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FACULTY OF INTEGRATED MANAGEMENT SCIENCE

DEPARTMENT OF MANAGEMENT STUDIES

RELATIONSHIP BETWEEN MINERAL REVENUE AND ECONOMIC GROWTH IN GHANA: A TIME SERIES ANALYSIS

BY

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MASTER OF SCIENCE IN ENGINEERING MANAGEMENT

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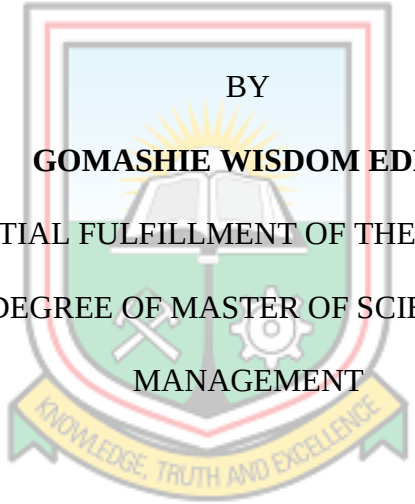

BY

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SUBMITTED IN PARTIAL FULFILLMENT OF THE REQUIREMENT FOR THE AWARD OF THE DEGREE OF MASTER OF SCIENCE IN ENGINEERING MANAGEMENT

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DECLARATION

I hereby declare that this thesis is the result of my own original work. It is being submitted for the degree of Master of Science in Engineering Management in the University of Mines and Technology (UMaT), Tarkwa. No part or whole of this thesis has been presented for another degree in this university or elsewhere.

……..……

(Signature of Candidate)

Submitted this..... day of..... 2022

ABSTRACT

Mineral revenue is an important revenue source for the Government of Ghana. Policies and investment strategies initiated by government over years, have made significant contributions towards Ghana's economic albeit concerns of Ghana not gaining much from mineral revenue in over a century. The aim of this study was to ascertain the impact of mineral revenue on Ghana's economic growth by specifically, investigating the long-run relationship between Mineral Revenue (MR), Government Expenditure (GE), Foreign Direct Investment and Economic Growth (RGDP) in Ghana. The research employed the Vector Error Correction Model, Granger-Causality, Variance Decomposition in VAR to analyze the time series data. The data were generated from the Minerals Commission, Bank of Ghana, Ghana Chamber of Mines, World Development Indicators among others covering the period 1990 to 2019. Variables were found to be stationary at first difference after failing at levels. Subsequently, the cointegration results indicated that there was at least one cointegrating equation, which indicated the existence of a long-run economic relationship between the variables in the system. The long-run analysis showed that mineral revenue has a positive relationship with economic growth (proxied as Real GDP) where FDI and GE negatively related with RGDP. The negative relationship between GE and RGDP confirmed findings from previous studies that, government expenditure in Ghana is not directed at critical sectors which can deliver the proportional economic growth. Findings of the study proved that, mineral revenue is a key contributor to Ghana's GDP and any shock to Ghana's Mining Industry is likely to cause a significant shock to the economy. The study recommended among others that, policymakers should formulate policies that will attract both local and international investors into the mining industry to enhance its contribution to the general economy.

DEDICATION

In memory of my beloved late parents, Mr. Christian Gomashie and Mrs. Faustina Mansa Deku who laid a very good foundation for me.

Special Appreciation to my supportive Uncle, Mr. John Deku and my late Auntie, Agnes Deku for their support towards my development.

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To my supportive wife, Favour and lovely daughter, Hillary-Clinton Elemawusi Gomashie, who happens to be my first child, without whom, motivation for this thesis would have been less. She will emulate this great path to higher heights in the near future.

May the Almighty Lord bless them all.

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Dr. Frank Boateng has really been a source of motivation and encouragement for me throughout the entire period of the thesis work. His commitment, persistence, analytical inputs and constructive criticisms have really contributed to the completion and success of this work.

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CHAPTER 1

INTRODUCTION

1.1 Background to the Study

More than 90% of Ghana's mineral income comes from gold mining (Aryee, 2012). Mining's contribution to Africa's GDP has grown, according to the United Nations Conference on Trade and Development (UNCTAD), which released its findings in 2005. Mining corporations have flocked to Ghana during the 1990s as proof of this (Appiah and Buaben, 2012). The mining sector contributed 8.5 percent of Ghana's GDP between 2013 and 2018. (Anon., 2019). Globally, the mining industry has a substantial impact on the economy. Mining is the world's fifth largest industry, and that it plays an important part in economic development around the world. The mining industry has played a major role in the development of numerous countries (Down and Stocks, 1977; Madeley, 1999).

Extracting minerals or other geological elements from the earth's crust is known as mining. Ore can be found in placer deposits and reefs as well as lodes and seams (Balasubramanian, 2016). Biogeochemical processes produce a solid material with specific chemical composition and physical qualities, as defined by the Natural Resource Governance Institute (NRGI) in 2015. There are about 2,500 different mineral varieties that are exploited by four primary types of mining operations: surface mining, underground mining dredging and artisanal mining, according to the Institute.

Over 300 small-scale mining firms have been registered in Ghana, and 90 of those firms are involved in mine-related support services. Ghana is home to 23 large-scale gold, bauxite, and

manganese mining (Anon., 2020a). Large-scale mining enterprises in Ghana directly employ roughly 28,000 people, and small-scale mining operations are expected to employ about one million people (Aryee, 2012). Traditionally, gold, bauxite, diamond and manganese are the minerals mined on a commercial basis, according to Hammond et al. (2011). Some minerals in Ghana are under- or non-exploited: Kaolin, salt, limestone, mica, and feldspar. The western and eastern coasts of Ghana, as well as the Ashanti and Brong-Ahafo regions, are home to the majority of Ghana's mineral resources. More than 95% of the country's mineral income is derived from gold, making it the industry's most important resource, according to Aryee (2011). Ghana was Africa's second-largest gold production in 2017, behind South Africa. Manganese and aluminum production ranked third in Africa.

According to the 2018 Ghana Chamber of Mines mining sector performance report, Ghana produced nearly 5 million ounces of gold in 2018, compared to South Africa's 4.2 million ounces. Ghana also retained its 8th position internationally. Due to cheaper mines and low operational costs (Anon., 2019). Ghana is still Africa's biggest gold producer in 2019. Anglogold Ashanti Ltd and Goldfields Ltd, two of South Africa's biggest gold producers, have increased their attention to Ghana's gold production due to cheaper and easier to mine deposits that translate to lower mining costs, friendlier policies, and new development projects (Anon, 2020b). As shown in Table 1.1 and Figure 1.1, the top 10 gold-producing countries in 2017 and 2018 are listed.

Table 1.1: Top 10 Gold Producing Countries in 2017 & 2018

	2017		2018	
Country	**Gold Produced (Tonnes)**	**Rank**	**Gold Produced (Tonnes)**	**Rank**
China	429.4	1st	404.1	1st
Australia	292.5	2nd	315.1	2nd
Russia	280.7	3rd	297.3	3rd
United States	236.5	4th	222.7	4th
Canada	171.2	5th	189.1	5th
Peru	166.6	6th	157.8	6th
South Africa	154.0	7th	129.8	9th
Ghana	130.2	8th	136.2	8th
Mexico	119/4	9th	114.3	10th
Indonesia	114.1	10th	136.9	7th

Source: Ghana Chamber of Mines, 2019

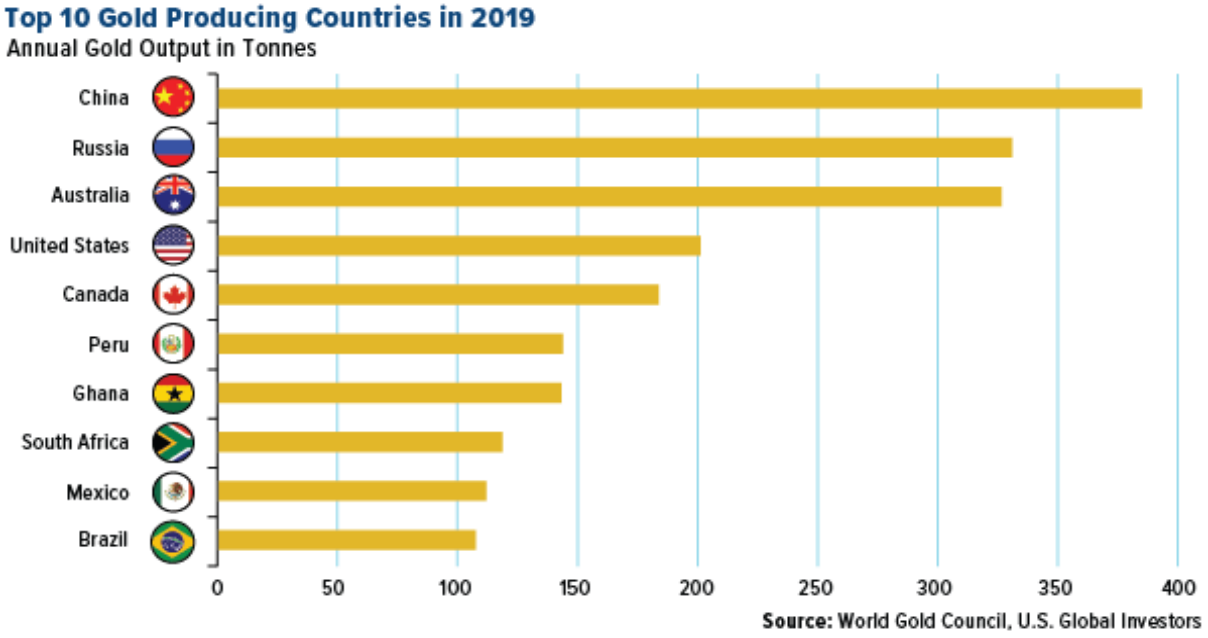

Figure 1.1: Top 10 Gold Producing Countries in 2019
Source: World Gold Council, 2020

It has been reported that mining corporations create jobs, pay taxes from mineral production, finance education, healthcare, transportation, power, and other sorts of infrastructure growth, as indicated by Amponsah-Tawiah and Baah-Dartey (2011). The majority of mining companies invest some of their own money in infrastructure development in the communities where they operate. Corporate Social Responsibility programs for host communities and the public as a whole are offered by mining companies, according to Aryee (2011). A total of USD 24 million was committed by mining firms in Ghana's CSR programs in 2011 (Aryee, 2011).

Mining may be beneficial economically, but the use of heavy machinery to dig for minerals can have a negative impact on vegetation because it creates more dust, according to the International Labour Organization (ILO). Open-pit mining is used by most large-scale mining enterprises in conjunction to cyanide heap leaching. People's health and safety on the field are greatly affected by these techniques (Akabzaa, 2000). Mining's positive and negative effects on communities have been documented in a variety of empirical research. Walser (2001) examined the economic impact of global mining. The study concluded that small and micro-enterprise local activities have the best chance of development. However, mining has been associated with a number of economic and societal difficulties. Because of this, there are questions about mining's economic efficiency in the long-term.

To find out if mining in Ghana is beneficial or harmful, Amponsah Tawiah and Dartey-Baah (2011) conducted research. According to their findings, the mining industry is critical for those in developing countries who live, work, or invest there. As Appiah and Buaben (2012) investigated, Ghanaian gold mining has been both beneficial and detrimental to the country's

economy. It was found that mining has had a favorable impact on local economies by creating jobs and markets and by expanding auxiliary industries and the local consumer economy, according to the researchers. Increased marginalization, job losses, and socio-economic volatility in local economies will inevitably undercut these benefits.

Many people have questioned the viability of mining as a vehicle for economic growth and development because of the "resource curse" (James and Aadland, 2011). The limited research on the mining industry's contribution to economic growth has not been able to come to a conclusion (Akabzaa, 2000; Agbesinyale, 2007; Amponsah-Tawiah and Dartey-Baah, 2011; Appiah and Buaben, 2012; Deller and Schreiber, 2012). The need therefore arises for current empirical studies to ascertain the impact of the mining industry on the economic growth of Ghana. This study therefore seeks to achieve this aim.

1.2 Statement of the Problem

Development, according to economics, is the process by which the economic and social conditions of a country are improved by managing its natural and human resources in order to create riches while also improving the lives of its people (Anon., 2017a). Numerous studies have looked at how mining contributes to economic growth while also highlighting its drawbacks (Akabzaa and Darimini, 2001; Agbesinyale 2003; Tsikata, 1997; 2007; Amponsah-Tawiah & Dartey-Baah, 2011; Ayee et al, 2011; Aryee, 2012; Darko, 2015; Adetunde et al., 2013; Entsie, 2017; Akudugu et al., 2020).

Mining is a major source of government revenue and continues to be a major source of FDI in most developing countries, as has been suggested for the most part in mining countries (Amponsah-Tawiah and Dartey-Baah, 2011). Several developed nations, such as Australia, Canada, Sweden, and the United States, have benefited economically from mineral discoveries and extraction (Amponsah-Tawiah and Dartey-Baah, 2011). According to Weber-Fahr (2002), mining is a top priority for FDI in most developing countries with mineral resources. This, however, is a rare occurrence. The economy of mineral-dependent countries is among the world's most impoverished and weak (Eggert, 2001).

Ghana's government loses millions of dollars each year from small-scale mining due to institutional weaknesses in tracking illegal Chinese miners' income. Because they sell their gold outside of Ghana, the Ghanaian authorities have no idea they are evading taxes (Enstie, 2017). In spite of Ghana being the continent's second largest gold producer (Enstie, 2017), the researchers found that the country's efforts to transform its mineral wealth into broad-based economic development have been unfruitful thus far. According to Tsikata (2007), a multiplier effect on growth could have been lower if mining activities were more connected with other economic activities because of the absence of integration between mining and other growth-promoting industries.

Ghana's mining industry, whether major or little, has a variety of effects on the lives and livelihoods of Ghanaians. Land, water, and air pollution have all increased as a result of mining activity in Ghana. Because of the massive surface mining projects that have taken over farmland across the country, rural populations living near mines are being cut off from a vital source of

income. In addition, mining, especially small-scale mining, has a number of negative consequences. Six persons were killed in Adum Banso, a rural town in the Western Region, when an illegal mining mine collapsed on them, according to the Dailyguide newspaper in 2020. Fourth-graders were trapped to death in an illegal mining pit at Obengkrom near the Western Region, according to the same newspaper on January 22nd, 2001. These are only a few of the incidents that mining has caused in Ghanaian communities.

Through the execution of Corporate Social Responsibility (CSR) programs for host communities and the wider public, mining also helps to development. Companies in the mining industry spent US$24 million on CSR projects in 2011. (Aryee, 2011). Tax holidays, investment allowances, tax rate reductions, and administrative discretion are just a few of the tax incentives that African governments offer to attract foreign direct investment. There are times when policy decisions are made without considering the costs and benefits, but rather with the goal of outdoing competitors for foreign direct investment, leading to damaging tax competition and a race toward the bottom (IFF, 2015).

Because the government of Ghana is unable to track the revenues of illicit foreign miners in Ghana, the government loses millions of dollars each year from small-scale mining. Because they are able to sell their gold outside of Ghana, they are able to avoid paying taxes. Ghanaian Minister of Lands and Natural Resources Peter John Amewu has stated that "In 2016, USD $2.3 billion worth of gold fled this nation through unlawful mining" in an interview (Entsie, 2017). On top of all that, they occasionally sell the gold to middlemen in India or the Middle East, and then arrange to send the earnings abroad through unauthorized means. What the Vice President

of Ghana said was true: "The UAE documented $7 billion in gold imports from Ghana, although official records (in Ghana) reflect only $2 billion in exports of the precious metal to the Gulf country" (Anon., 2018). As a result of these activities, Ghana might become a leading gold producer while also being a leading borrowing country, over-dependent on meager mineral earnings with minimal socio-economic development compared to other mining countries.

Aryee et al. (2011) report that Ghana is Africa's second-largest gold producer says the country has had unsatisfactory outcomes in turning its natural wealth into broad economic development. The Ghanaian government has acknowledged this and public dissatisfaction has grown as a result of it. After examining The Challenges of Economic Growth in a Liberal Economy, Tsikata (2017) came to the conclusion that the mining sector's relevance to the country's economy is not adequately linked with other activities that drive economic growth.

It is projected that work opportunities, road development and railway construction, hospitals, schools and community centers as well as other livelihood chances will expand with the majority of mining businesses headquartered in rural regions. Despite the projected benefits of gold mining, according to Appiah and Buaben (2012), Municipal communities are among the poorest in the country. Even though large and small-scale gold mining enterprises have wreaked havoc on the locals' lives in this area, it has become a tourist destination due to its illustrious past (Agbesinyale, 2007). To be sure, there have been significant efforts to raise awareness of mining-related issues like over-pollution and chemical contamination, as well as inadequate security in mines and diseases (Hilson 2002; Dorin et al., 2014), but the economic importance of mining is increasingly being overlooked in the process.

In spite of the mining industry's impressive performance and contribution since the economic recovery program began in the 1980s, Ghana has not fully reaped the benefits. When you consider that Ghana is Africa's biggest gold producer since 2018 and ranks 6th in the world, and the fact that it relies heavily on foreign loans and grants to sustain its annual budgets and other basic development initiatives, it is an indication that, gains from the mining sector is not promising and must be examined.

