of a vibrant and profitable private sector based mining industry, inclusive of mineral beneficiation, taking all aspects of the sustainable utilization of the Mineral resources.(MME,Addis Ababa,November,2009)

2.1.6 Factors Affecting Economic Contribution of Minerals

Ethiopia has been one of the least exporter and the highest importer countries within the COMESA region. Ethiopia's participation in the regional economic integration schemes is visible, but not at the operation (business) level. Despite the fact that Ethiopia has a very long time mining history and endowed with a wide range of occurrences and mineral, the development of the sector is still at infant stage providing little contributions to the national economy. The major constraints/ challenges to the development of the extractive industry in Ethiopia that should be acted on are:-

- Lack of clear mining policy for long time until very recent time.
- The relatively recent history of integrated mineral exploration activities and availability of very limited and inadequate geoscience information.

- Lack of capacity to frequently revise, update, prepare and disseminate promotional documents.
- Lack of local and foreign investment towards the development of a strong mineral industry.
- Poor coordination between the industry and higher education institutions in the development of human resource requirement of the sector.
- Capital and technology intensive nature of the mineral operation activities and the lack of these inputs.
- More environmental degradation at artisanal mining sites.
- Lack of trained and skilled manpower to regulate and conduct mineral operation activities.
- Low level of development of infrastructures.
- Lack of coordination between mineral consuming industries and mineral developing institutions and even more, lack of awareness of the availability of numerous raw material resources.

In Ethiopia there is no abandoned or orphaned mine due to large scale operations that the Rehabilitation cost is as such big. However, the history of gold mining in Ethiopia dates back to Scriptural times. Substantial amount of placer gold deposits were discovered and mined by semi mechanized and artisanal methods in the Adola belt, southern Ethiopia, western Ethiopia, and south western Ethiopia as well as to some extent in northern region of the country. Also Artisanal miners are exploiting a number of placer gold occurrences in other different parts of the country. Base on some assessment studies the gold being mined and produced by artisanal miners all over the country is estimated to be more than 3 tonnes (3000 kilo grams) per year. In addition to this, placer gold deposit that could be mined by legally and formally established artisanal mining cooperatives is also available in western, southern and northern parts of the country. The placer mining environment is extensively dug that there are physical land degradation, open tunnels and pits, deforestation etc which is becoming issue for the environment. Ministry of Mines and Energy, (November, 2009) Addis Ababa

The negative impacts that mining activities have caused on the environment include, among others, deforestation, disruption of ecosystems, erosion of fertile soils due to flooding and water pollution. The mining explorations and operations being undertaken at present are generally causing adverse impacts on the environment. Among the factors causing such adverse impacts, the following can be mentioned:

_ Failures by some governmental organizations and enterprises to take into account the need for environmental protection and rehabilitation works.

_ Failure to organize and provide training to the artisanal miners who are carrying out their activities haphazardly.

_ Failure to issue standards regarding the discharge into the environment of both solid and liquid waste emanating from the mining industry.

_ The inadequate knowledge that those responsible for the implementation of the mining laws at both federal and regional level have regarding environmental protection and their failure to give attention to the issue.

_ Failure to provide adequate and up to date training to those producers and professionals involved in mineral development.

_ the lack of a regulatory system and of skilled human power in the mining sector, particularly at the regional level.

_ severe ecosystem disruptions caused by excavations made by artisanal and illegal miners. The excavations are also serving as ideal hatching grounds for vector borne diseases (malaria and other water borne diseases) because no rehabilitation of the excavated land is made to restore it to its former condition.

_ The emergence of small settlements stimulated by the proliferation of illegal mining activities around some mining areas and the consequent pressure on the natural resources in such areas;

_ The risk to the environment and the communities near mining undertakings created by inappropriate handling of chemicals used for mining purposes. Environment Protection Authority, (April, 2003)Addis Ababa, Ethiopia

The mining sector also holds substantial prospects for fostering development and economic growth. The sector is, also seen to be associated with a number of less desirable characteristics such as environmental impacts,socio-economic unrest, land-use conflict, financial instability(e.g. Dutch disease),and due to the large amounts of money involved, to be prone to corruption and illicit financial transactions. Measures are needed to address these problem areas, such as the development of a suitable regulatory regime, as well as the building of institutional capacity to implement such a regime.

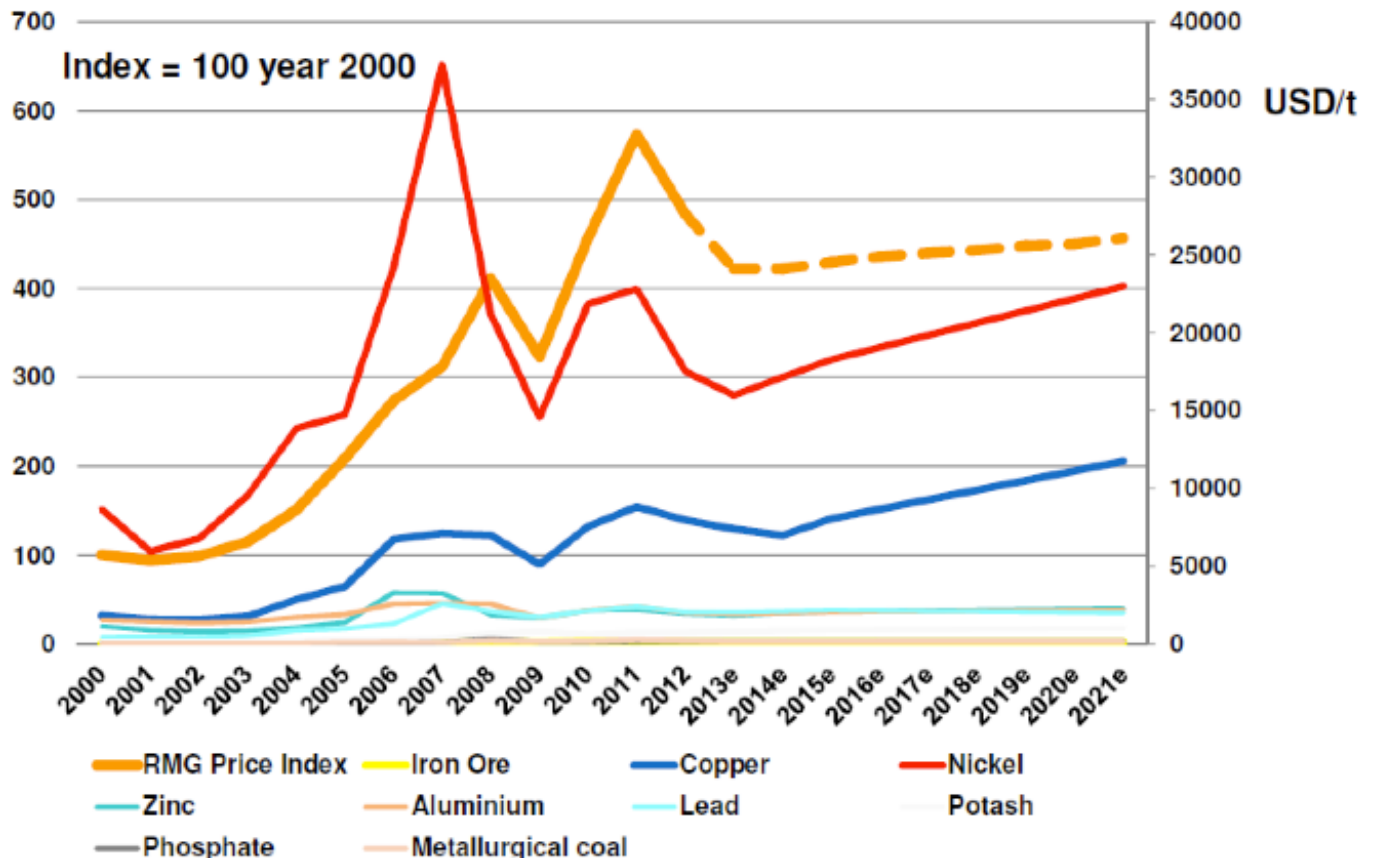


Figure 2.4. Variations in “metal price index” since 2000 (with 2000 given an index of 100). Source: Raw Materials Group, Stockholm (2013).

There is also need to recognize that (i) mineral resources are finite and unevenly distributed; (ii) they are location-specific and must be exploited where they occur; (iii) mineral wealth is

transitory (Short Lived); (iv) large-scale mining is often capital-intensive rather than labor-intensive; and (v) political, social, economic, cultural and environmental consequences and impacts of mineral exploitation are difficult to manage and overcome. It is therefore important to understand these attributes of mineral resources, the daunting public policy challenges that they pose, as well as the limitations that they impose on policy makers and other stakeholders. These challenges are linked to:

- Creating a viable, integrated and diversified mining industry throughout the value chain, and sustaining mineral wealth without compromising environmental, social and cultural considerations, and ensuring a regulatory framework that encourages mineral creation (the creation challenge).
- Investing transitory mineral revenues to ensure lasting wealth and deciding how much ought to be saved and how much should be invested and in what (the investment challenge).
- Distributing benefits from mining equitably, balancing and managing conflicting local and national-level concerns and interests and deciding what form the allocation should take to promote pro-poor growth (the distributional challenge).
- Ensuring sound systems of governance and a stable macroeconomic policy, which curbs rent seeking and corruption, addresses issues such as the Dutch Disease and externalities such as unstable commodity prices, and enhances public interest in wealth conservation (the governance and macro-economic challenges).

Most of the major issues to do with small-scale mining – including illegal trading, health and safety, environmental degradation, and taxation; but not labor matters – are addressed by the legislation however, more research is needed to determine how effective such measures have been. (Otto, 1996)

Several adverse social impacts of mining can be identified, which will include: ' Displacement of populations and resulting disruption of livelihoods;' Increased poverty—for example, through a degraded Environment on which community subsistence may depend;' Increased internal economic inequalities—for example, between men and women, between those with jobs at the mine and those without and between communities receiving royalty payments and other been

poverty and economic deprivation can lead to a general loss of development choices and options, eroding power over community decision-making, and a loss of control over the future of the community and its assets.

2.2 Empirical Literature

Debel Gemechu (2002) investigated the effect of exports on economic growth in Ethiopia for the period 1960/61-2000/01. The study aimed to review the policies undertaken by the different regimes in relation to export policies, and to empirically test the relationship between exports and economic growth using different techniques. In addition, attempts were also made to examine the supply (structural) constraints to export growth in Ethiopia. To test the export-economic growth relationship, this study used cointegration and error correction approaches in the regression analysis. Furthermore, a simultaneous equation model and the Granger causality test were conducted to examine the indirect effects of export on economic growth and to address a possible simultaneity problem that may arise because of the correlation between export and economic growth. The results from the cointegration and error correction models revealed that export significantly affected economic growth in the short run. In addition to its direct effect, export is also found to indirectly affect economic growth as evidenced from the simultaneous equation models. Furthermore, the causality test conducted indicated that causality runs from exports to economic growth. The key finding in this study is that export growth positively and significantly affected economic growth.

KirosHailu (2012) aimed at identifying the major determinants of export growth rate which have been a matter of argument in Ethiopia and Africa as a whole for a long period of time. The paper empirically examined the export growth rate and its major factors in the Ethiopian context using time series data for the period 1980-2010 by employing co integration and error correction model. Estimation result of the model shows that the relationship between the foreign price level, and terms of trade with the export growth rate are positive and negative which are statistically significant respectively gross domestic product also positive and significant but it is not strong. The result from the study is the foreign price level; Terms of trade and gross domestic product appear to be major determinants, whereas the real exchange rate and FDI have no statistically

significant effect on Ethiopia's export growth rate. Therefore to promote the export growth rate understanding and revising of the country's export structure, situations and other policies related to the sector is necessary.

Gezahegn Gebremedhin (2012) investigated the long-run effect of export volatility on GDP growth in Ethiopia. To address this research topic the paper has used extended Cobb-Douglas production growth model. The study have been used five variables inputs i. e, export of good and service, stock of capital, GDP and export volatility index and labor. The coverage of the time series data was from the year 1981 to 2011. According to the paper empirical finding result, the long run effect of export volatility seems to have negatively statistical effect on output growth on Ethiopia. As remedial the study suggests that the country should have to diversify its export commodities where it has comparative advantage. In addition, the country should also increase its trading partner countries.

Priscilla Kaela Kangwa, Dr Ransom Lekunze (2008) this study assesses the impacts of copper mining in Zambia, a country which is highly dependent on copper for foreign exchange earnings; the assessment was carried out through the use of a case study methodology which employed interviews and documents as instruments for data collection. It establishes that copper mining in Zambia has been a major contributor to the country's foreign exchange earnings however; the revenue from copper mining is externalized and consequently makes very minimal contribution to the local economy and people. It further establishes that though copper production has been on an increase and seen increased inflows in DFI, environmental management has not received the same attention and this has negatively impacted on the environment and the livelihood of the people of the Copperbelt Province. In addition to this, the social impacts on the local people arising from copper mining were examined and it was found that the mining industry has negatively impacted on the social support systems of the local people and that productive land which could ideally be used for other developmental projects has been allocated for copper mining. The study therefore, recommends reinforcement of institutional capabilities and competencies for proficient long-lasting planning for sustainable development.

Uyanga Gankhuyag(2013) studies discoveries and exploitation of mineral resources can increase economic growth and generate employment in developing countries. However, while the benefits of non-renewable resource extraction accrue mostly to owners of capital, the negative externalities on the environment can be disproportionately borne by people living in rural areas, such as nomadic pastoralists in Mongolia. This research uses panel data by soums (counties) in Mongolia to analyze the relationship between mining and livestock sectors. The study finds evidence that increase in mining is associated with higher mortality of livestock, indicating negative environmental externalities. More mining is also associated with more sales, or consumption of livestock, pointing to the positive effect of improved markets for herders.

A.G.N. Kitula studies the socio-economic and environmental impacts of mining in Geita District, Tanzania. In addition to sampling community perceptions of mining activities, the study prescribes interventions that can assist in mitigating the negative impacts of mining. Marked environmental and interrelated socio-economic improvements can be achieved within regional artisanal gold mines if the government provides technical support to local operators, regulations are improved, and illegal mining activity is reduced. Although there is growing awareness of the importance of sound environmental management amongst mining stakeholders and Government officials in Tanzania, mitigation strategies are possibly offset by conflicts of interest on both political and economic grounds at central and local levels. Data for the case study were obtained from both primary and secondary sources. Primary data were obtained using a combination of methods, including participatory rural appraisal (PRA) tools and techniques, participant observations, and informal and formal surveys. Pair-wise ranking was first performed to help identify problems caused by mining activities as experienced by the local people in the study area, and to rank socio-economic activities based upon their contribution to household livelihood. Frequencies, percentages and means are used in the discussion. Analysis of variance(ANOVA) and cross tabulations involving chi-square tests were used to test statistical differences in various variables between mining and non-mining communities.

CHAPTER THREE

METHODOLOGY OF THE STUDY

This chapter deals with the research design and techniques, Data sources, data collection and data analysis method it discusses the universe of the study, tools was used for data collection and data analysis.

3.1 Research Design and techniques

The research design used in this study is Descriptive approach. It used to describe characteristics of my study. It is more formal/ structured in terms of stating research hypothesis and investigative questions. It serves to achieve a variety of research objectives: To estimate the proportions of a population that have particular characteristics and to discover association/correlation among different variables.

Additional we was saw economic performance of gold, tantalum and opal also be focusing on causal relationships at a small degree. It allows causal inferences to be made; seeks to identify cause-and-effect relationships. The determination of the trend analysis and growth accounting techniques was apply to see the trend analysis of gold, tantalum and opal export and its economic contribution.

The study area of my thesis focused on Ethiopia. It focuses on the assessment of economic Contribution of major mineral resources in Ethiopia from the year 1994/95 to 2013/14.

3.2 Data Source and Data Collection Method

The study was requiring Reliable information with reference to Gold, Tantalum and Opal Export and its trend analysis. Both qualitative and quantitative data was generated from Secondary sources of data was used in this study. Secondary data for this study was obtained from reports of Ministry of finance and Economic Development, Ministry of Mines and Energy, National bank Export Performance of Gold, Tantalum and Opal (1994-2014), Central Static Authorities and other published and unpublished materials.

This study used annual data of Ethiopia and the variables included in the analysis are Gross Domestic Product (GDP), export of Gold, Tantalum and Opal (X) and Exchange Rate.

3.3 Method of Data Analysis and Estimation Technique

To be analysis export performance of major export minerals the export equation in this study was estimated using time series data for the period 1994/95 – 2013/14. Using models of Cobb–Douglas Production function and OLS estimation Method this paper was the contribution of major minerals export to the Ethiopian economy. The data consist of different facts on Gold, Tantalum and Opal export earnings in different years. The method of analysis for the investigation under study is mainly dependent on descriptive approach using relative figures, trends, and charts that was tabulated in summarizing forms.

A Linear Regression model has been employed to study the relationship between variables empirically. Thus, the OLS analysis is applied to analyze factors that influence Minerals export, moreover, the unit roots test and integration test applied to check stationary of the time series data, these different sources are used for comparison, cross checking and more insights in the analysis. The data consist of information on quantity terms for Minerals production, and supply.

The empirical frameworks of the model take the following form

$$\text{Real GDPY}_t = A + B_1 \text{EX} + B_2 \text{G} + B_3 \text{T} + B_4 \text{O} + \text{Et} \quad (3.1)$$

Where y_t = mining output export

RGDP = real gross domestic product

EX = Foreign Exchange Rate

G = Gold

T = Tantalium

O = Opal

Et = White Noise Error Term

The base regression presents the effect of mining to economic growth generally in Ethiopia. The real gross domestic product is dependent variable that is expected to be affected by the export of gold, tantalium, opal and the variable of exchange rate. Those sign is expected to be positive in relation to their contribution to economic growth and development.

3.4 Model Specification

In the study of the contributions of major minerals export to the Ethiopian economy, a number of variables that has important in the analysis were considered. However, the limited number of available observations often necessities the use of simple models that capture the basics of the relationships of interest. The assessment of the effect of export of major Minerals on economic growth is carried out in a production function and ordinary least square (OLS) Estimation Method.

$$Y_t = f(XG \ XT \ XO \ EX) \quad (3.2)$$

Where, Y_t is aggregate real output mineral Export, XG XT and XO denote exports of Gold, Tantalum and Opal Respectively, EX is exchange rate and Gold, Tantalum and Opal export value (Y) in \$ dollar is a dependent variables whereas: Gold export volume (XG), Tantalum export volume (XT), Opal export volume (XO) and Minerals exchange rate (Ex) are independent (explained) variable.