There is therefore paucity of studies on the subject in Ghana making it urgent to examine the impact of Ghana's mining industry on the economic growth of the country by providing answers to the questions posed in the study. From available literature, this study may be the first study which seeks to examine the relationship between the mining industry and economic growth of Ghana using VECM, Variance Decomposition, Granger-Causality Causality for analysis.

1.3 Objectives of the Research

The general objective of this study is to examine the impact of Ghana's mining industry on the economic growth of the country. Specifically, the study seeks to:

1. To estimate the short run relationship between mineral revenue and real GDP in Ghana.
2. To estimate the long run relationship between mineral revenue and real GDP in Ghana.

1.4 Research Questions

1. What is the short run relationship between mineral revenue and real GDP in Ghana?
2. What is the long run relationship between mineral revenue and real GDP in Ghana?

1.5 Significance of the Study

This study will make contributions to theory and practice. Globally, most countries especially resource rich countries under various levels of exploitation want to achieve greater economic growth and sustainable increase in GDP and other socio-economic indicators. In view of this, Ghana as the leading producer of gold in Africa is one of such countries where there is high expectation from the public from the extractive industries. Moreover, the mineral resources extracted are non-renewable making it crucial to get the best out of it. In view of this, it is important that, the impact of the mining industry on Ghana's economic development is from time to time analyzed and recommendations made for policy makers. This study will therefore reveal the performance of the mining sector over the last twenty-nine (29) years for policy interventions through the recommendations.

As a way to optimize Ghana's advantages from mineral resource exploitation, the issues faced by Ghana's mining businesses will be brought to light. As a result of the recommendations made in relation to this objective, mining businesses will be able to operate more efficiently. Last but not least, this study will add to the body of information on the topic. The study will serve as a reference for future students and researchers at the university, given that research on the issue in Ghana is still in its infancy.

1.6 Scope of the Study

The study examined the impact of Ghana's mining industry on the economic development of the country. The study focused on the year-on-year contribution of the mining industry towards Ghana's economic development using 1990 to 2019 as reference years. Specific variables

covered were Mineral Revenue, Government Expenditure, Foreign Direct Investment Real GDP. For the purposes of determining economic development, Real GDP was used as a proxy for the study. Geographically, the study focused on the Ghana mining industry. The report covered all minerals mined in Ghana with Gold being the dominant mineral. Government expenditure covered recurrent and capital expenditure excluding government military spending.

1.7 Limitations of the Study

It is anticipated that this study will have limits, however procedures have been put in place to alleviate those constraints. It is possible that the findings will not hold up over a long period of time. A year's circumstances may differ from another year's, resulting in either a substantial or little shift in the ranking of factors. This necessitates that these studies be conducted on a regular basis in order to keep policy makers up-to-date. In addition to this, the Ghana Chamber of Mines took a long time to release their report on the mining industry's performance. In this regard, the researcher was unable to get his hands on the most recent report, which is the one for 2020. Determining industry performance must therefore be done based on data from 2019, which may not be accurate.

1.8 Organisation of the Study

According to the study's structure, there are five chapters. Chapter 1 is the introduction, which discusses the study's history as well as its objectives, research questions, and scope. The second chapter examines both theoretical/ conceptual and empirical literature on the subject. The study's techniques and procedures are described in depth in Chapter 3. Chapter 4 focuses on analyzing and interpreting the results of the study. Discussions of the results is also presented

in comparison with the literatures reviewed. Summary and conclusions are presented in Chapter 5. Recommendations are also presented for stakeholders as well as suggestions for further studies.

CHAPTER 2

LITERATURE REVIEW

2.0 Introduction

This chapter reviews relevant theories and concepts related to the study. In the first section, the Economy of Ghana, the Mining Industry in Ghana including legal and fiscal regimes, players in the mining industry, economic benefits of mining, challenges of the mining industry and adverse effects of mining among others are reviewed and discussed to set the grounds for in-depth analysis of this study.

In the second section, empirical review of the nexus between the (mining industry/mineral resource abundance/mineral production) and economic growth of Ghana and other countries shall be reviewed through articles published by scholars and researchers on the subject. The empirical review finally sets the reason why this study is undertaken.

2.1 Theoretical Framework

2.1.1 The Solow Growth Theory

Gross Domestic Product is assumed to be achieved using aggregate production function in the growth model. It is worth noting that Solow model's important results is derived using any of the standard production functions found in microeconomic production theory. Solow (1956) recognizes "the economic forces of production-capital and labor as well as industrial technology as sources of output and, hence, total income. Income disparities must therefore be due to differences in capital, labor, and technology. The Solow growth model is the core of Mankiw's study.

The Solow growth model shows how saving, population growth, and technological progress affect the level of an economy's output and growth over time. The model also reveals some of the reasons for the wide disparity in living standards between countries. The model's second claim, that it identifies explanations for income variations among countries, is expressed more cautiously than the model's first claim, that it explains growth over time. Some researchers believe that the Solow model presented here should only be used in modern industrial economies. The following are the production assumptions that underpin the Solow growth models:

- There is only one output.
- This output can either be consumed or added to the capital stock in the form of units.
- In the production process, only one type of capital and one type of labor are used, and the production function has constant returns to scale.
- Changing both L and K's employment by a proportional factor "z" would result in an equi-proportional change in Y.

One of the most essential lessons learned from the simple circular flow model is that an economy's output is also its income, or the ability to buy that output. The next phase in the Solow model's development investigates the consequences of this relationship for output allocation between consumption and investment. The model implies that savings are turned into investment demand via the capital market. Depreciation is an unavoidable reality of life; capital stock depreciates with time. A consistent percentage of the whole capital stock wears out each year, according to the simple depreciation model utilized. Because saving is related to output (income), it grows at a slower rate as k grows. Savings surpass depreciation for modest values

of k. Savings exceeding depreciation indicates that the capital stock is rising, because saving equals investment. Depreciation exceeds saving at larger values of k. (which, to repeat, equals investment). This is because when k increases, output increases less than proportionately, whereas depreciation increases proportionately. Depreciation surpasses investment with greater values of k, hence the capital stock cannot be sustained. The saving rate is the one variable that policymakers may be able to influence. People's preferences for future and current consumption influence the rate to some extent, but not fully (Solow, 1956).

Much of the criticism leveled at Solow model and other versions of neo-classical growth theory is directed at its aggregate production function. Influential critics such as Robinson and Kaldor have argued that the microeconomic idea of the production function cannot practically be applied to the entire national economy. The neoclassical production function's flexibility is also claimed to be impractical. Machinery, for example, cannot shrink in size as labor employment grows. Furthermore, because technological advancement Ls linked with capital improvements, the disembodiment of technology from capital is regarded as unachievable. Romer's recent work has extended the neo-classical model to include technology as a separate production factor. Romer believes that increased returns to factors, or economies of scale, is caused by technology or knowledge.

2.2 The Mining Industry of Ghana

Ghana's geological space is rich in mineral reserves. In Ghana, the principal minerals are Manganese, Bauxite, Diamonds, and Gold. Almost all of the country's mineral revenues come from gold, which accounts for more than 95 percent (Ayee et al., 2011). Among Ghana's gold-

bearing regions are Ashanti, Western, Central, and the Brong-Ahafo region. Ghana is also home to a large number of small-scale and artisanal mines. Indirectly, large-scale mining employs around 16,000 people. However, its contribution to labour is significantly smaller than that of small-scale mining, which employs over a million people (Boas & Associates. 2015). Due to market-based adjustment strategies suggested by the IMF and the World Bank, Ghana's mining industry recovered after a period of general economic downturn. Economic Recovery Program (ERP) of the PNDC administration in 1983 privatized most of Ghana's mining industry. Because of the ERP advantages, the Structural Adjustment Programme (SAP) was implemented.

The Structural Adjustment Program (SAP) removed limitations on foreign exchange transactions and imports, among other things. Also, the SAP diluted the state's dominance in economic activities as a whole. It was a direct result of these measures that investors' interest in the economy was revived. Because of its demonstrated benefits, such as the generation of much needed foreign exchange, employment creation, and technology and knowledge transfer, the mining industry became the focus of government efforts to restore the ailing economy through the recruitment of foreign direct investments (FDI) (Anon., 2020b).

Ghana's mining industry has been effectively recovered since 1984, thanks to the Economic Recovery Programme (ERP), which targeted mining as a possible source of foreign cash. Minerals and Mining Law was passed in 1986 to provide incentives to the mining industry. Among the features were favorable capital allowances and lower income taxes. 75 percent of capital investment may be written off against taxes in the first year, and 50 percent of the

balance could be written off against taxes each year following that. There was a flexible royalty payment system and the government allowed enterprises to use offshore bank accounts for servicing loans, dividend payments, and expatriate staff compensation (Anon., 2020c).

Aside from the wider macroeconomic changes, there were also specific sector policies targeted at increasing investor interest in the mining sector. The mining industry's performance improved dramatically between 1984 and 1995 as a result of significant institutional improvements. The Mineral Commission was established in 1984, the Minerals and Mining Code was promulgated in 1986, the Small-Scale Mining Law was passed in 1989, and the Environmental Protection Agency was established in 1994, all of which helped expand Ghana's mining industry (Amponsah, 2015). Ghana's mining industry has grown significantly in recent years as the country's economy has grown as well.

It is true that gold production has climbed from 63 tons in 2004 to 80.5 tons in 2008 and 4,577,637 million ounces in 2019. Other mineral production has decreased. In addition to the Ghana Chamber of Mines, which operated from 2000 to 2008, the Mineral Commission operated from 1996 to 2006. Ghana is now Africa's top gold producer, surpassing South Africa in 2019. (Anon., 2020d). For example, the mining industry accounts for 41% of total export earnings, 14% of total tax revenues, and 5.5% of GDP (Ayee et al. 2011). While gold contributed 93.28% to the gross mineral revenue in 2019, manganese contributed 6.17% and diamond contributed 0.54 % of the gross mineral revenue, respectively. Underground and open pit mining are the most common mining processes in the country. Mining alluvial deposits is also common in the small-scale mining industry (Anon., 2020d).

2.2.1 Legal & Institutional Regime of Governing Ghana's Mining Industry

As a result of years of low productivity prior to the 1980s, the Ghanaian mining industry has undergone a number of reforms. It was hampered by various political instability in the Second and Third Republics of Ghana. The state acknowledged its mistake and decided to lower these risk factors in accordance with international norms promoted by the World Bank and the International Monetary Fund (Ayitey, 2016). A strategic reform program was developed to reduce the perceived dangers associated with state domination in the administration of natural resources in Ghana. As a result of reducing governmental control in the industry, private participation was promoted and regulated. Diverse fundamental laws were enacted or changed to achieve this goal. These include, according to Akabzaa and Dramani (2001):

- In 1986, the Minerals Commission was created (PNDCL 154);
- As of 1987, the Minerals & Royalty Regulations came into effect (L.I. 349);
- Enacted in 1985 (PNDCL 122);
- Promulgated in 1989 (PDCL 218);
- The Precious Marketing Corporation Act of 1989 (PNDCL 219);
- Precious Minerals Marketing Corporation was founded in 1989;
- The Environmental Protection Agency was established in 1994;
- In 1994, environmental guidelines for mining were developed;
- Environmental Guidelines for Mining in 1999 were re-examined; and
- In the period from 1992 to 1999, the state-owned mines were divested.

According to PNDCL 153, the first autonomous mining code in the country, a new version was released in 2006. This act is known as the Minerals and Mining Act 703. On the whole, the law

simplified all mineral rights licensing procedures, created a favorable competitive fiscal environment, and established a minimum quota system for minerals sales to be kept in offshore accounts, among other things. Probably the most important aspect of the Act was that it allowed for fiscal liberalization. It is important to note that both the PNDCL 153 and its revisions (PNDCL 122) as well as the L.I.349 included several advantageous provisions for the owner of mineral rights.

There is a five-year limit on deferring registration and stamp taxes as long as there is good cause. Moreover, the Minerals and Mining Law reduced corporate income tax and provided for a tax credit for mining companies allowances in order to relieve mine operators' tax burdens. Among the specific measures taken in this regard are:

- Tax reductions for corporations from 50-55 percent in 1975 down to 45 percent by the end of the decade. It was decreased to 35% in 1994.
- It was determined that the first capital allowance would allow investors to recoup their capital expenditure.
- Increasing the percentage of yearly allowances from 20 percent in the first year of production to 75 percent the first year of operation and 50 percent the following year in 1986;
- 75 % of royalties were reduced to 3 % in 1987;
- Abolition of other taxes (mineral tax of 5%, export tax of 5-35%, etc.)
- 33-75 percent foreign exchange tax

In general, the policy changes achieved the desired effect, and Ghana might be considered one of the few African countries with the most enticing geological and international mining

investment environment. Ghana's mining industry is governed by the Minerals and Mining Law of 1986 (PNDCL 153) and its subsequent revisions in 1994 and 2006 (Act 703).

Currently, The Mining and Minerals Act, 2006 (Act 703) regulates mining activity in Ghana. Ghana's Mining Industry is governed by the following laws and regulations:

- ☐ The Constitution of Ghana of 1992. This act was passed in 1993 (Act 450);
- ☐ The Environmental Protection Agency Act 490;
- ☐ (L.I. 1652) The Environmental Assessment Regulations of 1999;
- ☐ Act 703 of 2006 on Minerals and Mining, as amended by Act 794 of 2010, Act 900 of 2015 and Act 995 of 2019;
- ☐ Mining (General) Act, 2012, L.I. 2173;
- ☐ (L.I. 2174) Minerals and Mining (Support Services) Regulations;
- ☐ (L.I. 2175) - Minerals and Mining (Compensation and Settlement).
- ☐ (L.I. 2176) - Minerals and Mining Licensing Act of 2012
- ☐ L.I. 2177 on Minerals and Mining Explosives;
- ☐ 2010 (L.I. 2182); Minerals and Mining, 20112; and
- ☐ Law 592, as amended by Law 896, and Law 900 of 2015, governs the Internal Revenue Service.

Control and administration of mineral resources, as well as the coordination of mining-related policies, fall within the purview of the Minerals Commission. Each mining transaction is governed by Minerals and Mining Act, Act 703 of 2006. A mineral exploration agreement or a mining lease must be ratified by the legislature. If you want to sell or assign your mineral rights

to someone else, you need to get the minister's written permission beforehand. To regulate and manage mineral use, the Minerals Commission was created by Act 450 of 1994, which established the Minerals Commission as an independent corporate organization in 1994. (Boas & Associates. 2015).

2.2.2 Minerals and Mining (Amendment) Law, 2015, Act 900

When Parliament enacted the 2014 Minerals and Mining (Amendment) Law, it was in 2015. A change will be made to the Minerals and Mining Act of 2006. Act No. 703 (as amended). In the first place, a royalty payment cap will be implemented, and the equipment used in illegal small-scale mining would be seized in the second place. There will be no fixed rate of 5 percent for royalties in Act 703, but instead, payments must be made at the indicated rate and in the prescribed way. It criminalizes small-scale illicit mining, as did Act 703, but it also criminalizes mining by foreigners and Ghanaians without a permit, unlike the previous legislation (Boas & Associates. 2015).

2.2.3 Fiscal Regime Governing the Ghana Mining Industry

The fiscal system is based on a royalty levy. As a result, mineral royalties and corporate income tax are the primary sources of revenue from mining concessions. The corporate tax rate is 35 percent, with a 20 percent straight line capital allowance regime. Losses are carried forward for a period of five years.

Table 2.1: Taxes and incentives currently in place for the mining industry

Incentives & Taxes	**Rate**
Mineral Right	*Annual payment*
Capital Allowance	*Straight line method of 20%*
Carried Forward Losses	*5 yrs*
Corporate Income Tax	*35%*
Mineral Royalty	*A royalty of 3 percent to 5 percent (on gross revenue) (save for select corporations with stability/development agreements).*
Government Equity Participation	*10% free carried interest*

Source: GHEITI Mining Sector Report (2015).

There has been a change made to Section 25 in order to allow the Minister in charge of mining discretionary powers to dictate the royalty rate and payment method, based on input from industry participants and the repeal of the Mining Amendment Act, 2010. These changes are found in the Minerals and Mining (Amendment) Act, 2015. (Act 900).

However, even though the Minister has yet to publish regulations on the rate and method of royalties payment, some mining companies continue to pay a fee equal to 5% of mineral revenue as required by the amended Act. Meanwhile, others are required to pay a variable royalty rate as shown in Table 2.2. Gold mines in this category have investment agreements with the government and are major gold producers (Anon., 2020d).

Table 2.2: Taxes and incentives currently in place for the mining industry

Royalty Rate (%)	*Gold Price (USD per ounce)*
3.0	Less than $1,300
3.5	$1,300- $1,449.99
4.0	$1,450- $2,299.99
5.0	$2,300 and above

Source: Ghana Chamber of Mines, 2020

A sliding-scale royalty system based on the price of minerals is, in the Chamber's opinion, a good idea since it increases predictability and accommodates the erratic nature of resource markets, notably the gold price, Ghana's most important mineral. Selected adoption of a variable royalty regime results in an increased fiscal burden for mid-tier mines. Minor and mid-tier mines are discouraged from increasing investment because of the current circumstances. This may restrict mine development, which could be detrimental to mining's future. High-grade mining and suboptimal mineral development and exploitation may also ensue. As a result of this, the country would not be able to realize its entire mineral revenue potential including multipliers if it relied solely on high-grade ore extraction instead of lower-grade, potentially profitable ore. In addition, the state penalizes medium and marginal mining when commodity prices are low. This could lead to a lack of vital investments in existing mines since businesses may choose to invest their capital in other mining jurisdictions with lower royalty rates. That means fewer government revenues and a diminished ability for the state to build its economy on the back of mining (Anon., 2020d).