3.4.1 Stochastic Process

A random or stochastic process is a collection of random variables ordered in time. Y denote a random variable, if it is discrete, we denoted it as Y_t . a stochastic process is said to be stationary if its mean and variance are constant over time and the value of the covariance between the two time periods depends only on the distance or gap or lag between the two time periods and not the actual time at which the covariance is computed. If a time series is stationary, its mean, variance, and auto covariance (at various lags) remain the same no matter at what point we measure them; that is, they are time invariant.

3.4.2 Stationary and Non Stationary Series

A time series is a set of observations on the values that a variable takes at different times. Such data may be collected at regular time intervals. A time series is stationary if its mean and variance do not vary systematically over time. In short, if a time series is stationary, its mean, variance, and auto covariance (at various lags) remain the same no matter at what point we measure them; that is, they are time invariant. Such a time series will tend to return to its mean (called mean reversion) and fluctuations around this mean (measured by its variance) will have broadly constant amplitude. If a time series is not stationary in the sense just defined, it is called a non-stationary time series (keep in mind we are talking only about weak stationary). In other words, a non-stationary time series will have a time varying mean or a time-varying variance or both.

3.4.3 Unit Root Test

A test of stationarity (or non-stationarity) that has become widely popular over the past several years is the **unit root test**.

$$Y_t = \rho Y_{t-1} + u_t \quad -1 \leq \rho \leq 1 \quad (3.3)$$

Where u_t is a white noise error term we know that if $\rho = 1$, that is, in the case of the unit root, (3.2) becomes a random walk model without drift, which we know is a non-stationary stochastic process. Therefore, why not simply regress Y_t on its (one period) lagged value Y_{t-1} and find out if the estimated ρ is statistically equal to 1? If it is, then Y_t is non-stationary. This is the general idea behind the unit root test of stationarity.

$$Y_t - Y_{t-1} = \rho Y_{t-1} - Y_{t-1} + u_t$$

$$= (\rho - 1) Y_{t-1} + u_t$$

$$\Delta Y_t = \delta Y_{t-1} + u_t$$

All we have to do is to take the first differences of Y_t and regress them on Y_{t-1} and see if the estimated slope coefficient in this regression ($=\delta$) is zero or not. If it is zero, we conclude that Y_t is non-stationary. But if it is negative, we conclude that Y_t is stationary.

It is important to find out if a time series possesses a unit root there are several tests of unit root, that is, several tests of stationarity.

In the literature the tau statistic or test is known as the Dickey–Fuller (DF) test, in honor of its discoverers. Interestingly, if the hypothesis that $\delta = 0$ is rejected (i.e. the time series is stationary), we can use the usual (Student’s) t test. The DF test is estimated in three different forms, that is, under three different null hypotheses.

Y_t is a random walk: $\Delta Y_t = \delta Y_{t-1} + u_t$ (3.4)

Y_t is a random walk with drift: $\Delta Y_t = \beta_1 + \delta Y_{t-1} + u_t$ (3.5)

Y_t is a random walk with drift

around a stochastic trend: $\Delta Y_t = \beta_1 + \beta_2 t + \delta Y_{t-1} + u_t$ (3.6)

If the computed absolute value of the tau statistic ($|\tau|$) exceeds the DF or MacKinnon critical tau values, we reject the hypothesis that $\delta = 0$, in which case the time series is stationary. On the other hand, if the computed $|\tau|$ does not exceed the critical tau value, we do not reject the null hypothesis, in which case the time series is nonstationary.

In conducting the DF test it was assumed that the error term u_t was uncorrelated. But in case the u_t are correlated, Dickey and Fuller have developed a test, known as the **augmented Dickey–Fuller (ADF)** test. This study was using this test and Granger causality test.

This test is conducted by “augmenting” the preceding three equations by adding the lagged values of the dependent variable ΔY_t . To be specific, suppose we use (3.2). The ADF test here consists of estimating the following regression:

$$\Delta y_t = B_1 + B_2 t + \delta Y_{t-1} + \sum_{i=1}^m \alpha_i \Delta Y_{t-i} + \varepsilon_t \quad 3.6$$

Engle–Granger (EG) or Augmented Engle–Granger (AEG) Test

Engle–Granger (EG) or Augmented Engle–Granger (AEG) Test: We already know how to apply the DF or ADF unit root tests. All we have to do is estimate a regression, obtain the residuals, and use the DF or ADF tests. There is one precaution to exercise, however. Since the estimated $\hat{\beta}_2$ are based on the estimated cointegrating parameter β_2 , the DF and ADF critical significance values are not quite appropriate. Engle and Granger have calculated these values, which can be found in the references. Therefore, the DF and ADF tests in the present context are known as Engle–Granger (EG) and augmented Engle–Granger (AEG) tests. However, several software packages now present these critical values along with other outputs.

3.4.4 Cointegration Test

Two variables are cointegrated. Economically speaking, two variables will be cointegrated if they have a long-term, or equilibrium, relationship between them. In the language of cointegration theory, a regression such as known as a cointegrating regression and the slope parameter is known as the cointegrating parameter. The concept of cointegration can be extended to a regression model containing regressors. In this case we had cointegrating parameters.

A number of methods for testing cointegration have been proposed in the literature. We consider here simple methods the DF or ADF unit root test on the residuals estimated from the cointegrating regression.

Cointegration and Error Correction Mechanism (ECM) An important theorem, known as the Granger representation theorem, states that if two variables Y and X are cointegrated, then the relationship between the two can be expressed as ECM. To see what this means, now consider the following model:

$$\Delta y_t = \alpha_0 + \alpha_1 \Delta x_t + \alpha_2 u_{t-1} + \varepsilon_t \quad 3.8$$

where Δ as usual denotes the first difference operator, ϵ_t is a random error term, and $u_{t-1} = (y_{t-1} - \beta_1 - \beta_2 x_{t-1})$, that is, the one-period lagged value of the error from the cointegrating regression ECM equation (3.7) states that ΔY depends on ΔX and also on the equilibrium error term. If the latter is nonzero, then the model is out of equilibrium. Suppose ΔX is zero and u_{t-1} is positive. This means Y_{t-1} is too high to be in equilibrium, that is, Y_{t-1} is above its equilibrium value of $(\alpha_0 + \alpha_1 X_{t-1})$. Since α_2 is expected to be negative, the term $\alpha_2 u_{t-1}$ is negative and, therefore, ΔY_t will be negative to restore the equilibrium. That is, if Y_t is above its equilibrium value, it will start falling in the next period to correct the equilibrium error; hence the name ECM.

CHAPTER FOUR

RESULTS AND DISCUSSION

4.1 RESULTS

4.1.1 Economic Growth and Export of Mineral Resources in the long run

4.1.1.1 Test for stationary

Since the study involve time series analysis ,it is mandatory that stationary of the data be tested The stochastic process is said to be stationary if the mean and variance are constant regardless of the actual time taken .stationary test make sure that there will be exist a spurious result which is often forward in non-stationary time series . If the data is non-stationary, forecasting the result to other time period may not have any practical significance (Gujarat, 2004)

The AugumentedDicky Fuller Test

The ADF test for the variables arenon-stationary since ADF calculated is greater than the critical value at difference level of significance implying the taste is non-stationary.

Test for Stationarity in the real GDP

```
. dfuller gdp, lags(0)
```

```
Dickey-Fuller test for unit root          Number of obs   =      19
```

Interpolated Dickey-Fuller				
Test	1% Critical	5% Critical	10% Critical	
Statistic	Value	Value	Value	
Z(t)	-3.750	-3.000	-2.630	2.439

MacKinnon approximate p-value for Z(t) = 0.9990

Table 4.1: ADF Stationarity Test

It can be observed that the real GDP is non-stationary since the calculated value is greater than the Critical values. non-stationarity indicate that individual time series are not stationary the linear combination of GDP become cointegrated this implies it have long term or equilibrium relation between them and the real GDP don't have constant variance and mean this indicated the GDP of the country by any means fluctuate from year to year.

Test for stationaiarity of Gold export

It can be observed that the gold export is found to be non-stationary when tested by using Augmented Dicky–Granger (ADF) due to the fact that the calculated value is greater than the critical value at the given level of significance which implies that gold export will tend to have long run relationship between export of gold and growth of national income. The result was shows that Export of Gold has magnify impact on the country National Economy and there is no constant record of gold export from one year to another year the value of export is difference.

Test for stationarity of opal and tantalium

It can be observed that the opal and tantalum is found to be non-stationary when tested by using the familiar test ADF due to the fact that calculated value is greater than critical value. Moreover it shows that the existence of volatility of export of the tantalum and opal because of difference reason the record of export of opal and tantalum is not constant.

. dfuller opal, lags(0)

Dickey-Fuller test for unit root Number of obs = 19

Interpolated Dickey-Fuller				
Test	1% Critical	5% Critical	10% Critical	
Statistic	Value	Value	Value	
Z(t)	-0.356	-3.750	-3.000	-2.630

MacKinnon approximate p-value for Z(t) = 0.9172

. dfuller tantalium, lags(0)

Dickey-Fuller test for unit root Number of obs = 19

Interpolated Dickey-Fuller				
Test	1% Critical	5% Critical	10% Critical	
Statistic	Value	Value	Value	
Z(t)	-1.121	-3.750	-3.000	-2.630

MacKinnon approximate p-value for Z(t) = 0.7066

Table 4.2: ADF Stationarity Test

In general the stationary test advocate the existence of volatility among all variable included the regression thus require and also the result shows that Gold Export have more intensified relation the Country national income compare to opal and tantalum export. the magnitude of mineral in the long run are much higher and significant than the short-run impacts indicating that the

impacts of change in those variables on economic growth are much stronger in the long-run than in the short run. Though individual time series are not stationary, a linear combination of these variables could be stationary (i.e., they may be cointegrated). Economically speaking, two variables will be cointegrated if they have a long-term, or equilibrium, relationship between them. In this study GDP, Export of Gold, Opal and Tantalum and Exchange Rate are found to be cointegrated which confirms the existence of long run relation among the variables.