2.2.4 Regulatory Authorities of the Ghana Mining Industry

The government works with sustainable mineral development as a partner to maintain fundamental compliance criteria. Mining in Ghana is governed by the Mineral and Mining Act of 2006 (Act 703). For Ghana, this ministry is in charge of managing the country's land and forests, as well as its wildlife and mineral resources. The Minerals Commission issues mining and exploration permits in addition to supervising Ghana's mining industry. Minerals Commission Act established it in 1993 (Act 450). Aside from coordinating mining strategies, it's in charge of overseeing and managing Ghana's mineral resources.

The Mining Act mandates the Minerals Commission to make recommendations on mining policy, encourage mineral development, provide advice to the government on mineral issues, and serve as a go-between between business and government.

Ghana Geological Survey Authority

This department is charged with providing reliable and current geological information for national development through geological mapping, research and investigations, as well as studies involving the fabrication of maps; Safety inspections and mining records are carried out by the Minerals Commission Inspectorate Division.

Lands Commission

The lands commission contributes to determining the quantum of compensation for those who have been relocated or harmed by mining operations through its Land Valuation Division.

Commission's Survey and Mapping Division delineates, maps and certifies land boundaries; Land Registration Division deals with land titles.

Domestic Tax Revenue Division

Assists in the collection of taxes, such as income tax, royalties and capital gains tax, as well as corporate and gift taxes. Corporate taxes, mining royalties, and capital gains tax are collected by the GRA (DTRU). Because of this, it is the customs division of GRA that is accountable for:

- Inspecting the process of smelting (in the case of gold mining)
- Inspecting and document the weighing process.
- Packing and sealing boxes for shipment
- Accompanying shipments to the port for transportation, if necessary.

Units of Non-Tax Revenue

This unit, which is part of the Revenue Policy Division at the Finance Ministry, is responsible for collecting government dividends from mining firms.

Stool Lands Administrative Office

The Office is entrusted for collecting stool land revenue and distributing it to recipients under a provision in our 1992 constitution and a 1994 law (Act 481). The OASL is in charge of collecting ground rent. Ground rent is a predetermined amount payable annually by the holders of leasehold concessions and other terminable interests in Land transactions for residential, industrial, commercial, and other uses. It makes no difference whether the land is used or not.

The OASL also collects and distributes mineral royalties, which are distributed to district assemblies and communities affected by mining.

Finance and Economic Planning Ministry

A few of its responsibilities include formulating and implementing fiscal and financial policies, coordinating the use of available resources, and improving the oversight of government finances in general. The Ghana Revenue Authority and the Ghana Revenue Authority's Non Tax Revenue Unit are overseen by the Finance Ministry.

Local Government and Rural Development Ministry

They are in charge of all local government initiatives through the District Assemblies. District environmental communities would expect assemblies to ensure that mining operations are conducted out sustainably and ethically.

The Ministry of Environment, Science and Technology

In addition, the ministry is in charge of drafting national environmental protection policy. It's called Precious Minerals Marketing Company Limited. The company provides small-scale gold and diamond miners with official marketing services, such as public relations. Additionally, it encourages the development of Ghana's precious metals and jewelry industry, as well as oversees the export of all diamonds produced there.

Environmental Protection Agency

The agency establishes criteria for mining activities that are environmentally permissible. Die Agentur presides over a close working relationship with Minerals Commission, ensuring that the latter's position as an advocate and regulator of mining operations is in line with the environmental needs of the country.

Woods and Wildlife Service

To ensure the country's forest resources are managed in a sustainable manner, the forestry commission is accountable. When mining operations are conducted, it is closely supervised by a member of the Forestry Commission.

2.2.5 Players in the Ghana Mining Industry

In the mining industry, small-scale/artisanal miners and large-scale miners are the key players. The extraction of precious resources remains a significant source of foreign exchange earnings. As an example, small-scale miners accounted for 18% of the nation's gold production in 2009, up from 2%. Except for the Akwatia diamond mine, which is also on the divestment list, the mineral sector has been nearly completely privatized since 1989 to foster private sector development (Anon., 2010).

Large gold producers in Ghana include AngloGold Ashanti, Iduapriem & Obuasi Mines, Goldfields Ghana Limited, Tarkwa & Abossol Mine, Golden Star Resources, Ashanti Gold Corporation, Bibiani Mines, Kinross Mining Ltd., Chirano Mine and Newmont Ghana Gold Limited, Akyem and Ahafo Mine. The single bauxite mine in Ghana is run by the Ghana Bauxite Company (GBC), and the country's lone manganese mine, the Nsuta open pit, has been

in operation for over a century by the Ghana Manganese Company Limited. Consolidated Diamond Mines of Ghana Limited. The only diamond mine in Ghana still in operation on a limited scale is the Akwatia mine. In the next few years, there will be a slew of new large-scale mines opening in Ghana.

2.3 Economic Benefits of Mining

The contribution of the mining sector towards the Ghana Economy per this thesis, is described in share of exports, tax revenues, Foreign Direct Investments and Employment Generation.

2.3.1 Foreign Direct Investment

More than half of the overall yearly FDI is attributable to the mining industry. What this means for low-income countries is that they can attract mining investment even when other industries attracting foreign direct investment (FDI) do not. A country's credit rating and ability to get long-term loans financed from abroad improve significantly when FDI in the mining sector is combined with the enhanced financial rewards from exchange rate fluctuations (Dorin et al., 2014). 14 percent of domestic receipts and 5 percent of government revenue are represented by this. The mining industry has contributed 8.5% of the country's GDP since 2013. (Anon., 2020d).

2.3.2 Exports

This foreign cash is used by the government as foreign reserves for its importation activities because of the country's mineral exports. Mining contributes significantly to many countries' exports in the modern world. In the mining industry, exchange rate variations have a positive impact on profits. Miners import products and services for mine organization and activity with

a large portion of the revenues going back into the national economy (Dorin et al., 2014). The export of non-fuel minerals and metals makes up a considerable amount of many countries' total exports. In 2014, 17 nations had total mineral exports that exceeded 50% of total exports. Mineral exports make for 94 percent of Sierra Leone's total exports, putting it in top place. Over 70% of Botswana's GDP is derived from mineral exports, as is the case in the DRC, Mongolia, and Zambia (Ericsson and Lof, 2017).

Ghana exported 43 percent of its total exports in 2019 compared to 27 percent in 1990. The ratio of our overall mineral exports to our total exports is 40 percent on average. There were just 243 million dollars in 1990, but there are now 6.7 billion dollars in 2019. Significantly better than before. Only gold accounted for US$65.6 billion in total mineral exports between 1990 and 2019, as stated in the appendix.

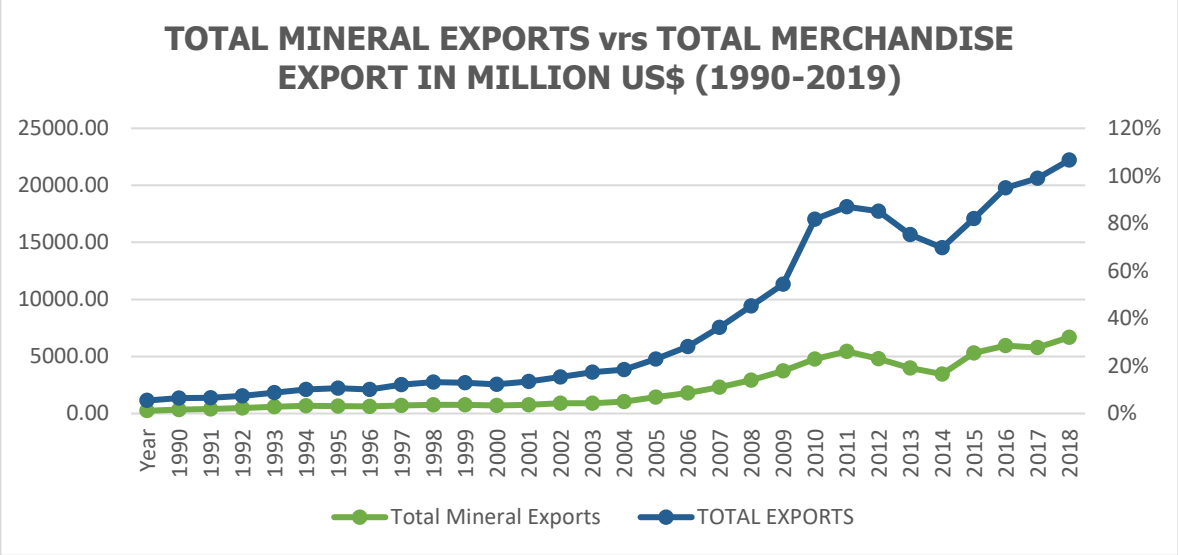

Figure 2. 1: A graph depicting total mineral exports and total merchandise of Ghana (US$)
Source: *Author's own construct using the data from Ghana Chamber of Mines*

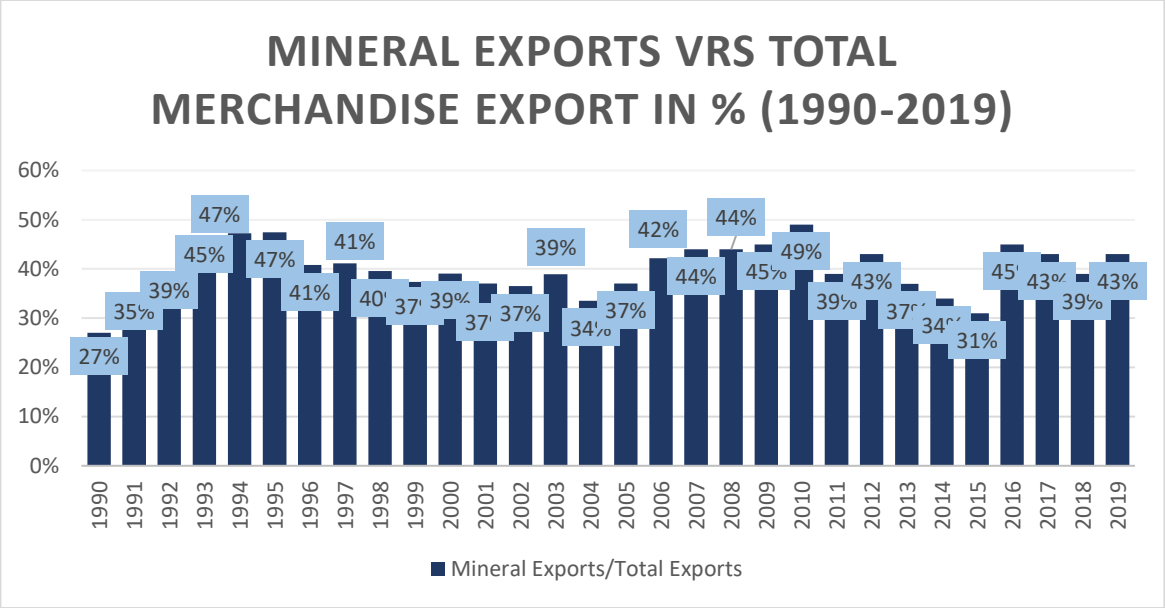

Figure 2.2: Graph showing percentage of total mineral exports to total merchandise of Ghana (%)

Source: *Author's own construct*

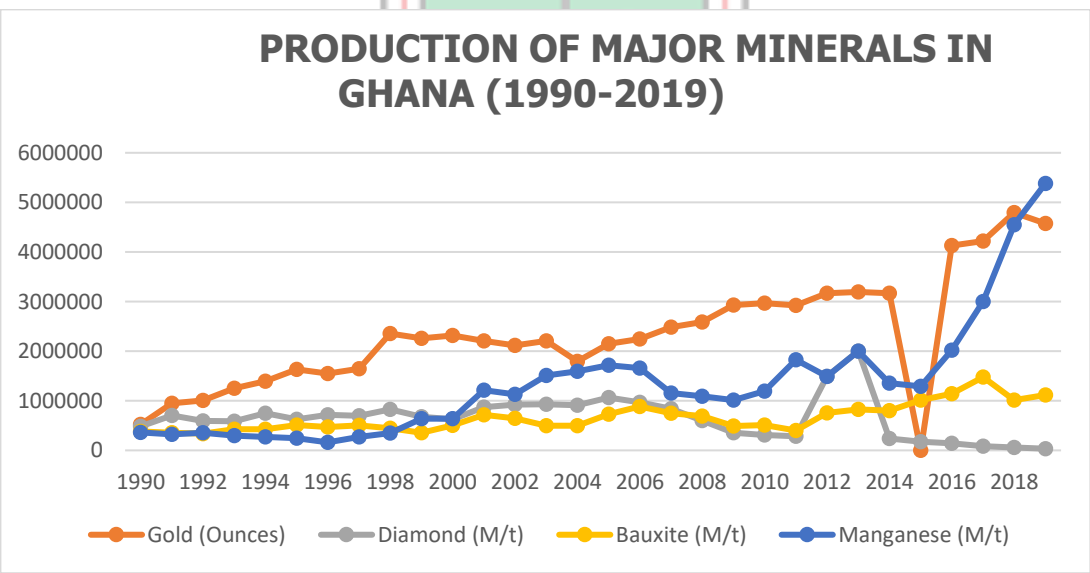

Figure 2.3: A graph production of major minerals in Ghana (1990-2019).

Source: *Author's own construct using the data from Ghana Chamber of Mines, Minerals Commission, Ghana.*

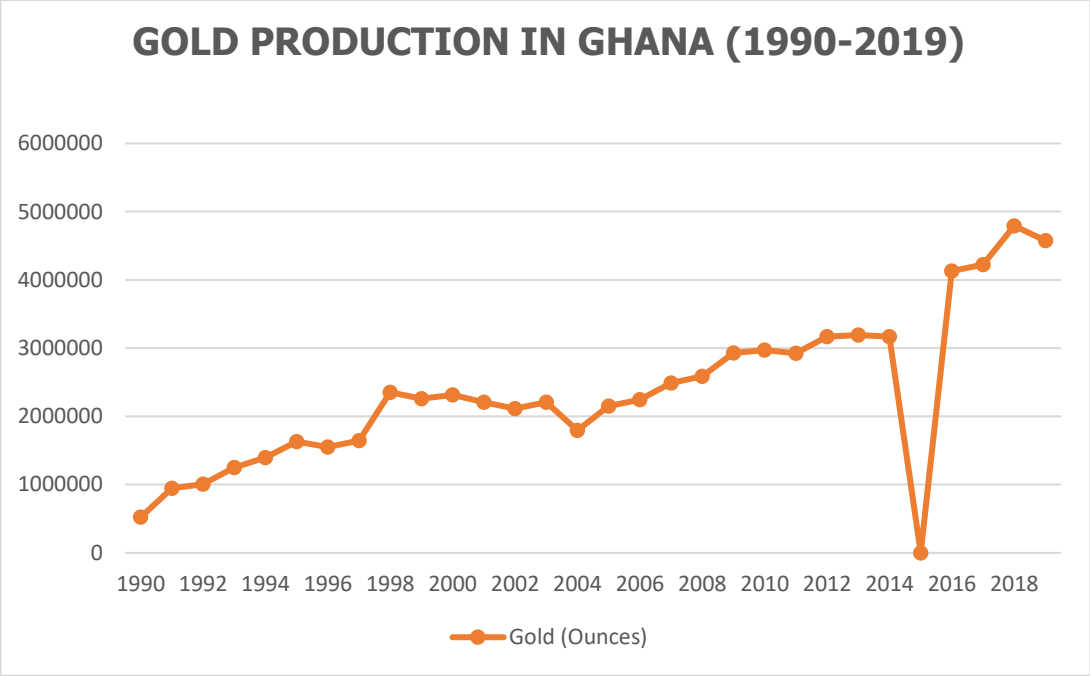

Figure 2.4: A graph showing gold production in Ghana (1990-2019)

Source: *Author's own construct using the data from Ghana Chamber of Mines, Minerals Commission, Ghana.*

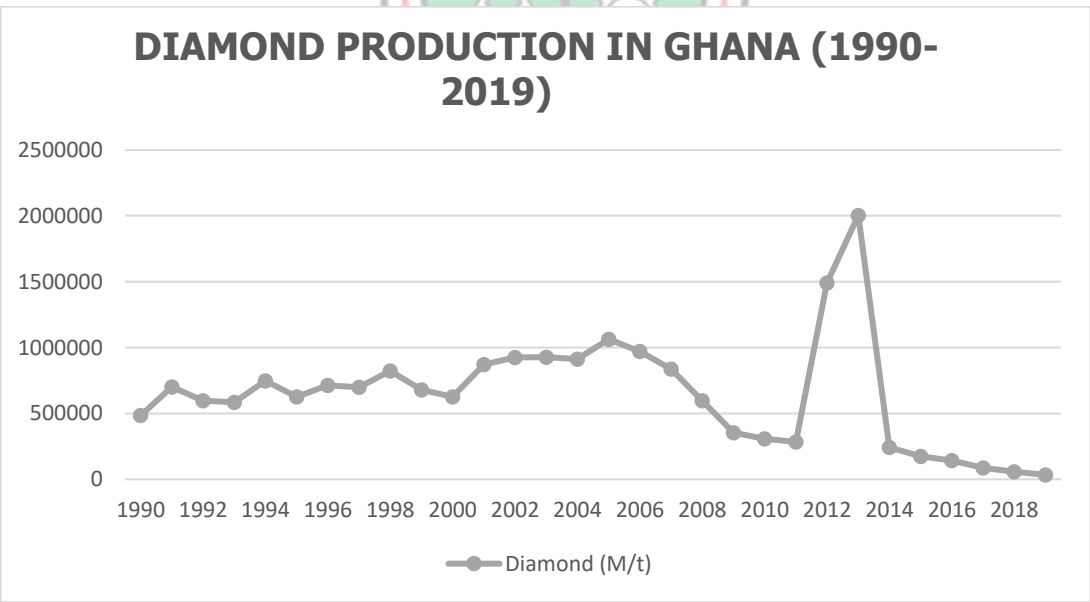

Figure 2.5: A graph showing diamond production in Ghana (1990-2019)