4.1.1.2 Unit Root Test

There are several tests of stationarity and non stationarity this study select unit root test for additionally to impudence of the stationarity of the variables.

Test for unit root for Gold

The test stastics indicate that the calculated value of ADF is greater than the critical value which implies the existence of non-stationarity which indicates a liner combination of this variables become stationary indicating the existence of long run cointegrating relationship between the gold export and real GDP.

Null Hypothesis: GOLD has a unit root				
Exogenous: Constant				
Lag Length: 4 (Automatic - based on SIC, maxlag=4)				
			t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic			2.212454	0.9997
Test critical values:	1% level		-3.959148	
	5% level		-3.081002	
	10% level		-2.681330	
*MacKinnon (1996) one-sided p-values.				
Warning: Probabilities and critical values calculated for 20 observations and may not be accurate for a sample size of 15				
Augmented Dickey-Fuller Test Equation				
Dependent Variable: D(GOLD)				
Method: Least Squares				
Sample (adjusted): 6 20				
Included observations: 15 after adjustments				
Variable	Coefficient	Std. Error	t-Statistic	Prob.
GOLD(-1)	2.414560	1.091349	2.212454	0.0542
D(GOLD(-1))	-1.210268	1.235490	-0.979585	0.3529
D(GOLD(-2))	-3.607293	1.188851	-3.034269	0.0141
D(GOLD(-3))	-2.539199	1.268596	-2.001581	0.0764
D(GOLD(-4))	-2.492534	1.274333	-1.955953	0.0822
C	-381732.1	330118.3	-1.156350	0.2773
R-squared	0.880805	Mean dependent var		569859.4
Adjusted R-squared	0.814585	S.D. dependent var		1444028.
S.E. of regression	621795.7	Akaike info criterion		29.80779
Sum squared resid	3.48E+12	Schwarz criterion		30.09101
Log likelihood	-217.5584	Hannan-Quinn criter.		29.80477
F-statistic	13.30128	Durbin-Watson stat		2.176426
Prob(F-statistic)	0.000618			

Table 4.3: ADF unit root test

Test for unit root for opal

The test statistics indicate that the calculated value of ADF is greater than the critical value which implies the existence of non-stationarity. Non-stationarity indicating that the variable don't have constant variance and mean which means the export of opal fluctuate from year to year because this minerals are begin to export recently and the country didn't adapt the export environment easily within this year's because of this and others reason the volume of export of opal fluctuate from time to time.

Null Hypothesis: OPAL has a unit root				
Exogenous: Constant				
Lag Length: 4 (Automatic - based on SIC, maxlag=4)				
			t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic			4.060940	1.0000
Test critical values:	1% level		-3.959148	
	5% level		-3.081002	
	10% level		-2.681330	
*MacKinnon (1996) one-sided p-values.				
Warning: Probabilities and critical values calculated for 20 observations and may not be accurate for a sample size of 15				
Augmented Dickey-Fuller Test Equation				
Dependent Variable: D(OPAL)				
Method: Least Squares				
Sample (adjusted): 6 20				
Included observations: 15 after adjustments				
Variable	Coefficient	Std. Error	t-Statistic	Prob.
OPAL(-1)	5.182266	1.276125	4.060940	0.0028
D(OPAL(-1))	-5.353443	1.574715	-3.399626	0.0079
D(OPAL(-2))	-5.434833	1.218753	-4.459338	0.0016
D(OPAL(-3))	-5.636736	1.359420	-4.146427	0.0025
D(OPAL(-4))	-1.904946	1.240862	-1.535179	0.1591
C	1634.513	2440.217	0.669823	0.5198
R-squared	0.943823	Mean dependent var		7230.935
Adjusted R-squared	0.912614	S.D. dependent var		26861.56
S.E. of regression	7940.575	Akaike info criterion		21.08653
Sum squared resid	5.67E+08	Schwarz criterion		21.36975
Log likelihood	-152.1490	Hannan-Quinn criter.		21.08352
F-statistic	30.24178	Durbin-Watson stat		2.554117
Prob(F-statistic)	0.000023			

Source: Own estimation using Eviews

Table 4.4: ADF unit root test

Test for unit root for tantalium

The test statistics indicate that the calculated value of ADF is greater than the critical value which implies the existence of nonstationarity indicating the fluctuation of mean and variance. Tantalum was recently exploited minerals but it is older than opal but the method of exploitation and the exporter capacity to compete with other country exporter is less in Ethiopia because of this and another reasons the volume of export of tantalum is not constant.

Null Hypothesis: OPAL has a unit root				
Exogenous: Constant				
Lag Length: 3 (Automatic - based on SIC, maxlag=4)				
			t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic				
Test critical values:			1.996962	0.9995
	1% level		-3.920350	
	5% level		-3.065585	
	10% level		-2.673459	
*MacKinnon (1996) one-sided p-values.				
Warning: Probabilities and critical values calculated for 20 observations and may not be accurate for a sample size of 16				
Augmented Dickey-Fuller Test Equation				
Dependent Variable: D(OPAL)				
Method: Least Squares				
Sample (adjusted): 5 20				
Included observations: 16 after adjustments				
Variable	Coefficient	Std. Error	t-Statistic	Prob.
OPAL(-1)	2.336381	1.169967	1.996962	0.0712
OPAL(-1))	-2.815868	1.320295	-2.132757	0.0563
DOPAL(-2))	-3.301905	1.315383	-2.510224	0.0290
DOPAL(-3))	-4.390012	1.883629	-2.330614	0.0398
C	13845.91	28730.73	0.481920	0.6393
R-squared	0.537744	Mean dependent var		5401.368
Adjusted R-squared	0.369651	S.D. dependent var		107146.2
S.E. of regression	85068.21	Akaike info criterion		25.79060
Sum squared resid	7.96E+10	Schwarz criterion		26.03203
Log likelihood	-201.3248	Hannan-Quinn criter.		25.80296
F-statistic	3.199083	Durbin-Watson stat		2.027736
Prob(F-statistic)	0.056792			

Table 4.5: ADF unit root test

Source: Own estimation using Eviews

Test for unit root for real GDP

The test statistics indicate that the calculated value of ADF is greater than the critical value which implies the existence of nonstationarity indicating the existence of instability. The reason for this is the way exploitation very backward, the method of the country licensed for exporter of minerals is not flexible and the area is recently privatized due to this and other reason the impact

of export of minerals to GDP is fluctuate but ceteris paribus minerals export have great impact on GDP while in the short run Mineral export has an insignificant impact on economic growth in Ethiopia this could be due to that Mineral export is a long run phenomenon that does not show its effect on economic growth immediately.

Null Hypothesis: R_GDP has a unit root				
Exogenous: Constant				
Lag Length: 0 (Automatic - based on SIC, maxlag=7)				
			t-Statistic	Prob.*
Augmented Dickey-Fuller test statistic			11.44524	1.0000
Test critical values:	1% level		-3.679322	
	5% level		-2.967767	
	10% level		-2.622989	
*MacKinnon (1996) one-sided p-values.				
Augmented Dickey-Fuller Test Equation				
Dependent Variable: D(R_GDP)				
Method: Least Squares				
Date: 06/08/15 Time: 15:21				
Sample (adjusted): 2 30				
Included observations: 29 after adjustments				
Variable	Coefficient	Std. Error	t-Statistic	Prob.
R_GDP(-1)	0.131861	0.011521	11.44524	0.0000
C	-11979.33	3008.067	-3.982402	0.0005
R-squared	0.829107	Mean dependent var		18094.98
Adjusted R-squared	0.822778	S.D. dependent var		18729.82
S.E. of regression	7884.841	Akaike info criterion		20.84974
Sum squared resid	1.68E+09	Schwarz criterion		20.94404
Log likelihood	-300.3213	Hannan-Quinn criter.		20.87928
F-statistic	130.9935	Durbin-Watson stat		1.540369
Prob(F-statistic)	0.000000			

Table 4.6: ADF unit root test

Source: Own estimation using Eviews

Generally the unit root test statics for all variable included in the model indicate that the existence of volatility of the independent variables and the dependent variable. this show the export of minerals and it is contribution GDP is fluctuate from year to years they have not constant records in the country but they have their on contribution Gold have huge contribution more than Opal and Tantalum because the record of Gold export is extensive. Generally in the

long run the country gives grate incentive for the export of the above minerals because from the above export the country can get huge foreign currency and economic growth.

4.1.1.3 Granger causality test

As the test statstics below indicate that all variable except tantalium which granger cause exchange rate and growth of GDP show relationship of causality in which the other explanatory variable is not in the short run.

Pairwise Granger Causality Tests			
Sample: 20			
Lags: 1			
Null Hypothesis:	Obs	F-Statistic	Prob.
GDP does not Granger Cause EXCHANGE	19	7.73984	0.0133
EXCHANGE does not Granger Cause GDP		1.41402	0.2517
GOLD does not Granger Cause EXCHANGE	19	4.09874	0.0599
EXCHANGE does not Granger Cause GOLD		7.64537	0.0138
OPAL does not Granger Cause EXCHANGE	19	11.8684	0.0033
EXCHANGE does not Granger Cause OPAL		16.3658	0.0009
TANTALIUM does not Granger Cause EXCHANGE	19	0.12750	0.7257
EXCHANGE does not Granger Cause TANTALIUM_OPAL		0.27445	0.6075
GOLD does not Granger Cause GDP	19	2.10636	0.1660
GDP does not Granger Cause GOLD		5.16426	0.0372
OPAL does not Granger Cause GDP	19	2.02415	0.1740
GDP does not Granger Cause OPAL		5.75158	0.0290
TANTALIUM_OPAL does not Granger Cause GDP	19	0.07955	0.7815
GDP does not Granger Cause TANTALIUM_OPAL		1.42928	0.2493
OPAL does not Granger Cause GOLD	19	29.8636	5.E-05
GOLD does not Granger Cause OPAL		48.2134	3.E-06

Table 4.7: AEG unit root test

Source: Own estimation using Eviews

The existence of granger causality implies the effect of exchange rate in explaining variation in the export of tantalium. Moreover the granger causality test indicate that gold ,tantalium , opal and exchange rate and GDP were not found to cause variation in real gross domestic product. In the long run all variables have a cumulative effect for each other's causality that means in the longrun mineral export Granger cause economic growth Exchange rate Granger cause economic growth which confirms long run bidirectional causality that runs among the variables (GDP, Mineral Export and Exchange Rate). However in the short run there is no causality among variables. The result shows the importance of mineral export in influencing economic growth, at the same time the role of growth in enhancing mineral export of Ethiopia.

4.1.1.4 Vector Error Correction Model

All variables on this study have short run dynamics but they have cointegration which is tested by vector autoregression. this method used for correct the error and to check the variables cointegration. the variables have long run equilibrium which indicates all variables are cointegrated based on this model. this model used for additional test of the cointegration of Export of Opal, Export of Tantalum, Export of Gold, GDP and Exchange Rate which implies in the long run they have cointegration but in the short run they have dynamics because export and GDP are long run variables.

Vector Error Autoregression Estimates				
	EXCHANGE	GOLD	OPAL	TANTALIUM
EXCHANGE(-1)	2.094392 (0.27750) [7.54745]	1064449. (390632.) [2.72494]	623.0133 (5610.28) [0.11105]	-8692.486 (27057.4) [-0.32126]
EXCHANGE(-2)	-1.246026 (0.27973) [-4.45439]	-1216419. (393776.) [-3.08911]	-2828.393 (5655.44) [-0.50012]	-11996.79 (27275.1) [-0.43984]
GOLD(-1)	6.39E-08 (2.7E-07) [0.23939]	0.980832 (0.37578) [2.61015]	0.021239 (0.00540) [3.93536]	0.125774 (0.02603) [4.83220]
GOLD(-2)	-3.52E-07 (4.8E-07) [-0.73917]	0.451561 (0.67096) [0.67301]	0.008162 (0.00964) [0.84703]	-0.045963 (0.04647) [-0.98899]
OPAL(-1)	-1.10E-05 (1.4E-05) [-0.81191]	-51.54898 (19.1476) [-2.69218]	-0.213898 (0.27500) [-0.77781]	-4.885016 (1.32627) [-3.68326]
OPAL(-2)	1.52E-05 (2.3E-05) [0.66079]	-21.41699 (32.3071) [-0.66292]	-1.132726 (0.46400) [-2.44123]	-0.727905 (2.23777) [-0.32528]
TANTALIUM_OPAL(-1)	-5.87E-06 (3.2E-06) [-1.83742]	1.545383 (4.49757) [0.34360]	-0.051346 (0.06459) [-0.79489]	-0.308637 (0.31153) [-0.99072]
TANTALIUM_OPAL(-2)	6.04E-06 (2.7E-06) [2.26104]	10.13548 (3.75979) [2.69576]	-0.001537 (0.05400) [-0.02846]	-0.267169 (0.26042) [-1.02590]
GDP	5.85E-06 (1.9E-06) [3.06642]	3.736190 (2.68478) [1.39162]	0.049221 (0.03856) [1.27650]	0.765016 (0.18596) [4.11380]
R-squared	0.997583	0.994528	0.993577	0.972911
Adj. R-squared	0.995435	0.989664	0.987868	0.948832
Sum sq. resids	0.689995	1.37E+12	2.82E+08	6.56E+09
S.E. equation	0.276886	389773.0	5597.949	26997.87
F-statistic	464.4206	204.4582	174.0308	40.40509
Log likelihood	3.812097	-251.0223	-174.6454	-202.9658
Akaike AIC	0.576434	28.89137	20.40504	23.55176
Schwarz SC	1.021620	29.33656	20.85023	23.99694
Mean dependent	10.69059	2605887.	28149.60	78670.03
S.D. dependent	4.098295	3833770.	50823.17	119352.5
Determinant resid covariance (dof adj.)		1.16E+26		
Determinant resid covariance		7.25E+24		
Log likelihood		-617.3451		
Akaike information criterion		72.59390		
Schwarz criterion		74.37465		

Table 4.8: Vector Error Autoregression Test

Source: Own estimation using Eviews

In the short run, change in economic growth is positively and significantly affected by last year growth and negatively and significantly affected by Exchange rate, Export of Gold, Opal and Tantalum. The base year growth matters for the current year economic improvement and become the base for the enhancement of its components for the years to come. The lagged error correction term (ECT-1) included in the model is negative and significant indicating speed of adjustment towards equilibrium and indicates the existence of a long-run causality between the variables of the study. However the effect of export of minerals is insignificant in the short run.

4.1.2 Trends of Mineral Export

The graphs below indicate that the mineral export trends have shown progressive improvement for the study period ranging from 1994 to 2012 and declining export trend -2012/14 due to global macroeconomic instability and rapidly growth export in terms of value and volume of export.