Source: *Author's own construct using the data from Ghana Chamber of Mines, Minerals Commission, Ghana.*

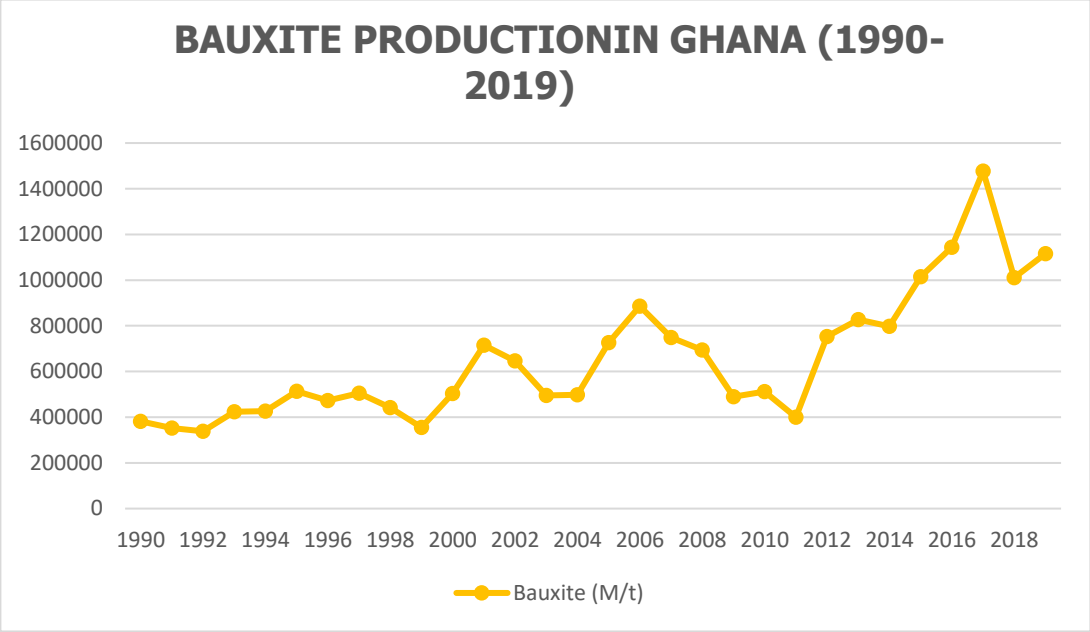

Figure 2. 6: A graph showing bauxite production in Ghana (1990-2019)
Source: *Author's own construct using the data from Ghana Chamber of Mines*

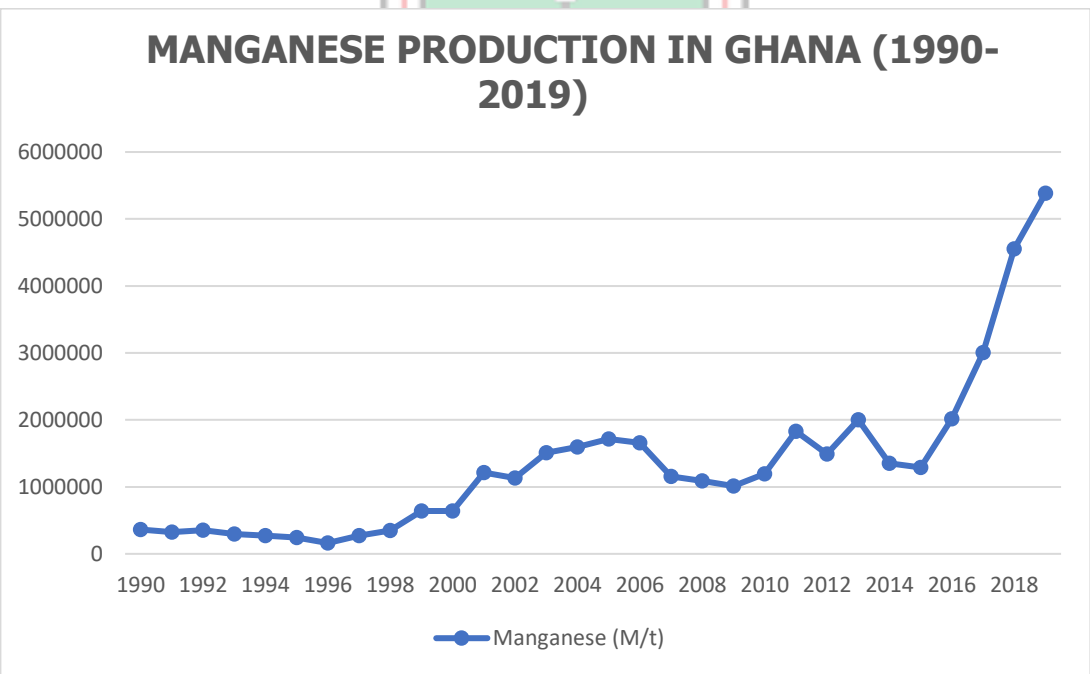

Figure 2.7: A graph showing manganese production in Ghana (1990-2019).
Source: *Author's own construct using the data from Ghana Chamber of Mines, Minerals Commission, Ghana.*

2.3.3 Contribution to Government Revenue

There are considerable differences between countries in terms of mining's contribution to total government income and how these earnings are distributed between national and subnational levels. However, the long-term contribution of the mining industry to income taxes must be recognized (Dorin et al., 2014). Ghana's mining industry contributes to government revenue by paying direct taxes such as corporate tax, Pay-As-You-Earn (PAYE) on the earnings and salaries of sector employees, and royalties. Other revenues generated by the mining industry towards the development of the economy are (Sampson, 2002):

- Social Security Contributions from employees and employers;
- Dividends to Shareholders;
- Equipment and Consumables purchased locally;
- Electricity, water charges and rent.

In this thesis, the term Mineral Revenue is referred to as total contribution of the industry towards government revenue. Mineral Revenue = Corporate Taxes + Royalties + PAYE (1993 – 2019).

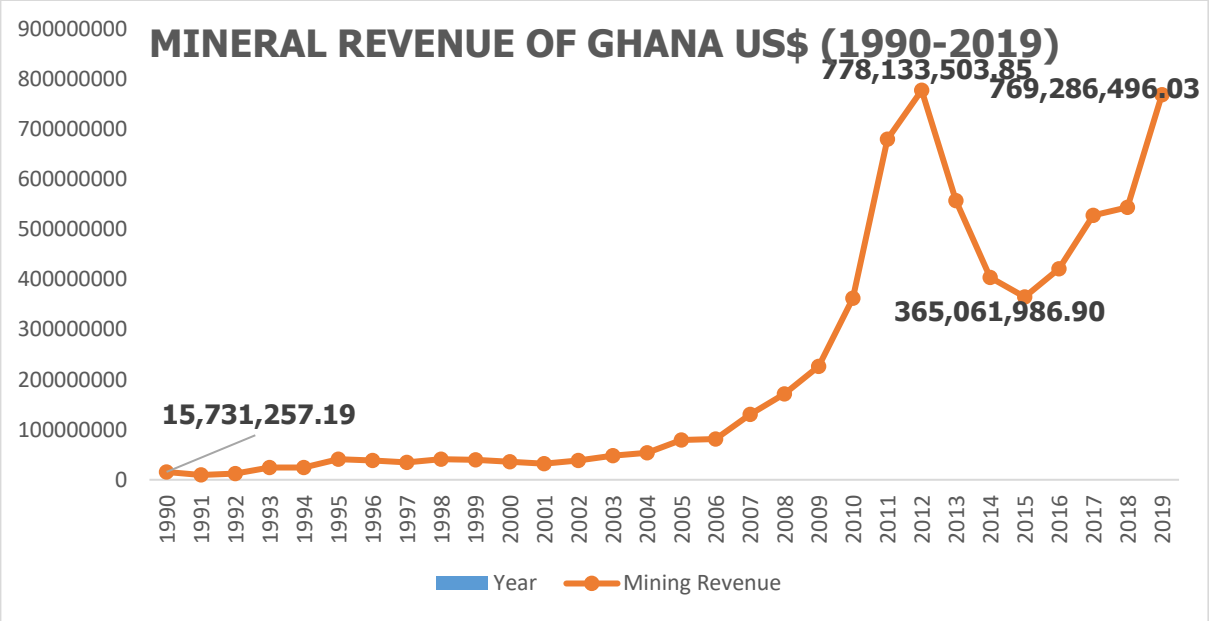

Figure 2.8: A graph showing government revenue (US$) from the mining industry (1990-2019)

Source: *Author's own construct using the data from Ghana Chamber of Mines, Bank of Ghana.*

2.3.4 Gross Domestic Product (GDP)

The mining industry's contribution to a country's GDP and other components of national income is typically considered to be insignificant (usually about 2-4 percent of national income). Developing countries, on the other hand, frequently lack large industrial resources and advanced mining technology used in modern mines, which explains the little contribution they have made. To make up for this, numerous upstream value-added components are exported, such as exploitation earnings (such as GDP contributions) (Dorin et al., 2014). For the government, mining revenue accounted for 12.7% of overall revenue, 3.2% of corporate tax revenue, and 40% of total merchandise export revenues. In 2009, this industry accounted for 7% of Ghana's corporate tax revenue, 45% of total export revenue, and 19.8% of government revenue. It also contributed 6% to Ghana's Gross Domestic Product (GDP) (Anon., 2010).

According to the 2011 GDP figures, mining contributed for 6 percent of GDP and expanded by 23.5 percent (Aubynn, 2015).

2.3.5 Employment

Compared to the national average wage, (Dorin et al., 2014) report that new positions directly created by large mining businesses are often well paid. Due to their rarity, only a tiny fraction of all employment in the United States are in this category. On the other hand, mining has the potential to create substantial indirect jobs in the supply chain. As a result of such behavior, the multiplicative effects might be exceedingly severe. Three or four workers from a different industry are usually equivalent to one miner. Indirect job consequences may be particularly substantial in disadvantaged communities where mining is a dominant sector. One of the most important contributions of FDIs in resource-rich but impoverished countries is creating jobs in the mineral resource industry/country for host communities (ICMM, 2018).

Mine Support Services and Large-scale Mining employ roughly 27,000 people in Ghana, while the small-scale gold and diamond mining, quarrying, and salt industries employ an estimated 500,000 people. As a result of the mineral sector, export receipts totaled US$2.62 billion in 2009. About US$10 billion in foreign direct investments (FDI) were made in the minerals and mining sector between 1984 and 2009. (Anon., 2010). Mining is a major source of employment in the country, according to (Aryeetey, 2004). He went on to say that up until 1995, the mining sector accounted for 20 percent of formal sector employment in the country, with big scale mining businesses employing 20,000 people and small scale artisanal mining employing double that number. Assay laboratories, equipment leasing and sales agencies, contract mining, road

building firms, transportation companies, security companies, and catering organizations also contributed to the formal sector's employment in 1996 and 1999, respectively.

Although output of critical minerals increased dramatically from 1987 to 2007, the number of jobs created by the sector decreased between 2001 and 2005. Heavy machinery used in mining and processing activities, rather than labor-intensive methods or low mechanization options, is to blame for the fall in mining and processing. The total number of employees directly employed by the Chamber's member companies in 2019 was 11,899, up from 10,109 in 2018. AngloGold Ashanti's Obuasi Mine, Newmont's Ahafo Mine, Asanko Gold Mine, Golden Star Resources' Wassa Mine, and Gold Fields' Damang Mine accounted for the majority of the 18% increase in employment. One hundred and forty-four people were expats and the rest were Ghanaians in 2019. The number of expatriates in the workforce in 2019 is 1.2%, which is somewhat less than the 1.6% recorded in 2018.

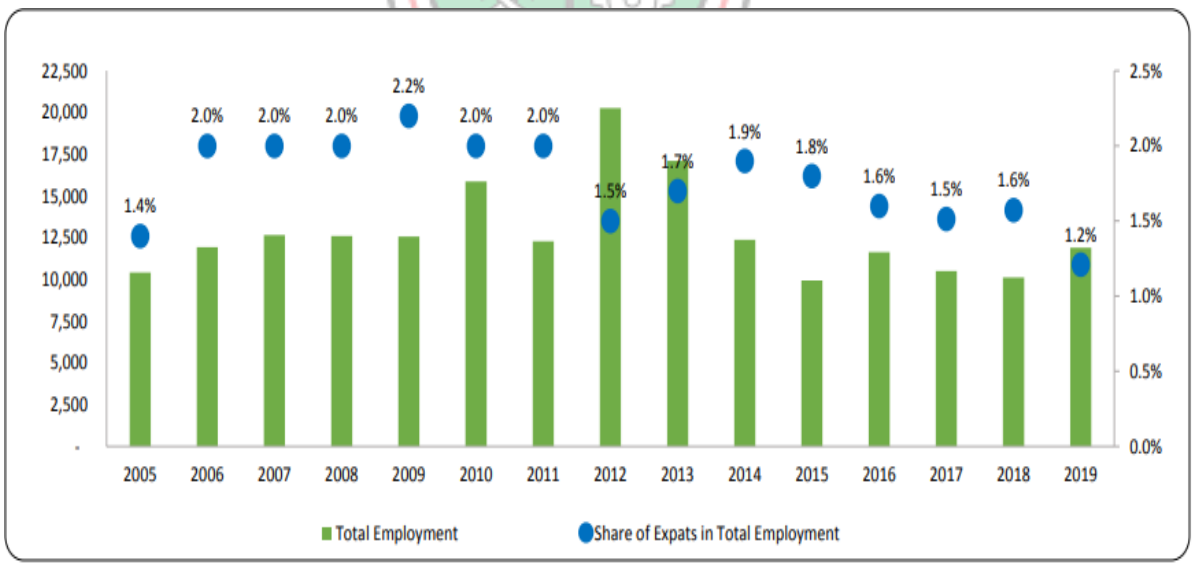

Figure 2.9: Employment statistics in the Large-Scale Mining Sector (2005 – 2019)

Source: Ghana Chamber of Mines, Mining Industry Statistics Report, 2020

2.4 Adverse Effects of Mining

Despite the positive economic consequences of mining in a country's growth, mining comes with a slew of problems, and Ghana is no exception. The mining industry in Ghana faces the following challenges:

2.4.1 Effects on Soil Quality

Mining activities deplete soil fertility by removing topsoil and polluting the soil. In a report commissioned by the European Union, mining activities expose previously undisturbed soil materials, methodically altering the surrounding landscape. As a result of the erosion of exposed soils, mined mineral ore tailings and fine material in waste rock piles surface water sediment loading might change (Singh et al., 2016).

2.4.2 Effects on Air Quality

A mine's exploration or development will invariably impact the environment as well as those who live there (Warhurst, 1994). For example, mining involves a great deal of excavation and resulting in a lot of waste. It also exposes previously buried geological elements to oxidation and precipitation. Environmental and health concerns might persist even when the best standards are faithfully followed (Chiaro and Joklik, 1998). As a result of chemical and explosive use in specific regions of mining, poisons such as chemicals, dust, and fumes are released into the air. Environment has become a major factor in mining activity over the previous two decades (Omalu and Zamora, 1999).

Drilling, blasting, hauling, collecting, and transportation are primary sources of airborne pollutants and waste, according to Tripathi et al., but mining can pollute the environment at any

stage of the mine cycle. Miners, solid waste generators, refiners, and processors all contribute to toxic air pollution. The usage of waste disposal technologies like dragline conical dumping can cause gully erosion, dump slope failure, and pumping issues that result in flooding of the working area during rainy seasons, among other concerns (Singh et al., 2016).

2.4.3 Effects on Water Resources

Water has been a victim of mining from the beginning of time, with the huge multinational mining firms today damaging surface and ground water to a higher degree, despite their efforts to achieve successful enforcement through Acid Mine Drainage (Veiga and Beinhoff, 1997). In terms of water quality and availability, mining has the most devastating impact on the environment. It contains dissolved metals and pollutants that leach into waterways. As a result of this, harmful substances, such as lead and arsenic are released into the environment. Massive leaching and blasting operations have also led to higher cyanide and nitrogen levels in water supplies. Besides being unsafe for human consumption, mining-affected water can have dire repercussions for the environment and marine life. Surface water consistency has a negative impact on terrestrial fauna (Singh et al., 2016).

The major water supply in the Eastern Region, Birim, has been affected by illicit mining, according to Mantey (2017). Kyebi had to close its water treatment plants because of river contamination that was too severe to cure. These problems have pushed the Ghana Water Company to construct boreholes that would serve smaller populations.