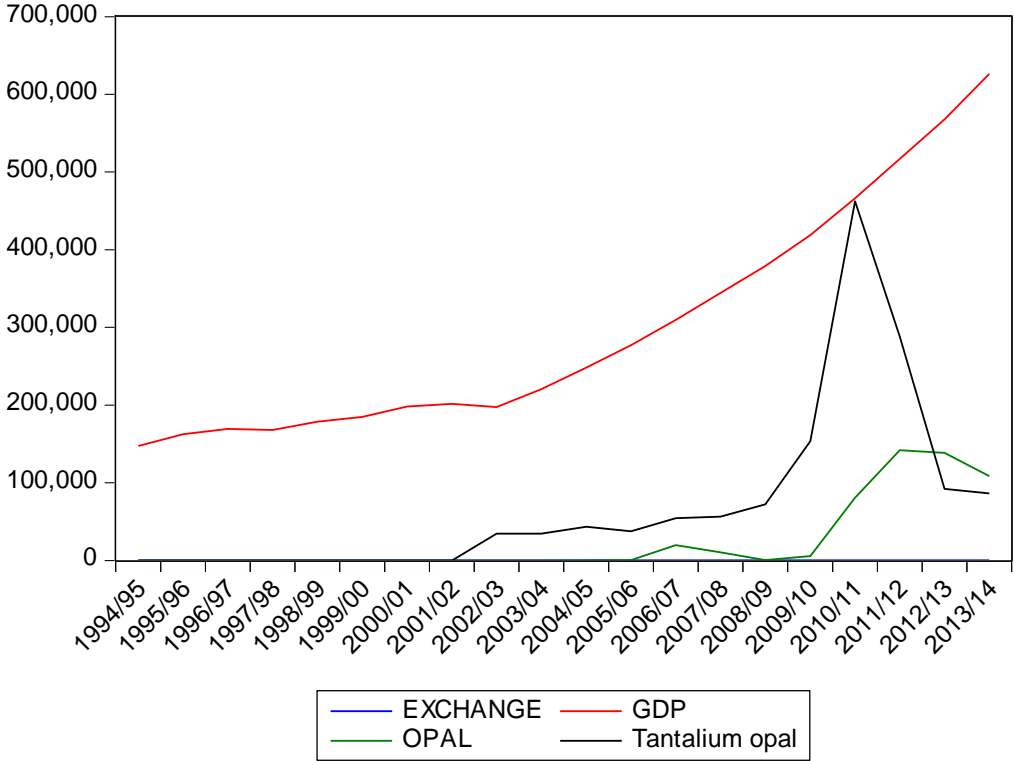


Figure 4.1: Trend Analysis of Mineral Export

Source: Own Computation from National Bank Data

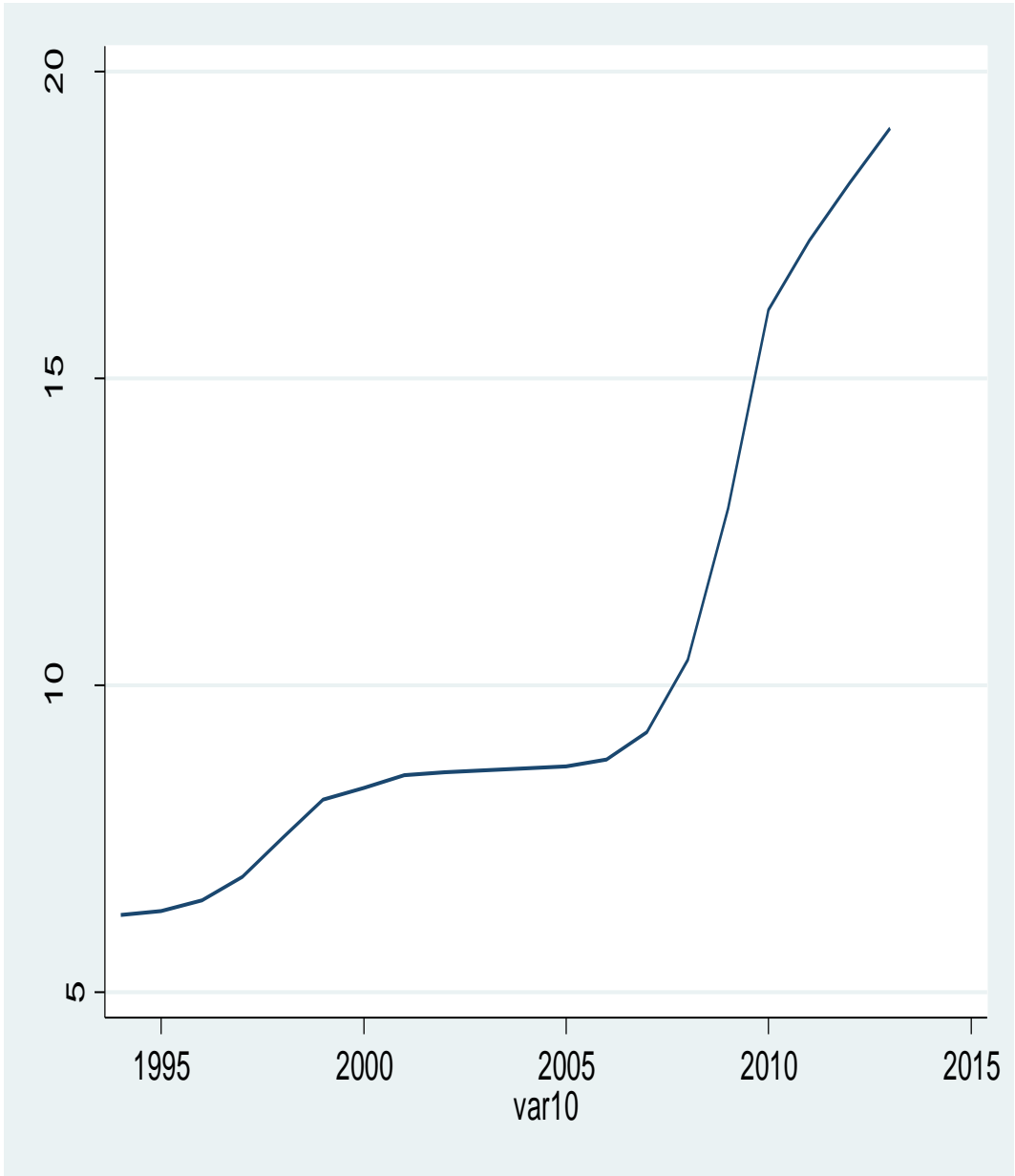


Figure 4.2: Trend Analysis of Mineral Export

Source: own Computation from national bank estimation

The above graph indicate that the exchange rate of the currency has shown substantial increment interms of USD due to rapid growing on the economy of Ethiopia and the increased import and export trends of goods and service.this implies if the export of minerals increase which helps the

country to get higher foreign currency this helps the country to be balanced their trade by using their foreign currency.

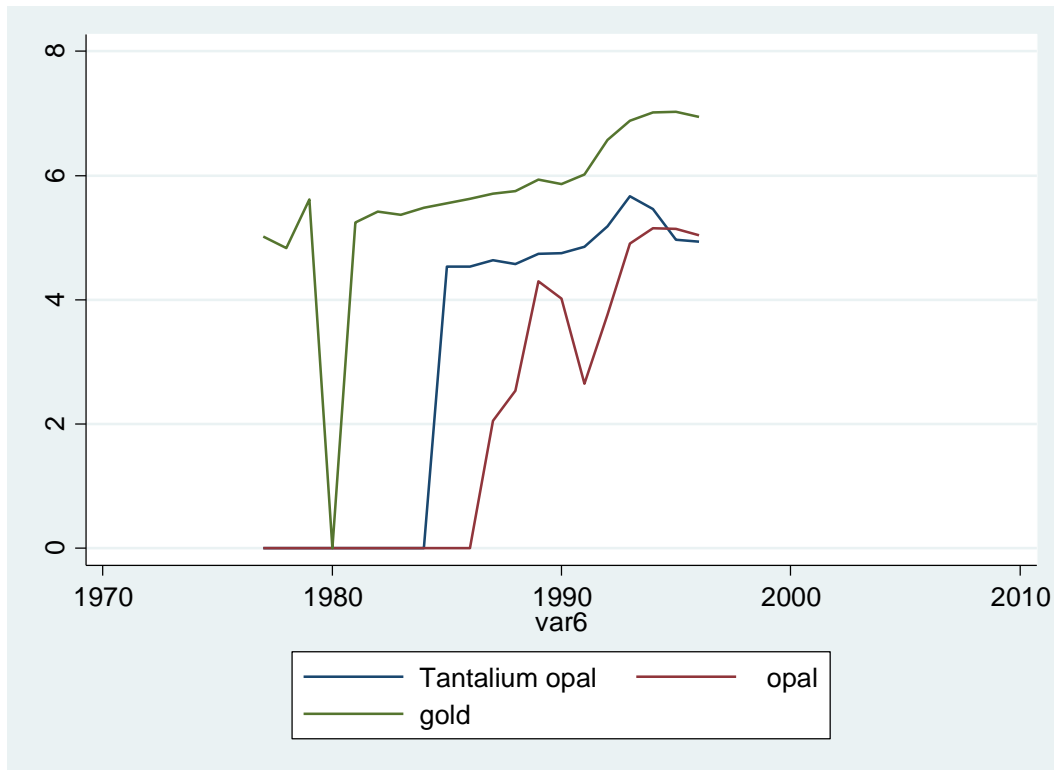


Figure 4.3: Performance of Mineral Export

Source: own computation from National Bank Data

The evidence obtained from the analysis portray that even though mineral export is a recent activities as compared to export of Agricultural output such as oil seed, coffee pulses & cereals, it is found that the performance of mineral export is showing progress when evaluated in terms of volume of export, value of the export and the share of export of mineral from total export of the country.

There is gradual and continuous advancement in the value, volume & share of mineral export from the total export of the country.

In the study year between 1994/95 up to 2001/02 the all share of mineral export (100%) covered by Gold but in the 2002/03 up to 2003/04 the share of Gold Export shift to Opal and the record indicate 92% of mineral export covered by Gold and 8% covered by Tantalum and on the year of 2004/05 to 2013/14 export of Gold consist by 96% and Tantalum consists 2.9% and 1.1% covered by Opal.

The contribution of the mining sector to the national economy has been minimal at less than 1% of the gross domestic product (GDP). The main export mineral is gold. In recent years, however, the contribution of mining to the national economy is showing some progress (5.8% of GDP) due to improvement in policy measures, favorable commodity prices and the introduction of other minerals in the export list.

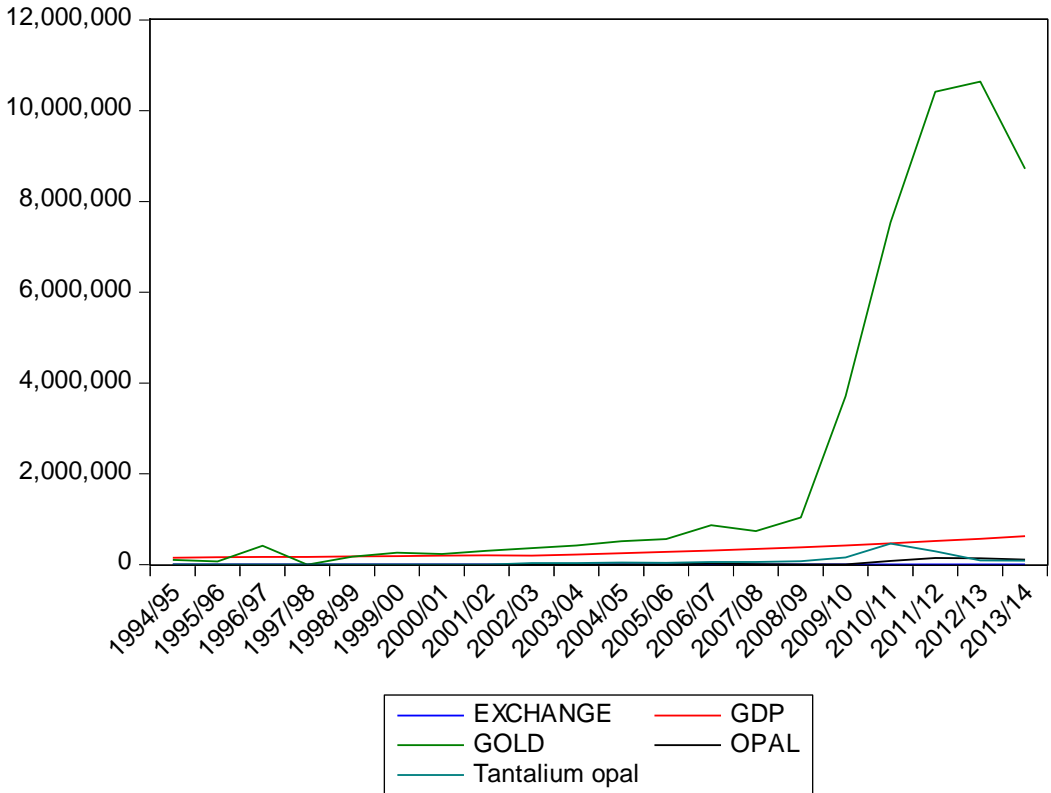


Figure 4.4: Export trends of major mineral resource

Source: own computation from the data obtained from MOFED

Based on the evidence obtained from the data of MoM gold minerals play leading role in terms of value and volume of export whereas opal and tantalum are at their infant stage of export and value of export.