2.4.4 Disturbances

Noise pollution from drilling, crushing, draglines, conveyors, and processing plants is one of the most severe consequences of mining operations. Earthquake, airblast, and gas emissions are only some ways that blasting has an impact on the environment. Explosive blasts cause vibration vibrations to propagate through soil and rock strata to neighboring building foundations (ERM, 2013). Large-scale open-pit mining activities harm infrastructure, housing, and people's homes. Neither domesticated nor wild animals are exempt from the effects of the fungus. Explosions in mining can cause noise and dust, as well as shocks and vibrations that may lead to collapse of structures in neighboring inhabited areas (Singh et al., 2016).

2.4.5 Effects of Mining on Social Values

Changes in population number and composition, new patterns of employment and income, and environmental changes (land use changes, loss of natural habitat and hydrological regime) are some of the significant social repercussions of mining (UNEP, 2002). Two of the most major socioeconomic repercussions include displacement and resettlement. Many individuals are forced to leave their homes due to mining activities (Singh et al., 2016).

2.4.6 Effects of Mining on Wildlife & Fauna

Wild flora and fauna include both domesticated and non-domesticated species (or other organisms). Miners degrade habitats, produce chemicals, and create noise, all of which have a negative impact on wild fauna and other wildlife. Some of the biggest losses affect the ground surface by disrupting, destructing, or redistributing it, with some short-term and some long-term consequences. It is not uncommon for wild animals, as well as those that are sedentary

(such as insects and reptiles), to be killed or moved during excavation or mine spoil piling. Because large land areas are divided into smaller parts, habitat fragmentation can have substantial ecological consequences. Native species are unable to disperse from one area to the next. As a result of habitat fragmentation, species that require extensive forest patches have been extinct.

2.5 Concerns and Perceptions in the Mining Industry

In spite of the positive economic implications of mining in the development of countries, many prevailing issues in the mining industry affects the gains by the various stakeholders in the industry of which, companies in Ghana are not exempted. Below are some topical issues emanating from Ghanaians and stakeholders of Ghana's Mining Industry.

2.5.1 Non-Transparency in the Industry

Because of the prevalence of corruption and bribery in Africa, which has some roots in Ghana, running a transparent mining business with advantages for all Ghanaians is a difficult task. Transparency is essential in the mining business if you want to succeed. Sunlight is the best disinfectant, as the late US Supreme Court Justice Louis D. Brandeis famously said. The state loses a lot of money when large mining corporations undervalue mineral blocks due to inadequate regulatory systems, according to my opinion, which is supported by empirical evidence. Most mining firms hide behind bureaucratic, complex, global company structures in order to deny the state the tax benefits it needs. However, despite Ghana's 2003 membership in the Extractive Industries Transparency Initiative (EITI), which aims to promote good

governance in the extractive industry, little is done to properly monitor the cash flows of mining corporations in Ghana (Gomashie, 2020).

2.5.2 Illicit Financial Flows and Weak Regulatory Agencies

Former U.S. President, Barack Obama indicated in 2009 that, strengthening African institutions is more important than having strongmen (Anon., 2009). There are also estimates that Africa has lost up to $US 1 trillion in the previous 50 years due to unlawful transactions via channels such as criminal activities of multinational firms, of which mining companies play a key part (IFF, 2015). Weak regulatory and other government institutions make us ripe for bribery, which in turn has a detrimental impact on government revenue from the mining business. Ultimately, we'll need a little help from the International Monetary Fund (IMF) in the form of small loans with severe terms and conditions in order to run the state.

Tax holidays, investment allowances, tax rate reductions, and administrative discretion are just a few of the tax incentives that African governments offer to attract foreign direct investment. There are times when policy decisions are made without considering the costs and benefits, but rather with the goal of outdoing competitors for foreign direct investment, leading to damaging tax competition and a race towards the bottom (Gomashie, 2020).

2.5.3 Radical Retrenchment Programmes

A retrenchment is a strategy used by an organization to maintain its viability. Many of Ghana's large mining corporations have relied on retrenchment to ensure the sustainability of their operations over the years. Despite the fact that most of them were positively greeted by the workforce, quite a few of them have recently come under fire. Extreme employment cuts in the

mining industry are threatening job security, and have opened the door for unpleasant working conditions in the industry. Because of these rigorous retrenchment initiatives, the government has to spend more money to combat social problems that occur (Gomashie, 2020).

2.6 Empirical Literature Review

After conducting a study, Auty (1993) concluded that tiny resource-rich economies do not perform statistically well when compared to other economies because of structural shocks that squeeze the export sector in an unsustainable manner. As a result, according to him, the economy suffers, and policies that mislead the allocation of resources are put on the front-burner. "Natural resource curse" was coined by Auty (2001) as a way of describing how countries rich in natural resources were not able to use their wealth to strengthen their economies, and so faced reduced economic growth (Mahonye and Manhishara, 2015).

Using Ordinary Least Square, Mahonye and Manhishara (2015) examined the importance of mineral resources in Zimbabwe's economic development. Real manufacturing and mining growth, the fraction of mineral exports in total exports, and property and political rights were found to be major predictors of Zimbabwe's economic growth.

Mongale and Nhlangwini, (2015) used Granger causality, vector autoregressive and decomposition approaches to study the relationship between mining production in South Africa and its economic growth. Natural resources theory is supported by the fact that the mining production of gold exhibited a negative relationship with GDP spending. Natural resource curse is unavoidable, according to a study by Roy et al (2013). This means that resource-rich countries do worse than countries without natural resources. There is an unexpected negative association

between mineral output and economic growth, according to Mobarak and Karshenasan (2012). According to a study by Mahonye and Mandishra (2015), there is a negative link between mineral resources, which is a proxy for resource dependence/abundance, and economic growth in Zimbabwe. This conclusion was reached by Alpha and Ding (2016) in a study using Error Correction Model (ECM) regression to examine the impact of natural resource endowment on economic growth in Mali.

A study by Koitsiwe (2018), who used Granger causality, VAR estimations, Impulse Response Functions, and Variance Decomposition to examine the "Impact of the Mining Sector on Economic Development in Botswana," found a unidirectional causality between mineral revenue and Botswana's gross domestic product (GDP). For example, Appiah and Buaben (2012) looked at whether gold mining in Sub-Saharan Africa had been good or bad for Ghana. The researchers collected data from 102 households in the three areas studied, as well as interviews with the most important informants. As part of a qualitative and quantitative research approach, the study analyzed these paradoxes in the sense of mining firms' interactions with communities as well as the socio-economic effects on livelihoods and survival. By producing jobs and markets as well as boosting the auxiliary sectors, mining has contributed modestly to local economies, according to the research. Higher marginalization costs and abrupt shifts in local economic paradigms, which result in job losses and socio-economic insecurity, always undermine these benefits.

Using the Ordinary Least Square Method to analyze gold production data from 1991-2009, Adetunde et al., (2013) found that gold production and export have not significantly improved

the Ghanaian economy, and urged the government to invest in the sector and implement policies that will encourage the private sector to participate actively in Ghana's economy.

When it comes to global mining, Walser (2002) did a lot of study at the community level in places like Papua New Guinea (PNG), Bolivia, and Chile. Social and economic benefits are enormous, according to the findings of the study. Many small and micro-enterprises are expanding their operations in the local area, which is a very encouraging sign. It's important to remember that sustainable development is more than just a matter of money, thus mining will always be controversial. Other economic and social difficulties have been related to mining. Consequentially, economic outcomes are viewed with suspicion. It is necessary to analyze the mining industry's contribution to long-term growth in terms of economic and technological feasibility, environmental protection, and social equality. There must be a collaborative effort between the mining companies and the local community to overcome these concerns, the research states.

With the purpose of assessing how mining has affected local populations, Al Rawashdeh, Campbell and Titi (2016) looked at selected socioeconomic indices (unemployment, poverty and human development index) in Jordan. It appears that mining activities are linked to lower-than-average output as assessed by development indicators in Jordan's south-western section of the country, based on the development indicators that were evaluated. If other factors are at play and the link is causal, mining towns may be better off as a result. Socioeconomic data before and after mining in Ma'an do not indicate that Ma'an experienced a faster growth rate.

Aside from what's going on in the rest of the world, mining enterprises in Jordan continue to struggle to provide for the local population.

Obiri et al. (2016) undertook a study on the environmental and socio-economic effects of artisanal gold mining in the Tarkwa Nsuaem Municipality. Between January and October 2013, the natural science team interviewed 250 persons about mining-related socio-economic issues using techniques laid out by the American Water Works Association, while the social science team collected biweekly samples for study. The survey results were analyzed with the help of a logistic regression model. GS 175-1/World Health Organization a water quality analysis conducted by the locals found that permissible guideline levels were frequently exceeded in water samples from the study area (where 83 percent of respondents believe water bodies in the study area are polluted).

Selebi-Copper-Nickel Phikwe's Mine was researched by Asare and Darkoh (2001), who assessed the mine's social and environmental impacts. Some of the data indicate that the mine's existence triggered rapid population expansion, outpacing the town's ability and aptitude to cope with an inflow of migrants through social services such as housing, according to the study. Consequently, on the periphery of the city, squatter communities have sprung up in large numbers. People, soil, water, and flora all suffer from air pollution in the region. Due to pollution, approximately 40 hectares of land in the area cannot be developed for human settlement. Financial issues have made it difficult for the company to meet environmental quality standards and provide assistance to the community in which it operates. No obvious

relationship exists between the mine's administration and its surrounding community in terms of environmental concerns.

According to Chuhan-Pole and co-authors, rapid mine growth in industrial development has negative socioeconomic effects on the local community's economy. When it comes to providing proof for its findings, the paper makes use of a vast data collection that includes geocoded household data, as well as significant information on gold mining activities. Two analyses were conducted: one at the local level to define an economic footprint region near to a mine and another at the district level in order to determine fiscal channels. Men are more likely to gain from direct work as miners, and women from indirect employment chances in services, according to the data, despite the fact that the calculations are imprecise. Electricity and radio are available to households that have been there for a long time. Families with children are more prone to get diarrheal infections if they live near mines. Mining districts on the other hand have significantly lower infant mortality rates. An urgent need for a similar study is urgently needed in light of all the results and debates surrounding natural resources, and how they relate to economic growth, in addition to the fact that Ghana has abundant mineral resources.

2.7 Conceptual Framework

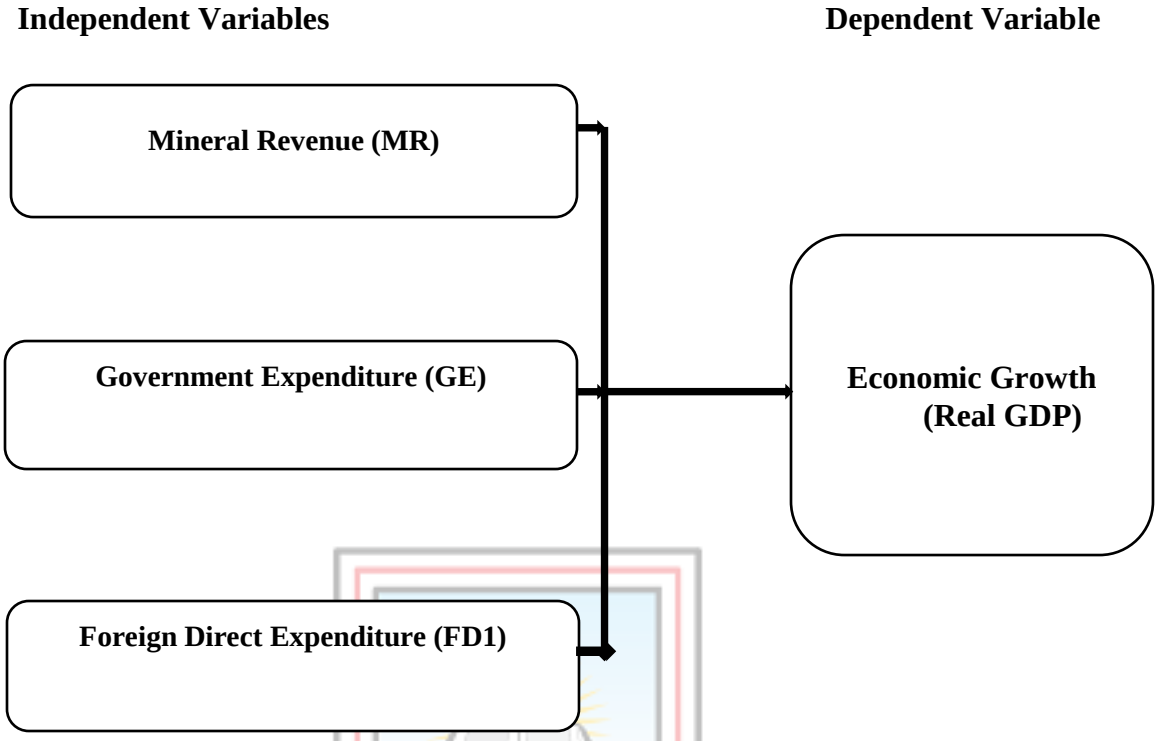

Figure 2.101: Conceptual Framework for the study
Source: Author's Construct, 2021

Figure 2.10 shows the conceptual framework for the study indicating the relationship between the variables. The independent variables were mineral revenue, government expenditure and foreign direct investment. The dependent variable was economic growth represented by Real GDP.

2.8 Chapter Summary

This chapter reviewed theories and concepts pertaining to the relationship between mineral revenues and economic growth. Empirical literatures on the subject were also revealed. The chapter concluded with the conceptual framework underlying the study. The review has showed that, different authors have reported on varied findings on the effects of mineral revenue and

economic growth. This study seeks to conclude on the subject in the context of Ghana to influence policy decisions. The next chapter of the study presents the methodology employed in realizing the study aim.

CHAPTER 3

METHODOLOGY

3.0 Introduction

This study intends to evaluate the long-term relationships between mineral revenue, government expenditure, foreign direct investment, and economic growth in Ghana from 1990 to 2019. Here, a description of the research technique used to conduct the empirical investigation is presented. There is a certain framework for each research study that must be followed. The chapter describes the study's concept, the characteristics of Ghana's leading mining corporations and the data sources used. As part of the study, researchers followed commonly acknowledged procedures and methodologies published in related peer-reviewed journals to conduct the research.

3.1 Study Design and Approach

The study employed a causal research design. The quantitative method was applied on data from 1990 to 2019. Mineral revenue, government expenditures, foreign direct investment, and real gross domestic product were the variables of this study. For the data on mineral revenue, government spending, and real GDP, it was given in US dollars. The research included a 29-year span, from 1990 to 2019. The information was gathered on a yearly basis.

3.2 Sources of Data

In order to achieve the study's goals, secondary data was utilised. Secondary data was gathered from the Ghana Minerals Commission, Ghana Chamber of Mines, World Bank, Bank of Ghana, and International Monetary Fund reports and publications. The study employed time series data

from 1990 to 2019 as its reference period. The data was collected on a yearly basis. Over the study period, quantitative data on mineral revenue, Real GDP, government expenditure, and foreign direct investment were collected.

3.3 Variables of the Study

3.3.1 Mineral Revenue

The mining sector in Ghana accrue revenue to the government in different forms. These revenues include mineral rights fees, operating permit, processing fees, other fees and licences collected by the minerals commission. Revenues such as mineral royalty, pay-as-you-earn (PAYE), corporate tax, withholding tax, import duty, value added tax; capital gain tax, customs processing fee and destination inspection fees are collected from the Ghana Revenue Authority. Environmental payment fees are paid to the Environmental Protection Agency. The district assemblies and local authorities collect property rates and ground rent from the mining companies (Anon, 2019). The data were collected from the websites of the Ghana Revenue Authority and other online sources. These revenues are important source of income to the country. In this study, changes in mineral revenue were assumed to be capable of affecting the other macroeconomic variables in the study. Therefore, mineral revenue is exogenous.

3.3.2 Government Expenditure

Money spent by government on products and services such as education, health care, social protection, defense, etc. Capital and consumption expenses make up government spending. This category contains all of the government's current expenditures for the purchase of goods and services, traditionally known as general government consumption (including compensation of

employees). Most national security and defense spending is included, but not government military spending, which is part of state capital formation. In addition to taxes and government revenue production, government spending is financed by borrowing. For governments, mineral revenue is a major source of revenue for funding expenditures. As an endogenous variable in the study's model, government expenditures were included since they have a controlling effect on economic growth. The study's data is based on current U.S. dollar exchange rates.

3.3.3 Foreign Direct Investment

Investments made by one party in one country into a company in another country are known as foreign direct investment (FDI). A foreign direct investment (FDI) is distinguished from a foreign portfolio investment (FPI) by the presence of a permanent interest. Earning a long-term interest or expanding one's business to a foreign country are two ways that foreign direct investment can be made. Foreign direct investment (FDI) is a critical component of every country's growth, including Ghana's. Each nation's economic progress depends on it (Coy and Comican, 2014). In Ghana, mining-related FDI comes from foreign companies and investors injecting capital into the mining industry. Foreign direct investment (FDI) and consequently exogenous elements of the economy are affected by the mining sector's attractiveness, which is determined by external factors in the economy. Due of its ability to influence economic growth, foreign direct investment was included in the model.