The above graph indicate that the trend of growth in the country economy is increasing from time to time due to the fact that Upward movement of gold price in the global market added to it NBE's decision to purchase gold at the prevailing world market price plus a premium makes AM an attractive venture in the short run. Furthermore, one of the macro-economic measures taken by the Ethiopian government to make Ethiopian exports more competitive in the international market and that of imports more expensive was devaluation of the Birr against the USD and other major currencies. This measure has an income boosting effect on the miners and that of mining sector at large.

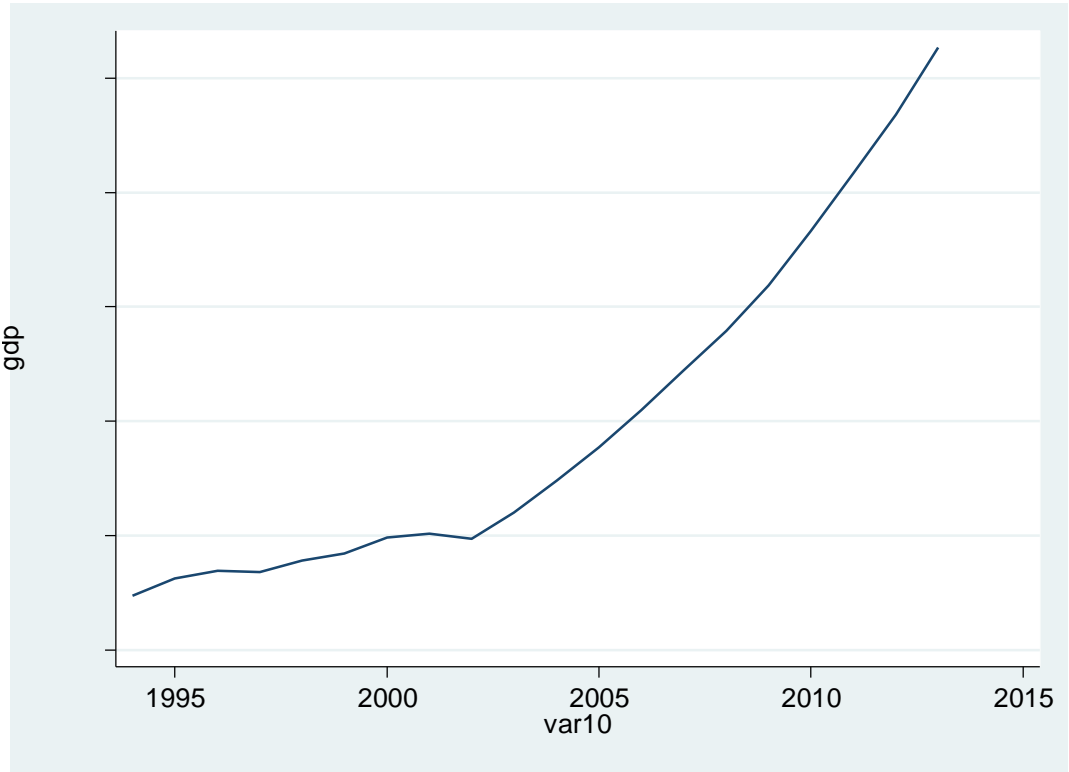


Figure 4.5: Export trends of major mineral resource

Source: own computation from the data obtained from MOFED

As the above graph indicate that the GDP the country has shown substantial increment due to rapid increased of import and export trends of goods and service.

Gold is also a source of FDI in Ethiopia. Among the export items gold is ranked second next to coffee for long years. There are companies' engaged in extracting gold and providing it to the world market and also the above graph show that from 2005 the country GDP is increase because a lot of investment which is controlled by government become privatized this encourage country's investment and have great contribution for the country GDP.

Generally, the magnitude of Mineral export and Exchange rate in the long run are much higher and significant than the short-run impacts indicating that the impacts of change in those variables on economic growth are much stronger in the long-run than in the short run.

The result of this study reveals the existence of long run bidirectional causality between export of minerals and growth but no short run causality among the variables this indicates that Ethiopia will accelerate its growth if the country focus on diversify export in to the sector of mining from other sectors and follow Export promotion oriented.

The result of the study depict the potential of mineral resource to generate substantial foreign exchange , employment generation ,growth in real gross domestic product .coupled with serving as most important source of improving Economic Groth.

The current study reveal that to how much extent the mineral potential of the country is not utilized substantially due to inherent lack of capital ,technology, infrastructure as well as the prevalent tedious legal procedure followed to gain license to the private investors.

The study addressed the potential of the mineral resource to serve as vehicle to pave the way for sustainable economic growth during these moments where global economic competition engulfs the continent of Africa.

CHAPTER FIVE

CONCLUSION AND RECOMENDATION

5.1 Conclusion

The study examined the contribution of export of mineral resource in economic growth of Ethiopia from 1994/95 to 2013/14 by including another macroeconomic variable that is import in the conventional production function form using annual time series data. In empirical analysis Augmented Dickey Fuller (ADF) and Augmented Engle–Granger (AEG) unit root test are used in testing the stationarity of the variables. The study result shows that all variables (i.e., Gross Domestic Product, Export of Opal, Export of Gold, Export of Tantalum and Exchange Rate) are found to be long run relation between the variables in the long run but have short run dynamics and the volume of export of minerals and GDP are volatile. Therefore, the study proceeds to determine the existence or otherwise of cointegrating vectors in the variables. The result of cointegration test shows that Gross Domestic Product, Export of Opal, Export of Gold, Export of Tantalum and Exchange Rate are cointegrated (i.e., they have long run equilibrium relationship).

The Regression result which indicate the impact of mineral export of Gold, Tantalum and Opal in the Real GDP of Ethiopia indicate that Gold export have shown significant impact in promoting growth of Real GDP. The export of tantalum is statistically significant to influence real GDP. Moreover the opal exports have shown statistically insignificant result in determining the growth of GDP.

the result of granger causality test also indicate that gold ,tantalium , opal and exchange rate and GDP were not found to cause variation in real gross domestic product.

The trend analysis of different charts and graph on the study shows that mineral export trends have shown progressive improvement for the study period ranging from 1994 to 2012 and declining export trend 2012/14 due to global macroeconomic instability. Rapidly growth export in terms of value and volume of export and gold account the lion share of mineral export followed by tantalium and opal.

Generally Export of Minerals has great contribution for economic growth of Ethiopia and from time to time the extraction and exploration and export of minerals are increase in Ethiopia and the all tests indicate in the Long run Export Create valuable effect on the country GDP.

5.2 Recommendation

The mining sector have significant potential to promote economic growth and development through augmenting technology transfer, providing income and employment opportunity for substantial portion of skilled and unskilled labor force, promoting output growth thus economic growth and development.

In order to exploit the potential of the mining sectors and to facilitate economic growth and development of Ethiopia the following policy intervention should be needed!

- The government should encourage the export potential of mineral resource through providing incentive and creating favorable climate that enable the export here to reap substantial foreign exchange earnings.

- The government in collabrization with other conserved bodies should create favorable legal and institutional climate conducive to encourage the involvement of domestic and foreign private investor to invest their capital in the mining sector through providing incentives, encouragement and other policy.

- The investment in human capital should be extend in order to exploit the potential of skilled human resource that can flourish as well as easily adept technology that help as well as easily adept technologies that help facilitate the mining sector actinides.

- Further research and discovery should be extended to assess the prevalence of unexplored mineral should be undertaken by employing qualified & trained human power that contribute for the performance mining sector in particular & the whole economy in general.

- To strength our mining sector: a) build on the momentum of the World Summit on Sustainable Development (WSSD), b) create awareness on the vulnerability of ASM communities, c) form a new consensus on how best to assist the miners and their community and strengthen the contribution of industrial development to poverty eradication and sustainable natural resource management. This would include actions at all levels to: Provide financial and technological support, as appropriate, to rural communities of Ethiopia to enable them to benefit from safe sustainable livelihood opportunities in small scale mining ventures.
- Although there is growing awareness of the importance of sound environmental management amongst mining stakeholders and Government officials in Ethiopia, Mitigation strategies are possibly offset by conflicts of interest on both political and economic grounds at central and local levels. To address the impacts of mining: The government should aim at providing technical support to local mine stakeholders such as training in facilitation and management tasks to local stakeholders. New technology has to be developed that uses fewer chemicals during extraction and processing, and mine waste should be regulated and turned into a non-harmful form before it is discharged to waste ponds.

Generally, collaborated effort should be extended that has potential contribution to build the potential of the mining sector through creating favorable institution that can mobilize and make valuable the required capital as well as creating awareness to the society about the role of mineral resources for the economy of the country and the well bingness of the society.

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APPENDICIES

Appendices 1: ADF Unit Root Test Summary

	EXCHANGE	GDP	GOLD	OPAL	TANTALIUM
Mean	10.24995	299133.2	2353866.	25334.64	70803.03
Median	8.635750	234416.0	466611.3	56.75000	36096.32
Maximum	19.07480	626557.0	10640228	141931.8	462480.7
Minimum	6.250500	147454.5	0.000000	0.000000	0.000000
Std. Dev.	4.107020	148752.4	3708424.	48848.44	115463.7
Skewness	1.148979	0.893038	1.456078	1.649334	2.383438
Kurtosis	2.851030	2.509532	3.385685	4.005851	8.111350
Jarque-Bera	4.419003	2.858856	7.191171	9.910793	40.70750
Probability	0.109755	0.239446	0.027445	0.007045	0.000000
Sum	204.9989	5982664.	47077326	506692.7	1416061.
Sum Sq. Dev.	320.4847	4.20E+11	2.61E+14	4.53E+10	2.53E+11
Observations	20	20	20	20	20

Source: own computation based on data from MOFED.