3.3.4 Real GDP

All finished products and services generated within a country's boundaries are counted in the Gross Domestic Product (GDP), which includes both domestically produced goods and services

as well as those created by outsiders. To determine how well a country's economy is doing, it is mostly used. GDP is measured in nominal and real terms by macro-economists. Nominal GDP is the total monetary worth of goods and services generated by an economy in a specific period (for example, one year) (Fix et al., 2019). Actual Gross Domestic Product (GDP) was chosen because it provides an accurate comparison of growth over a year, taking inflation into consideration. A country's place in the business cycle can be determined using this tool. When measuring economic development, researchers used the real GDP (gross domestic product). It is assumed that changes in mineral revenue influences Real GDP. Therefore, GDP is an endogenous variable in the study model.

Table 3.1: Summary of Variables and Data Sources.

VARIABLE	**MEASURE USED**	**SOURCE**
Dependent Variable		
Economic Growth	Real GDP	World Development Indicators (WDI)
Independent Variables		
Mineral revenue	Royalties, Corporate Taxes, PAYE, other levies	Ghana Chamber of Mines, Minerals Commission
Foreign Direct Investment	Direct Investment	IMF
Government Expenditure	General Government Final Consumption Expenditure	World Development Indicators (WDI)

3.4 Growth Model

Growth theory has developed into a fundamental aspect of development economics over time. The 'Harrod-Domar' Model, named after English economist Sir Roy Harrod and American economist Evsey Domar, is widely regarded as one of the first attempts to model economic growth. The model is an early attempt to illustrate that growth is linked to savings and the capital-to-output ratio (Adetunde et al., 2013).

Growth (G) can be presented as follows:

$$G = \frac{s}{k} \tag{3.1}$$

Where:

G- Growth

K – Capital output ratio (incremental)

S- Average savings propensity

According to the model, saving has a direct effect on growth, whereas the incremental capital/output ratio has an indirect or inverse effect on growth. However, Solow's economic growth model is based on the assumption that an economy's output is produced by a combination of labor (L) and capital (K) under constant returns, such that doubling input results in double output. Physical and human capital are separated in more recent editions. As a result, the efficiency (A) with which capital and labour are utilised also influences the quantity of output (Y).

This is represented mathematically as:

$$Y = Af(L, K) \tag{3.2}$$

Solow hypothesized that this production function had constant returns to scale, which means that if all inputs are increased by a particular multiple, output will also grow by that multiple. The neoclassical growth model proposed by Solow employs a typical aggregate production function.

$$Yt = AtK_t^a Lt^{1-a}\, 0 < \alpha < 1 \tag{3.3}$$

Y denotes gross domestic product, K denotes capital stock, L denotes labor, and are denotes labor productivity, which is expected to grow at exogenous rates n and g.

$$Lt = Loe^{nt} \tag{3.4}$$

$$At = Aoe^{gt} \tag{3.5}$$

At Lt, the number of effective labor units grows at a rate of n+g. These rates are estimated to be around 2% every year in wealthy countries. It may be less or greater for developing countries, depending on whether they are stagnating or catching up to developed countries. The elasticity of output with respect to capital is represented by in equation (3.3) (the percentage increases in GDP as a result of a 1 percent increase in human and physical capital). The share of capital in a country's national income accounting is usually used to calculate it statistically. The model implies that a fixed percentage of output, called s, is invested.

If k is defined as the stock of capital as per effective unit of labour and y as the level of output, the function of k is given by:

$$Kt = syt - (n + g + \delta)kt = sktn - (n + g + \delta)kt \tag{3.6}$$

Where:

δ – Depreciation rate

K is defined by

$$k^* = [s/(n+g+\delta)]^{1/(1-\alpha)} \quad (3.7)$$

The steady-state capital-labor ratio has a positive relationship with saving and a negative relationship with population growth. The Solow model's primary predictions address the impact of saving and population growth on real income. We may calculate steady-state income per capita by substituting (3.5) into the production function and taking logs.

$$In(\frac{Y}{L}) = InA_O + gt - \frac{\alpha}{1-\alpha} In(s) - \frac{\alpha}{1-\alpha} In(n+g+\delta) \quad (3.8)$$

The magnitudes and signs of the coefficients on savings and population growth are predicted by the model, which assumes that factors are paid their marginal products. When competitive markets are considered, the economy's growth rate can be viewed as a weighted sum of the growth rates of the efficiency parameter gA (also known as technical advancement), the labor force gL, and the capital stock gK. The shares of payment to labor and capital in Gross Domestic Product are the weights on labor and capital.

$$gY = gA + a\lg L + akgK \quad (3.9)$$

The enlarged version of Solow's growth model was specified by Mankiw et al. (1992) in light of the model's flaws. A Cobb Douglas production function is assumed in this expanded version of the model. To begin, the Solow model was modified to include human capital accumulation. The aggregate output of the economy, according to Mankiw et al. (1992), can be stated as:

$$Y_t = A_t K_t^{\alpha} H_t^{\beta} L_t^{1-\alpha\beta} \quad (3.10)$$

Where,

K represents the capital stock,

L represents the labor supply, and

A represents the index of technical change.

H stands for human capital stock.

It is worth noting that the coefficients and are expected to be between 0 and 1 and (+) 1, meaning that all capital has declining returns. Assuming that sk is the percentage of revenue spent on physical capital and sh is the percentage spent on human capital, the economy's evolution is dictated by:

$$kt = skyt - (n + g + \delta)kt \tag{3.11}$$

$$ht = shyt - (n + g + \delta)ht \tag{3.12}$$

Where: y, k, and h are quantities of effective labour.

Due to the fact that the model's repeatable factors have no constant returns to scale, it will never reach a steady state. A stable state of the economy is implied by equations (3.11) and (3.12) defined by:

$$k = \left(\frac{sk^{1-\beta}s_h^{\beta}}{n+g+\delta}\right)^{\frac{1}{1-\alpha-\beta}}, \qquad h = \left(\frac{sk^{\alpha}s_h^{1-\alpha}}{n+g+\delta}\right)^{\frac{1}{1-\alpha-\beta}} \tag{3.13}$$

When you substitute (3.13) into the production function and take the natural logs, you get an equation that looks like:

$$In\left(\frac{Y^t}{L^t}\right) = InA_{\circ} + gt - \frac{\alpha+\beta}{1-\alpha-\beta}In(n+g+\delta) + \frac{\alpha}{1-\alpha-\beta}In(s_K) + \frac{\beta}{1-\alpha-\beta} \tag{3.14}$$

This equation explains how mineral revenue affect real GDP (a proxy for economic growth). The framework is built on an endogenous growth theory-based augmented Cobb Douglas

model. According to the fundamental Cobb Douglas model, the country's output level is determined by both capital and labour. The combination of capital and labour produces mineral revenue which propels economic growth. The production function resulting is expressed as:

$$Y_t = A_t(MR_t)^{\beta 1}(FDI_t)^{\beta 2}(GE_t)^{\beta 3}(L_t)^{\beta 4} \quad (3.15)$$

Where:

Y- Economic Growth proxy by Real GDP

MR- Mineral Revenue

FDI – Foreign Direct Investment

GE – Government Expenditure

β1,….B4 – Slope coefficients

3.5 Model Specification

The model used in this study are vector autoregressive (VAR) and Vector Error Correction (VEC). The VAR was used to model real GDP growth of Ghana, while the VEC was used to find the long-run and short-run relationships between the variables.

3.5.1 Vector Auto Regression (VAR)

The relationship between mining revenue, government spending, foreign direct investment, and economic growth was studied using a vector autoregressive (VAR) model. Sims (1980) invented vector auto regression as a multivariate framework in which changes in one variable (mineral revenue) are related to changes in its latencies, as well as changes in other variables' latencies. VAR treats all variables endogenously, eliminating the need for severe constraints. Because the dependent variables are written as lag variables, it is a reduced-form model. The

vector of endogenous variables in our VAR models includes mineral income, government expenditures, foreign direct investment, and real GDP.

The dependent variable's lagged values must appear as a 'right-side' of the equation to be deemed "autoregressive." For a function to be named "vector," it must have a vector with two or more variables. A VAR model can only be created when variables are incorporated for ordering. Ordinary least squares is used as a predictor to predict the VAR model. The VAR model is being used in this study to make predictions and discuss outcomes. Because the relationship between variables is simultaneously determined, unknown relationships between variables are considered endogenous in the system.

In a VAR Model, each variable is modeled as a linear function of past lags of itself and past lags of other variables in the system. For example, the system of equation for a VAR (1) for a two-time time series variable (Y_1 and Y_2) is as follows (Anon., 2021b);

$$Y_{1,t} = \alpha_1 + \beta_{11,1} Y_{1,t-1} + \beta_{12,1} Y_{2,t-1} + \beta_p Y_{t-p} + \varepsilon_{1,t} \quad (3.14)$$

$$Y_{2,t} = \alpha_2 + \beta_{21,1} Y_{1,t-1} + \beta_{22,1} Y_{2,t-1} + \beta_{2p} Y_{t-p} + \varepsilon_{2,t} \quad (3.15)$$

Where y_t is a vector of endogenous variables, α is an intercept β is are coefficient matrices, p is the lag length and $\boldsymbol{\varepsilon_t}$ is an unobservable zero-mean white noise.

3.5.2 VAR Model

There are a number of endogenous variables in unrestricted VAR models (gross domestic vector). As a result of the standard neoclassical growth models adopted by Sadaat et al. (2016), Mahonye and Mashindra (2015), Koitsiwe (2018) and Nhiangwini and Mongale (2019), the model employs GDP as the dependent variable and a range of independent factors. We have found that the independent variables employed in this study have a strong connection to these research. An analysis of Ghana's economic growth is conducted using mineral earnings as a proxy. The VAR model is used to predict the variables in the system, simulate shocks in the system and create causal relationships to monitor the effects of shocks on endogenous variables and forecast (decomposing shocks in VAR system).

The estimate econometric model for this study is presented as follows:

GDP = (mineral revenue, government expenditure, foreign direct investment)

$$LRGDP = (ß_0 + ß_1 LMINREV + ß_2 LGOVEXP + ß_3 LTFDI + \varepsilon_t) \quad (3.16)$$

Here, *L* in front of each variable signifies conversion into logarithm; GOVEXP stands for total government expenditures; MINREV is for mining revenue; TFDI stands for total foreign direct investment into the country. There are three coefficients in this model: the intercept, parameters, and slope (b1 to b3). To account for variables that are not included in the model but may influence the dependent variable, *t* is used as the error term.

3.6 Vector Error Correction Model (VECM)

It's a VAR model with co-integration restrictions called the VECM. A vector error correction model (VECM) incorporating the error correction term is specified and estimated as a result of the co-model of the variables in the VAR model. Once the equilibrium conditions have been established, it describes how the investigated model is responding in each time period in model to the long-term equilibrium.

Although inconsequential variables can be removed from a dynamic model, the error correcting term is preserved. Long-term equilibrium can be achieved by rapidly correcting any disequilibrium by increasing the error correction period (Engle and Granger, 1987). It is a VAR in its initial difference form with the addition of vector cointegrating residuals (Xu, 2015). A simple error correction term is defined as;

$$ECT = y_t - \beta x_t \quad (3.17)$$

Where β is the cointegrating coefficient and βx_t the error term from the regression of y_t on x_t

The Vector Error Correction Model (VECM) is given as;

$$\Delta y_t = \Pi_{y-1} + \sum_{i=1}^{k} \Gamma_i \Delta y_{t-1} \quad (3.18)$$

The above equation is a single equation of ECM which can be applied in a multivariate model. In this study, four (4) variables are studied: Real GDP (RGDP) as the dependent variable, Mineral Revenue (MR), Government Expenditure (GE) and Foreign Direct Investment (FDI) as independent variables. With inspiration from VAR modelling and equation 1 and 2, the error correction model can be extended to the following equations (Koitswe, 2018);

$$\Delta RGDP_t = \alpha_o + \alpha_1 LRGP_{t-1} + \alpha_2 MR_{t-1} + \alpha_3 GE_{t-1} + \alpha_4 FDI_{t-1} + \alpha_5 ECT_{t-1} + \varepsilon_t \quad (3.19)$$

$$\Delta MR_t = \beta_o + \beta_1 LRGP_{t-1} + \beta_2 MR_{t-1} + \beta_3 GE_{t-1} + \beta_4 FDI_{t-1} + \beta_5 ECT_{t-1} \quad (3.20)$$

$$\Delta GE_t = \lambda_o + \lambda_1 LRGP_{t-1} + \lambda_2 MR_{t-1} + \lambda_3 GE_{t-1} + \lambda_4 FDI_{t-1} + \lambda_5 ECT_{t-1} \quad (3.21)$$

$$\Delta FDI_t = \Psi_o + \Psi_1 LRGP_{t-1} + \Psi_2 MR_{t-1} + \Psi_3 GE_{t-1} + \Psi_4 FDI_{t-1} + \Psi_5 ECT_{t-1} \quad (3.22)$$

In the long-run cointegrating relationships between the four variables, the ECTt-1 is a lagged error correcting term. First difference vector autoregressive model (VAR) is formed using the given equations. It's a first difference VAR with cointegrating residuals vectors as a type of VECM, so to speak. Assuming the model has endogenous variables (yt), we get two square matrix matrices with elements that depend on the model's coefficient (and). To calculate the long-run parameter, we need to multiply the long-run parameter by the first difference operator and add a white noise term e. This can be done by taking the product of the co-integration vectors and the co-integration matrix. When the cointegration vector appears in an equation, it is weighted according to a matrix that contains the long-run relationship coefficients and a matrix that contains the speed adjustment parameters (Xu, 2015).

3.7 Test for Stationarity

Using Eviews, the Augmented Dickey-Fuller (ADF) Unit Root Test was utilized to determine whether the data used in the VAR model were stationary or not.

3.8 Ethical Consideration

The researcher acquired permission from Tarkwa University of Mines and Technology to carry out the study (UMaT). Throughout the study period, the overall concepts and foundations of

human research ethics were scrupulously adhered to. Every source used in the study was properly acknowledged, both in-text and out-text.

3.9 Data Analysis Tool

Eviews software (version 12) was used to analyze the data. Descriptive statistics such as mean, median, minimum, maximum, standard deviation, skewness and kurtosis were presented for all the variables of the study. An enhanced Dickey-Fuller (ADF) unit root test was utilized to determine whether or not the data used in the analysis were stationary or not. The study employed EViews lag length criteria to determine the appropriate lag length. The variables under study were analyzed using Vector Autoregression (VAR) and Granger Causality Analysis and Vector Error Correction Model (VECM).

3.10 Chapter Summary

This chapter presented the methods and procedures that were employed in undertaking the empirical research. The study employed a causal research design. The quantitative method was applied on data from 1990 to 2019. Mineral revenue, government expenditures, foreign direct investment, and real gross domestic product were the variables of this study. Secondary data was gathered from the Ghana Minerals Commission, Ghana Chamber of Mines, World Bank, Bank of Ghana, and International Monetary Fund reports and publications. A vector error correction model was used to assess mineral revenue, government spending, foreign direct investment, and economic growth in Ghana in this study. The procedure employs economic estimation techniques such as the Augmented Dicker Fuller Unit Roots Test, cointegration analysis, and VECM analysis. Other tests include diagnostic and stability tests, as well as the

generalized impulse response function and variance decomposition in VAR. Eviews software (version 12) was used to analyze the data.

CHAPTER 4

RESULTS AND DISCUSSIONS

4.0 Introduction

Results will be presented and analyzed in this chapter. The results are discussed in more detail in the next sections of the book. The purpose of this research was to determine the economic impact of Ghana's mining industry. Secondary data on mining revenue, gross domestic product, government spending, and foreign direct investment have been used to conduct the analysis, which spans the years 1990 to 2019. We used the most recent available data from the Ghana Chamber of Mines, the Ghana Bank, the World Bank Group, the International Monetary Fund, and the International Financial Statistics Institute (IFSI). EViews software was used to perform the time series analysis (version 8). VECM, Granger Causality and Variance Decomposition analyses were used in particular to establish the connection between the variables under inquiry. More light was shed on the findings during the subsequent discussion in comparison with findings from previous researchers and scholars on the subject.

4.1 Descriptive Statistics

Table 4.1 shows the descriptive statistics for the variables of the study. The results show that, the mean value for Mineral Revenue (MR) between from 1990 to 2019 is $219 million with median of $63.48 million. The maximum revenue realized over the study period was $778 million which was achieved in the year 2012 and a minimum of $9.61 million realized in 1991. The deviation of revenue from the mean was $252 million and skewness of 1.003. The kurtosis was 2.585775 indicating peaked distribution (Hair et al., 2017). The results imply that, the

Government of Ghana is able to raise on average $219 million in mineral revenue of the recent 20 years period.

With regard to Government Expenditure (GE), the mean value was $2,450 million with median of $1,360 million. The greatest expenditures made was $6,820 million and the least was $507 million. These expenditures were made in the years 2013 and 2000 respectively. The deviation from the mean was $2,160 million with skewness and kurtosis of 0.778933 and 1.927579 respectively. The expenditure values showed peaked distribution.

Further analysis indicates a mean of $1,380 million for Foreign Direct Investment over the study period. The median was $238 million and the deviation from the mean was $1,490 million. The minimum investments made was $14.80 million and the maximum was $3,880 million. The investment figures were skewed by 0.430424 with kurtosis of 1.347544.

The descriptive statistics for Real GDP show a mean of $27,700 million, median of $22,800 million and Standard Deviation of $13,900 million. The maximum Real GDP over the study period was $57,300 million and the minimum was $12,100 million. The skewness was 0.707765 and the kurtosis was 2.162936. The results show a peaked distribution.

Table 4.1: Descriptive Statistics for the variables of the study

	MR (Million USD)	GE (Million USD)	FDI (Million USD)	RGDP (Million USD)
Mean	219	2,450	1,380	27,700
Median	63.48	1,360	238	22,800
Maximum	778	6,820	3,880	57,300
Minimum	9.61	507	14.80	12,100
Std. Dev.	252	2,160	1,490	13,900
Skewness	1.003074	0.778933	0.430424	0.707765
Kurtosis	2.585775	1.927579	1.347544	2.162936
Observations	30	30	30	30

Source: Author's own construct

4.2 Unit Root Test

Stationarity tests allow to verify whether a series is stationary or not. A time series is said to be stationary if its statistical properties do not change over time (expectation, variance, autocorrelation). Determining that a series is not stationary allows us to examine where stationarity comes from. A series that is not stationary can be stationary in difference. In this case, VAR analysis can be performed in the first differentiated time series (Koitsiwe, 2018). The augmented Dickey-Fuller unit root test (ADF) was used to indicate the stationarity of the data series used for the study. The results for stationarity test have been presented in Table 4.2.

4.2.1 Test for Stationarity

Through the use of stationarity tests, you may determine if a series is, in fact, stationary. If the statistical features of a time series do not change over time, it is said to be stationary (expectation, variance, autocorrelation). Once we have shown that a series is not stationary, we

can look into what causes it to be stationary in the first place. It is possible for a non-stationary series to have a stationary difference. In this situation, a VAR analysis in the first differentiated time series can be carried out (Koitsiwe, 2018).

The stationarity of the data series utilized in the study was determined using the augmented Dickey-Fuller unit root test (ADF). Because the test statistic exceeds the crucial value at a 5% significance level, some variables do not refute the presence of a unit root. As a result, the findings show that none of the variables are stationary, but rather are only stationary at the beginning of the difference. Because all the variables are integrated in the same order, the long-term relationship between them may be determined using the Johansen cointegration test. The null hypothesis testing is done in Table 6.

Table 4.2: Null hypothesis Testing at Levels

Variables	**Test**	**T-Statistic at Intercept**	**Critical Value at 5%**	**Probability**
LRGDP	ADF	2.154	-2.971	0.9998
LMR	ADF	0.210	-2.976	0.9682
LGE	ADF	-0.499	-2.967	0.8775
LFDI	ADF	-0.117	-2.967	0.9617

Table 4.2 shows results of stationarity test at Levels for the variables of the study which are Mineral Revenue, Government Expenditure, Foreign Direct Investment and Real GDP. The results of the Augmented Dickey-Fuller (ADF) Unit Root Test at Levels time series data shows probability of 0.9682 and 0.8775 for Mineral Revenue and Government expenditure. The

probability for Foreign Direct Investment and Real GDP were 0.9617 and 0.9998 respectively. Since, all the variables show probability greater than the critical value of 0.05, the time series data are invalid at Levels and not reliable for undertaking further analysis. Stationarity test therefore needs to be undertaken at First difference to determine if the probabilities will be less than the critical value in order to be used for further analysis.

Table 4.3: First Differenced Test for Stationarity (Unit Roots Test Results)

Variables	**Test**	**T-Statistic at Intercept**	**Critical Value at 5%**	**Probability**	**Results**
LRGDP	ADF	-1.681(0)	-2.972	0.0002	I(1)
LMR	ADF	-0.821(0)	-2.976	0.0075	I(1)
LGE	ADF	-6.921(0)	-2.972	0.0000	I(1)
LFDI	ADF	-4.334(0)	-2.972	0.0021	I(1)

Notes: Lag length/bandwidth in a bracket
I (1): Integrated at order 1

Table 4.3 indicates the stationarity test for the first differenced variables under study. The probability for Mineral Revenue was 0.0075. Government Expenditure (GE) showed probability of 0.0000 whiles FDI was 0.0021. The probability for Real GDP was 0.0002. Since the probability figures were less than the critical value of 0.05, the data for all the variables is stationary in first difference. The data are therefore considered valid and reliable for further analysis. The selection of the optimal lag for the study was undertaken next.

4.2.2 Optimal Lag Selection Test Results

The choice of the lag order is critical in empirical research using the vector autoregressive (VAR) model because the right model specification is required for all inferences. The impact of lag duration selection has been established in a number of studies. Selecting a larger order lag length than the correct one increases the VAR's mean square prediction errors, according to Lutkepohl (1993), while underfitting the lag length often results in auto-correlated errors when fitting the lag length too closely.

The Akaike Information Criterion, the Schwartz Information Criterion, the Hannan-Quinn criterion, the log probability, and the mean square error were used to determine the ideal duration of a delay in a time series. There are several criteria included. To assess the optimal lag length, the research used the EViews lag length criterion.

Table 4.4: Lag Selection Results

Lag	LogL	LR	FPE	AIC	SC	HQ
0	-2455.335	NA	2.3e+71	175.667	175.857	175.725
1	-2381.311	121.611	3.70e+69	171.522	172.474	171.813
2	-2337.823	59.019*	5.62e+68*	169.559*	171.272*	170.082*

* *denotes optimal lag length order selected by the criterion*

The results from Table 4.4 presented five information criterion to choose from with regard to the optimal lag selection. The sequential modified LR test statistics, Final prediction error, Akaike information criterion, Schwarz information criterion and Hannan-Quinn information

criterion. All the criterion selected 2 as the optimal lag. Per the results, the study used optimal lag of 2 for the model.

4.2.3 Cointegration Test Results

Table 4.5: Johansen-Cointegration Test

MAXIMUM-EIGEN VALUE				**Trace Test**			
Hypothesized No. of CE(s)	Eigenvalue	Max-Eigen Statistic	0.05 Critical Value	Hypothesized No. of CE (s)	Eigenvalue	Trace Statistic	0.05 Critical Value
None*	0.756	38.133	27.584	None*	0.756	58.511	47.856
At most 1	0.410	14.264	21.131	At most 1	0.410	20.377	29.797
At most 2	0.177	5.274	14.264	At most 2	0.177	6.112	15.495
At most 3	0.031	0.839	3.841	At most 3	0.031	0.839	3.841

Max-eugenvalue and trace tests indicates 1 cointegrating eqn (s) at the 0.05 level.

* denotes rejection of the hypothesis at the 0.05 level.

Table 4.6: Normalized Cointegrating Coefficients

LRGDP	LMR	LGE	LFDI
1.000	-2.323	1.116	0.767
	(0.318)	(0.205)	(0.196)

The Trace and Maximun Eigenvalue Statistics display the cointegration outcomes of the study's variables. The results show four cointegration equations. However, using the Johansen Cointegration Technique, variables were discovered to be cointegrated at order 1, as shown in Table 4.6. This is demonstrated by the fact that both test statistics are greater than the crucial value of 0.05 for all variables at order 1. The null hypothesis, that there is no cointegration between the variables, is rejected by the investigation. The results show that at least one (1) cointegration equation exists, proving the presence of a long-run economic link between the variables. The concept of cointegration allows us to determine the presence of an equilibrium or stationary relationship between two or more time series, each of which is non-staionary on its own (Banerjee et al., 1993). Shocks in the short run that may alter movement in individual series will converge over time (in the long run). Vector Error Correction model is utilized for estimation.

The analysis also gave the results of the long-run relationship between the dependent variable (LRGDP) and its regressors using simple normalized cointegrating coefficients, as presented in table 10. To acquire correct parameters and slopes of the coefficients in the model, 1 to 3 in

equation 1 are substituted by values from table 10 in order to obtain the long-run results effect. Hence, the econometric long-run equation is presented as follows:

$$LRGDP_t = \beta_0 + 2.323LMR - 1.116LGE - 0.767LFDI + e \quad (4.1)$$

The long-run results indicates that, LMR have a positive relationship with LRGDP whereby LGE and LFDI relates negatively to the dependent variable. The values of the coefficients suggest that, a 1% increase in LMR brings about 2.323% increase in LRGDP whereas a 1% increase in both LGE and LFDI brings about a 1.116% and 0.767% decrease in LRGDP in respectively in Ghana.

4.2.4 Estimation of VECM (Short-Run Results)

The study developed two vector auto-regressive models (VAR and VEC) based on the same time series data, in an effort to figure out how mineral revenue, government spending, and foreign direct investment relate to economic growth. The VECM system's error correction term estimates a causal connection between the variables. A short-term association between variables is established by using the VECM method, as shown in Table 4.7. Statistically and economically, the error correction term is substantial, and it takes on the predicted negative sign. With this coefficient (-0.028), an annual disequilibrium of 2.8% between the dependent variable (LRGDP) and independent variables may be addressed more quickly and brought back to balance. In the long run, an increasing negative sign on the ECT indicates that things are stabilizing. RGDP's variance is explained by the independent variables in excess of 40%, according to Adjusted R-squared. In the short-run, the independent variables contribute to 40.3% of Real GDP.

Table 4.7: VECM Estimation Results

Dependent Variable: D(LRGDP)			
Variable	**Coefficient**	**Standard Error**	**T-Statistic**
ECT(-1)	-0.028	0.014	-1.959
C	0.050	0.019	2.573
D (LRGDP(-1))	-0.047	0.310	-0.151
D (LRGDP(-2))	-0.007	0.268	-0.029
D (LMR(-1))	0.033	0.021	1.581
D (LMR(-2))	-0.001	0.018	-0.059
D (LGE(-1))	0.001	0.021	0.032
D (LGE (-2))	-0.025	0.020	-1.225
D (LFDI(-1))	0.012	0.013	0.924
D (LFDI (-2))	0.013	0.010	1.307
R-Squared	0.609		
Adjusted R-Squared	0.403		

Significance level: 10%

Furthermore as shown in Table 4.7, the error correction term of the target variable is negative (-0.0275) and that of explanatory variables are LMR (0.3177), LGE (-0.2999) and LFDI (0.5335). The results of the LRGDP equation reveals a negative reaction between the first and second lags of LRGDP as summarized in Appendix B. There exists a positive reaction between LRGDP and the first and second lags of LMR, LGE and LFDI.

In line with the Apriori expectation, the log of MR (Mineral Revenue) has a positive important relationship with economic growth. The past realization of LMR, thus LMR (-1) accounts for a 3.3% increase in economic growth. A 1% increase in the second lag of LGE accounts for a 1% decrease in economic growth while a percentage increase in LFDI accounts for a 1% increase in economic growth in the long run.

4.2.5 Diagnostics and Stability Tests Results

To be sure the findings were accurate, the researchers ran a battery of experiments. Table 4.8 displays the outcomes of the diagnostic tests. Therefore, the model has passed all diagnostic tests because the null hypothesis is not always rejected. It's safe to assume that the model is well-defined at this point. As a result of the model's excellent fit within the 0.05 threshold of significance, the model has been extremely stable throughout the research.

Autocorrelation/Serial Correlation

Autocorrelation is where error terms in a time series transfers from one period to another. This can lead to inefficient Ordinary Least Square Output, exaggerated goodness-of-fit, false and large t-static values (Anon., 2021c). A residual LM-test conducted to verify the presence of serial correlation indicated that, errors on the analysis were not serially correlated (No Autocorrelation) since the t-static value of the test is 17.579 and greater than the p value of 0.05. Results shown in table 12.

Residual Normality Test

The study used normality tests to see if a data set fits a normal distribution well and to calculate the probability that a random variable in the data set would be normally distributed (Anon., 2021d). The VAR system's mistakes must have a normally distributed distribution in order to conduct an effective and efficient analysis of VAR estimations. By accepting that the combined p-value of 4.417 in this study is more than double the system's 0.05, we reject the null hypothesis that residuals are multivariate and, thus, system errors have a normally distributed distribution.

Heteroscedasticity Test

Heteroscedasticity is not a problem because the variance is constant from the results. Economic analysis of the data is possible since the LRGDP systems equation is stationary and homoscedastic.

Table 4. 81: Diagnostics Test Results

Test	**Null Hypothesis (H_0)**	**Statistic**	**P- Value**	**Conclusion**
Breusch-Godfrey LM	No Serial Correlation	17.579	0.349	Do not reject H_0
Glesjer	No Heteroscedasticity	173.572	0.219	Do not reject H_0
Jarque-Bera	Normality	4.417	0.818	Do not reject H_0

4.2.6 Granger Causality

Granger causality is a theory of causality based on statistics and prediction that has been around for a while. Given the "Granger Causes" of an event, the past values of an input signal X1 should contain information that can be used to anticipate the output signal X2 above. This economics model was created in the 1960s and has been in use ever since (Anon., 2021e).

Granger causality test was performed for the variables of the study. Two variables were considered at a time and both variables served as dependent and independent. The test was done for Mineral Revenue and Real GDP. From the granger causality results, it is established that there exists a uni-directional causality between LMR and LRGDP.

Table 4.9: Granger Causality Test Results

Null Hypothesis	**Obs.**	**F-Statistic**	**Probability**
LRGDP does not granger cause LMR	28	1.793	0.189
LMR does not granger cause LRGDP	28	4.852	0.018

4.2.7 Variance Decomposition

In order to find out how much a shock or impulse in one variable contributes to random movement in other variables, the variance decomposition is used. The most important thing is to look at how the variables change over time in order to predict the effects of other variables in the same regression equation (Lanne and Nyberg, 2014). Shocks and variations are shown in years two (2) and ten (10) of the time series, which represent short and long periods,

respectively, in Table 14. A comparison is made between the dependent variable (LRGDP) and the independent variables.

Table 4.10: Variance Decomposition Results

Variables	Periods	LRGDP	LMR	LGE	LFDI
LGDP	2	**26.913**	**67.357**	5.706	0.025
	10	**31.470**	**57.501**	1.460	9.568
LMR	2	1.815	**94.568**	2.349	5.970
	10	4.925	**81.454**	5.356	8.265
LGE	2	0.506	**65.518**	**32.209**	3.621
	10	3.105	**65.025**	**26.776**	4.083
LFDI	2	0.331	**54.386**	1.590	**43.692**
	10	3.105	**57.770**	13.419	**25.705**

The first row of Table 4.10 shows the results of variance decomposition innovations of real GDP, in the short run, that is year 2, shock to LRGDP contributes (26.913%) to the variance of its own shock, shocks to LMR contributes (67.357%) to variance in LRGDP, shocks to LGE and LFDI suggests an insignificant influence with (5.706%) and (0.025%) respectively variance in LRGDP. In the long run, that is year 10, shocks to LRGDP, LMR, LGE and LFDI accounts for (31.470%), (57.501%), (1.460%) and (9.568%) respectively variations in LRGDP. The results suggest that, LRGDP strongly accounts for itself, LMR suggests a stronger influence on LRGDP, LGE poorly influences LRGDP due to declining effects and LFDI shows promising influences on LRGDP in the long run.

Variance Decomposition of LMR

In the short term, LMR shock account for 94.568% variation of the fluctuation in MR (own shock), shocks to LRGDP, LGE and LFDI contributes 1.815%, 2.349% and 5.970% fluctuation in Mineral Revenue (MR). In the long run, that is year 10, shocks in Mineral Revenue (MR) account for 81.454% variation of the fluctuation in MR itself (own shock), shocks to LRGDP, LGE, LFDI caused a 4.925%, 5.356% and 8.265% increase in fluctuations in LMR. Results suggests that, LMR strongly accounts for itself with the effects of LRGDP on LMR non-significant. A shock in MR contributes significantly to fluctuation in itself both in the short and long run. The results mean that, a shock in GE, FDI and GDP does not significantly contribute much to fluctuation in MR both in the short and long run as well as a shock in GDP.

The results indicate that, there exist no significant relationship between LGE and LRGDP in the short-run, this is evidenced by 0.331% shocks to LRGDP by LFDI but in the long-run, LFDI may affect changes in LRGDP by 3.105%. LMR still shows greater influence on changes in LFDI by 54.386% and 57.770% in the short and long-run.

There exists no significant relationship between LGE and LRGDP in the short and long-run. This is evidenced by 0.506% and 3.105% effects on changes in LRGDP in short and long-run. LMR is a stronger influencer in predicting the variation in government spending which is evidenced by causing a fluctuation of 65.518% and 65.025% in LRGDP in short and long-run respectively. LGE shocks kept declining over the period and hence not a stronger predictor of itself. LGE, LFDI and LGDP does not significantly influences changes in GE.

4.3 Discussions

Establishing Cointegrating Relationship between variables

Johansen cointegration result indicates that, there existed a cointegration, establishing the presence of long-run economic relationship between variables. The long-run analysis further indicated that, a 1% increase in LMR increases LRGDP by 2.33% while a 1% increase in LGE and LFDI decreases LRGDP by 1.11% and 0.767% respectively.

The Relationship between Mineral Revenue (MR) and Real GDP

Findings from the study indicates that mineral revenue in Ghana has significant positive impact on real GDP, thus a major contributor towards economic growth. The findings further show that, mineral revenue can help predict real GDP. This is further evident in a uni-directional causality between mineral revenue and real GDP in the granger causality analysis. Furthermore, shocks to mineral revenue strongly accounts for itself, significantly influences GE, GDP and FDI.