Appendices 2: Data Used for Regression

YEAR	GOLD	GDP	EXCHANGE	TALTALIUM	OPAL
1994/95	103,133	147454.5	6.2505	0	0
1995/96	68,232	162373.1	6.3178	0	0
1996/97	416,045	169246.9	6.5007	0	0
1997/98	0	167917.5	6.8817	0	0
1998/99	174,300	178512.7	7.5111	0	0
1999/00	260,044	184625.4	8.1426	0	0
2000/01	234,890	198320.8	8.3279	0	0
2001/02	300,715	201561.3	8.5425	0	0
2002/03	361,026	197331.5	8.5809	34,324	0
2003/04	419,858	220477.2	8.6197	34,472	0
2004/05	513,364	248354.8	8.6518	43,430	113.5
2005/06	562,141	277013.3	8.6810	37,721	343.11
2006/07	863,856	309686.8	8.7943	54,488	19829.87
2007/08	735,122	344331.9	9.2441	56,563	10431.39
2008/09	1,034,498	378907.4	10.4205	72,109	444.55
2009/10	3,709,812	418947	12.8909	153,608	5728.62
2010/11	7,540,512	466214.8	16.1178	462,481	80890
2011/12	10,417,359	517026.5	17.2536	288,206	141931.8
2012/13	10,640,228	567803.4	18.1947	92,238	138515.9
2013/14	8,722,191	626557	19.0748	86,422	108464

Appendices 3: Vector Error Autogression Estimation

Vector Autoregression Estimates				
Included observations: 18 after adjustments				
Standard errors in () & t-statistics in []				
	EXCHANGE	GOLD	OPAL	TANTALIUM
EXCHANGE(-1)	2.094392 (0.27750) [7.54745]	1064449. (390632.) [2.72494]	623.0133 (5610.28) [0.11105]	-8692.486 (27057.4) [-0.32126]
EXCHANGE(-2)	-1.246026 (0.27973) [-4.45439]	-1216419. (393776.) [-3.08911]	-2828.393 (5655.44) [-0.50012]	-11996.79 (27275.1) [-0.43984]
GOLD(-1)	6.39E-08 (2.7E-07) [0.23939]	0.980832 (0.37578) [2.61015]	0.021239 (0.00540) [3.93536]	0.125774 (0.02603) [4.83220]
GOLD(-2)	-3.52E-07 (4.8E-07) [-0.73917]	0.451561 (0.67096) [0.67301]	0.008162 (0.00964) [0.84703]	-0.045963 (0.04647) [-0.98899]
OPAL(-1)	-1.10E-05 (1.4E-05) [-0.81191]	-51.54898 (19.1476) [-2.69218]	-0.213898 (0.27500) [-0.77781]	-4.885016 (1.32627) [-3.68326]
OPAL(-2)	1.52E-05 (2.3E-05) [0.66079]	-21.41699 (32.3071) [-0.66292]	-1.132726 (0.46400) [-2.44123]	-0.727905 (2.23777) [-0.32528]
TANTALIUM_OPAL(-1)	-5.87E-06 (3.2E-06) [-1.83742]	1.545383 (4.49757) [0.34360]	-0.051346 (0.06459) [-0.79489]	-0.308637 (0.31153) [-0.99072]
TANTALIUM_OPAL(-2)	6.04E-06 (2.7E-06) [2.26104]	10.13548 (3.75979) [2.69576]	-0.001537 (0.05400) [-0.02846]	-0.267169 (0.26042) [-1.02590]
GDP	5.85E-06 (1.9E-06) [3.06642]	3.736190 (2.68478) [1.39162]	0.049221 (0.03856) [1.27650]	0.765016 (0.18596) [4.11380]
R-squared	0.997583	0.994528	0.993577	0.972911
Adj. R-squared	0.995435	0.989664	0.987868	0.948832
Sum sq. resids	0.689995	1.37E+12	2.82E+08	6.56E+09
S.E. equation	0.276886	389773.0	5597.949	26997.87
F-statistic	464.4206	204.4582	174.0308	40.40509
Log likelihood	3.812097	-251.0223	-174.6454	-202.9658
Akaike AIC	0.576434	28.89137	20.40504	23.55176
Schwarz SC	1.021620	29.33656	20.85023	23.99694
Mean dependent	10.69059	2605887.	28149.60	78670.03
S.D. dependent	4.098295	3833770.	50823.17	119352.5

Table 4.8: Vector Error Autogression Test

Appendices 4 (a)

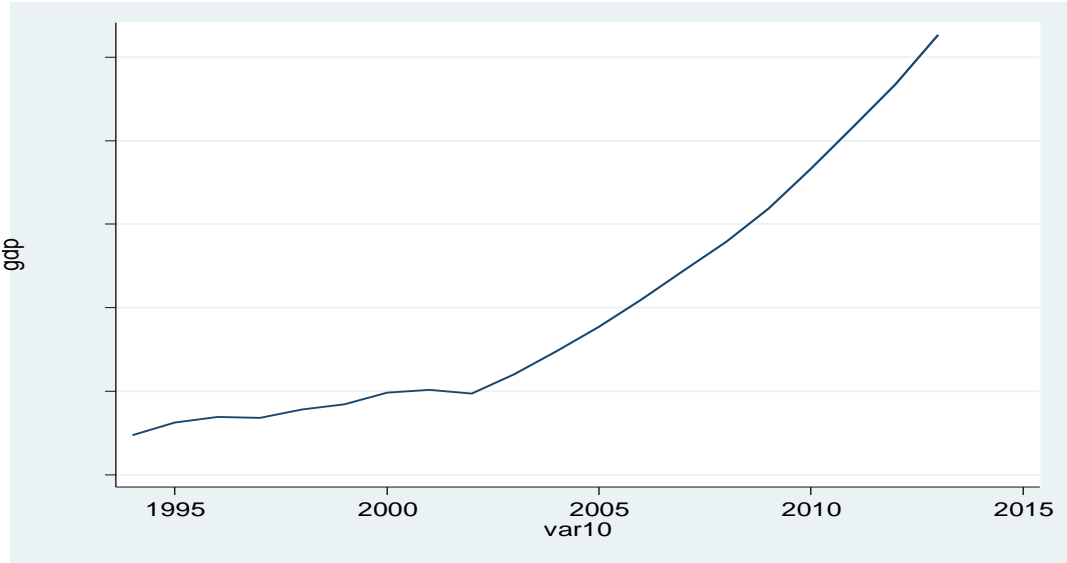


Figure 4.5: The Contribution of Minerals Export on GDP

Appendices 4 (b)

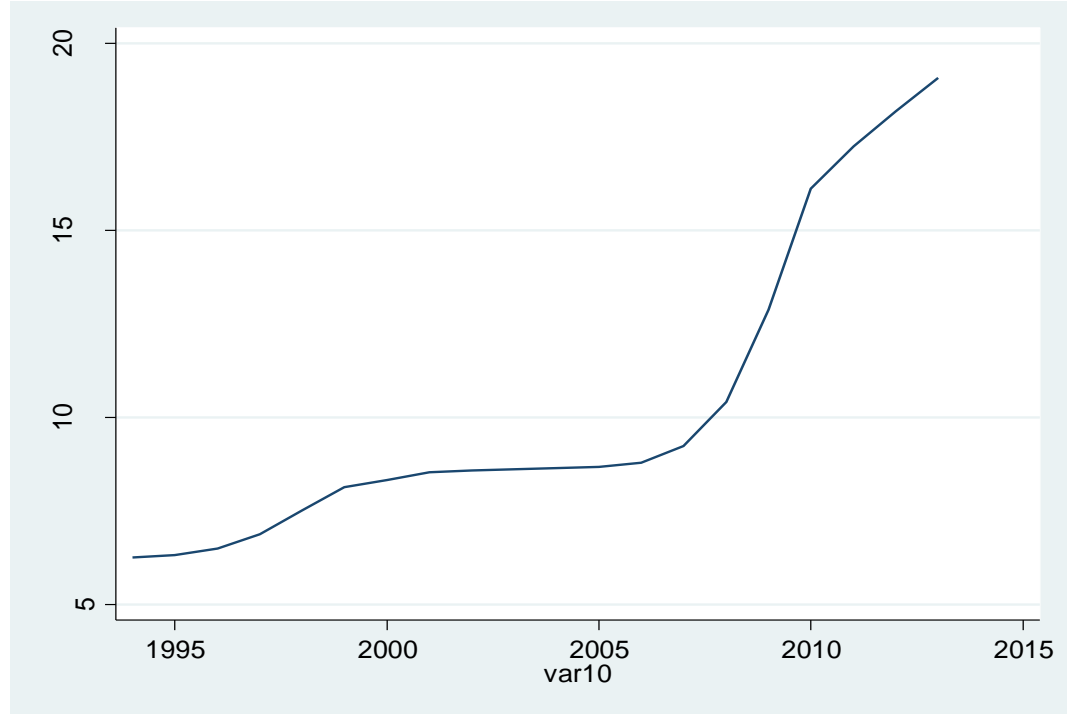


Figure 4.2: Relationship of Mineral Export and Exchange Rate