Much of the changes in real GDP over the study period (1990-2019) is determined by mineral revenue. Real GDP can also help predict mineral revenue from the results. The findings of this study is consistent with the observations of Appiah and Buaben (2012) who found that mining has contributed some modest benefits to local economies by creating employment, creating markets, improving ancillary industries, and expanding the local consumer economy. Koitsiwe (2018) who investigated the impact of the mining sector towards economic development in Botswana also concluded that, there was a uni-directional causality from mineral revenue that determines real-GDP. The findings are also congruent with the findings of Walser (2002) who

established that the society receives significant social and economic benefits from mining. The study is also consistent with observations of (Adetunde et al., 2013) who found that, capital, labour and gold production and export can lead to Ghana's economic growth. A study which sort to examine the determinants of economic growth in Ghana by (Darko, 2015) concluded that, mineral rents accounted significantly for Ghana's Economic Growth from 1975-2013. Meanwhile, Al Rawashdeh, Campbell and Titi (2016) found that development indicators analyzed, showed south western part of Jordan to lags behind the rest of the country in terms of development from mining. Also, Schorlary work by Mahonye and Mandishra (2015) also revealed a negative relationship between the Zimbabwe mining sector and its economic growth.

The relationship between Real GDP (LRGDP) and Foreign Direct Investment

VECM and Variance decomposition results revealed a non-significant relationship between LFDI and LRGDP. This is further shown in the no causality between them in the granger causality test. Neither FDI nor GDP can help predict each other.

Establishing Causal Relationship between Government Expenditure (GE) and Real GDP

Findings also show that, there is no causal relationship between GE and GDP neither causal relationship between GDP and GE. None of them can help predict the other. The causal relationship between GE and GDP which was not established as seen in the long-run where, shocks to GE influences GDP by just 3.105% while shocks to GDP influences GE by a scanty 1.460%. This finding is consistent with findings by (Adi, 2019) who undertook a study to assess the impact of public debt on economic growth in Ghana (1975-2017) in which he indicated that,

public debt had a substantial positive effect on economic growth but surprisingly observed that, there was no causality between government expenditure and economic growth.

The seemingly lack of causation between GE and the long-run economic development indicator, GDP could mean that, our expenditure as a country creates fiscal deficits or is spent on non-productive resources. This claim is supported by d'Agostino, Dunne and Pieroni (2016) who pointed out that, if government expenditure is not geared towards productive activities, there is a high probability that, it will have negative repercussions than positive impacts on economic growth. A report which sought to analyse Ghana's Public Debt and Debt Sustainability by (Institute for Fiscal Studies, 2015) also supported this finding by indicating that, it will be a grave mistake by spending borrowed monies to fund recurrent expenditures or refinance debt that were used to fund recurring expenditures that had less or no significant impact on economic growth. The findings by Koitsiwe (2018) which analysed the impact of the mining sector on Botswana's economic development strongly support this claim.

4.4 Chapter Summary

This chapter presented the results and discussions of the study. The results were presented using descriptive and inferential statistics. The results showed that, the data were stationary at first differenced. Final prediction error, Akaike information criterion, Schwarz information criterion and Hannan-Quinn information criterion showed optimal lag length criteria of 2. Johansen cointegration result indicates that, there existed a cointegration, establishing the presence of long-run economic relationship between variables. The Granger causality results showed a uni-directional causality between LMR and LRGDP. The findings from the study indicated that

mineral revenue in Ghana has significant positive impact on real GDP, thus a major contributor towards economic growth. The findings further show that, mineral revenue can help predict real GDP.

CHAPTER 5

SUMMARY OF FINDINGS, CONCLUSIONS AND RECOMMENDATIONS

5.0 Introduction

The study analyzed the connections between mineral revenue which served as a proxy of the impact of the Ghana Mining Industry towards Economic Development during 1990 – 2019. The results are summarized and further insights drawn up in this section. The findings provide avenues for the deductions, inferences and conclusions from the research results. This chapter presents the

5.1 Main Findings

The issue of countries shares and use of mineral revenue is now more topical and loud in developing countries of which Ghana is not an exception looking at its impact towards economic growth. Mining Catchment communities largely with poor infrastructure makes the echo louder. Studies by Walser (2002), Appiah and Buaben (2012), (Adetunde et al., 2013), (Darko, 2015) and Koitsiwe (2018) among others established a significant positive relationship between mining revenue/rents and economic growth. Meanwhile, Al Rawashdeh et al. (2016) found that development indicators analyzed, showed south western part of Jordan to lags behind the rest of the country in terms of development from mining. Also, Schorlary work by Mahonye and Mandishra (2015) also revealed a negative relationship between the Zimbabwe mining sector and its economic growth.

5.1.1 Short-Term and Long-Term relationship between study variables

This study examined the trend of Government Expenditures, Foreign Direct Investments Inflows, Mineral Revenue, GDP and also the connection that exists between Mineral Revenue and economic growth from 1990 – 2019. GDP is used in this proxy for economic growth which is measured as an annual percentage for economic growth and the measure of mineral revenue is the sum of government's receipts from mineral royalties, corporate taxes, Pay-As-You-Earn Tax and other levies as declared yearly by the Minerals Commission of Ghana and Ghana Chamber of Mines.

The study after analyzing the results of granger causality tests, VECM estimates and Variance Decomposition revealed that, there exists a significant positive relationship between mineral revenue and its impact on GDP. Minerals Revenue strongly determines fluctuations in Government Expenditure but Government Expenditure doesn't strongly influence Mineral Revenue. Failure to maintain or diversify the economy beyond the current contributions from the sector, the economy will be hit hard. Prudent public debt management is expected of Ghana. Growth in Mineral Revenue have been significant from 1990 with some fluctuations in later years. With inflows of US$15 million in 1990, it grew steadily to US$ 81 million in 2006. Just after passing the Minerals & Mining Act, 2006, Act 703, Mineral Revenue rose to US$ 130 million in 2007 up to an all-time-high of US$ 778 million in 2012. Between 2012 and 2016, revenues fell to an all-time-low of US$ 365 million in 2015 and starting rising up to US$ 770 million in 2019 as seen in figure 2.7 above (Anon., 2019d).

Government Expenditure does not help predict GDP and Vice Versa. This could mean that, government expenditure creates deficit as indicated by the mineral revenue-government expenditure relationship. Moreover, it could mean that, most areas government is spending is not significantly or productively impacting on Ghana's economic growth. There is a great lack of causation between economic growth and government expenditure. Scholarly works by d'Agostino, Dunne and Pieroni (2016), Koitsiwe (2018) and Adi (2019) supports the findings. There has been a massive significant exploitation of Ghana's Minerals which reflects in total exports of US$ 243 million in 1990 against US$ 6.7 billion in 2019. Over the period of the study, in absolute terms, documented evidence indicates that, over US$ 68.8 billion worth of the major minerals that is Gold, Diamond, Manganese and Bauxite have been exported from Ghana with Gold only, accounting for US$ 65.6 billion. An amount which is slightly above our Gross Domestic Product (GDP) as a country after 64 years of Independence. Total government revenue over the period stands at US$ 6.6 billion thus, 10% of the total minerals exports. Our total mineral exports as of 2019 is averaged at 40% to total exports. This makes Ghana a mineral resource-dependent country as defined by (International Council on Mining & Metals, 2018) which states that, a country is defined as mineral resource-dependent if resources accounts for more than 20% of export earnings. According to the (Ghana Chamber of Mines, 2021), the Mining Industry contributed to Ghana's GDP by 8.6% and 7.5% in 2019 and 2020 respectively. Averagely, the industry contributes to GDP growth by 7.5%. As a resource dependent nation, the seemingly low contribution of the industry towards GDP could mean that, Ghana's is much diversified with other sectors growing. It could also mean that, linkages in the extractive industry is not properly exploited to contribute the needed contribution to GDP.

Despite the seemingly low returns from the mining industry to the State, regulatory policies regime established by the economic recovery policies and structural adjustment program have led tremendous growth in the production of major minerals in Ghana. The purpose of those policies to attract FDIs have fully materialized which led to Act 703. A new mining code in needed urgently to direct any focus. Economic and industrial linkages within the mining industry remains weak and even in most cases, socio-economic response lags behind growth in some mining catchment communities. Mineral Revenue strongly influences GE, but for GE not to influence economic growth, it indicates that, MR is not enough.

Secondary production in the industry which happens to be value addition is not vigorously undertaken in Ghana. Ghana's gold, Manganese, Bauxite and Diamonds are mostly exported unrefined which reduces the value of receipts by the government. Employment opportunities which would have been available in that chain could contribute massively to economic growth. We are rather transferring wealth to other countries. Though there are many other minerals in the country, attention on gold exploitation is too much as other minerals are given less attention. Policies must be mapped out to exploit other minerals for economic growth.

5.2 Conclusions

The primary focus of this study was to establish the relationship between the mining industry and Ghana's economic growth covering the period 1990-2019. From the findings above, it is concluded that, the mining industry has a significant positive impact on economic growth in Ghana especially in the area of foreign exchange through mineral exports. This means that, mineral revenue accrued to the state over the years have been directed to critical developers of

the economy. Despite the positive impact of the industry on Ghana's economic growth, Ghana has failed to fully develop the mining sector, especially, the small-scale mining sector despite a very rich and long history of mining. There has been a net transfer of our mineral wealth to other countries as a result of poor enforcement of regulations and no linkages to add value to our mined minerals before export. Poor regulation of the small-scale mining sector is destroying lot of the country's heritage. As a sector contributing an average of 40% of total gold produced in the country, fiscal returns due the state is not been paid as done by the Large Scale Mines which is really affecting the country and a great contributor of the non-linkage between the mining sub-sector and the rest of the economy. The sub-sector is also on record for smuggling lot of gold off the shores of the country. The study also showed a negative relationship between mineral revenues and government expenditure. The study also observed that, there was no correlation between government expenditure and economic growth in Ghana. Since government expenditure leapfrogs cash flows in an economy, it indicates that, Ghana may have been spending in quite unproductive sectors of the economy which needs immediate attention. Finally, the study also revealed that, Foreign Direct Investments have had a significant impact on Mineral Revenue but has not significantly impacted on economic growth. This could mean that, the state is paying a huge cost of surrendering a large share of value added to foreign companies as insurance cover to attract FDIs. This is seen in the numerous tax exemptions and holidays granted foreign companies. Stability and Development Agreements granted in the mining industry is one of such benefits which if poorly given and managed, deprives the state of much resources. The time is due for Ghana not just to think of attracting FDIs but attract it with policies that, will make her derive the necessary value it deserves from its mineral endowment towards economic growth.

5.3 Recommendations/ Policy Implications

From the above findings and conclusions, the recommendations of the study are as follows;

- Ghana, with a long rich history of mining should draft a new mining code which will not only attract foreign direct investments but will generate lot of value as well. The small-scale mining sector must be properly integrated, local players in the industry should be supported through various growth path. The state should not only focus on the extractive industry, development of non-traditional mineral exports and the services sector of the economy must be undertaken and properly linked with the extractive industry which has the tendency to propel massive economic growth;

- Government should continue to provide well-thought-through incentives to the industry players in a bid to boost production which will eventually lead to improved fiscal benefit to the state;

- Government should develop a model that will see Ghanaians control enviable shareholding structures in existing and future Large-Scale Mining. This will help mitigate the entire capital flight of mineral proceeds by Multinational Corporation through repatriation privileges bestowed on them. This will help raise local players in the industry and proceeds from such local players remain in the country.

- The weak link between the mining sub-sector and the general economy is greatly as a result of no value added to the minerals mined before they are exported. With this, the State should pass a law which indicates that, all minerals mined in Ghana are to be

refined here in Ghana before they are exported. The State and Ghana Chamber of Mines can collaborate to map-out strategies and arrangements through Public-Private Partnerships (PPP) to establish the necessary refinery infrastructure to achieve this aim. When achieved, the chain has the potential to provide lot of jobs, contribute millions of dollars in taxes to the state and finally, the state earns more from selling the refined product.

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APPENDICES

Table 4.11: Data for Analysis (All in US$).

DATE	MINERAL REVENUE	FDI	GOVERNMENT EXPENDITURE	REAL GDP
1990	15,731,257.19	14,800,000.00	548,372,188.03	5,889,174,825.49
1991	9,607,804.95	20,000,000.00	625,559,782.61	6,596,546,195.65
1992	12,502,139.71	22,500,000.00	776,567,505.72	6,413,901,601.83
1993	24,213,123.82	125,000,000.00	862,086,286.59	5,966,255,778.12
1994	24,808,573.00	233,000,000.00	747,175,732.22	5,444,560,669.46
1995	41,047,218.33	106,500,000.00	780,567,139.28	6,465,137,614.68
1996	38,451,311.25	120,000,000.00	835,229,357.80	6,934,984,709.48
1997	34,742,884.50	81,800,000.00	851,464,843.75	6,891,308,593.75
1998	41,438,487.39	167,400,000.00	772,347,318.34	7,480,968,858.13

1999	39,843,254.50	243,700,000.00	837,036,384.10	7,719,354,838.71
2000	35,883,315.22	165,900,000.00	506,854,101.67	4,983,024,408.15
2001	32,296,447.92	89,320,000.00	516,734,887.62	5,314,909,953.93
2002	38,593,155.81	58,930,000.00	608,787,607.27	6,166,330,136.29
2003	48,317,311.97	136,751,000.00	880,260,959.85	7,632,406,552.84
2004	54,086,575.90	139,270,000.00	1,081,112,284.60	8,881,368,538.08
2005	79,434,888.54	144,970,000.00	1,644,812,638.09	10,744,675,209.90
2006	81,329,087.22	636,010,000.00	1,813,254,835.54	20,440,893,017.16
2007	130,874,325.53	1,383,177,929.85	2,116,558,974.91	24,827,844,949.60
2008	171,407,983.81	2,714,916,343.70	2,504,126,674.90	28,678,701,891.10
2009	226,243,032.62	2,372,540,000.00	1,972,947,259.79	26,048,108,185.05

2010	362,952,920.28	2,527,350,000.00	2,276,186,013.99	32,197,272,797.20
2011	680,409,021.05	3,247,588,000.00	5,424,064,250.95	39,337,314,809.94
2012	778,133,503.85	3,294,520,000.00	4,855,258,041.54	41,270,954,737.25
2013	557,599,654.04	3,227,000,000.00	6,819,599,172.30	62,405,374,785.51
2014	404,178,389.66	3,363,389,444.44	5,597,868,121.25	53,660,342,159.77
2015	365,061,986.90	3,192,320,530.79	4,689,884,186.72	48,564,863,888.44
2016	421,530,191.50	3,485,333,369.28	5,474,741,316.69	55,009,730,600.03
2017	528,400,679.34	3,254,990,000.00	5,193,935,271.81	58,998,132,329.62
2018	544,587,641.30	2,989,035,000.00	5,909,483,654.29	65,556,464,048.15
2019	769,286,496.03	3,879,831,469.70	5,948,644,669.76	66,983,634,223.94

Source: Real GDP (RGDP)**,** Government Expenditure (GE), Foreign Direct Investment (FDI)**:**

World Development Indicators (WDI, http://databank.worldbank.org/source/world-

development-indicators**),** FDI**: IMF,** Mineral Revenue**: Ghana Chamber of Mines (2004-2019), Minerals Commission, Ghana (1990-2003).**

Figure 4. 1: Granger Causality Graph

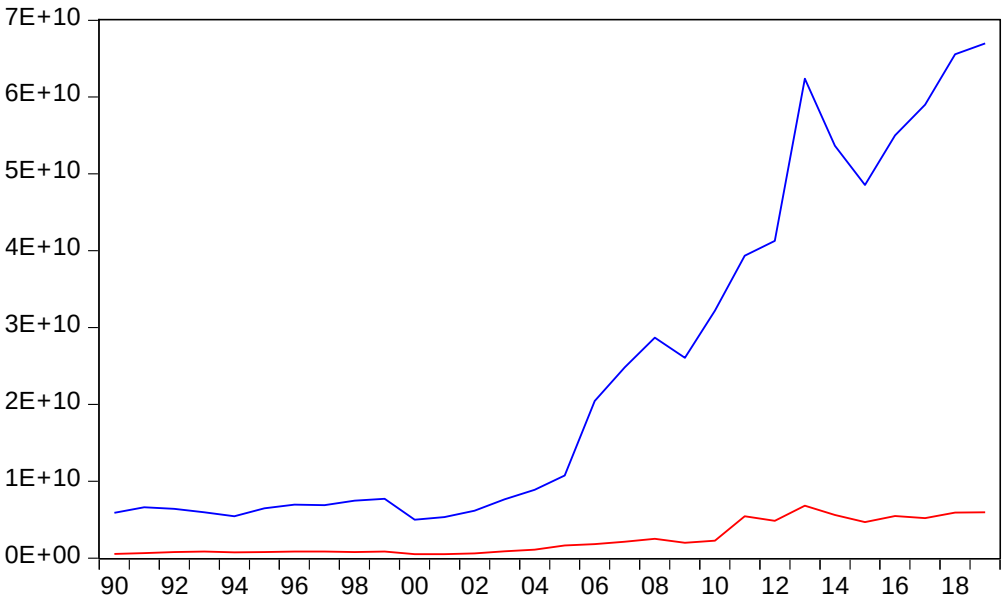
7E+10
6E+10
5E+10
4E+10
3E+10
2E+10
1E+10
0E+00
90
92
94
96
98
00
02
04
06
08
10
12
14
16
18
GDP
GE

Table 4.12: Ordinary Least Square Output

Estimation Method: Least Squares

Date: 03/27/21 Time: 20:48

Sample: 1992 2019

Included observations: 28

Total system (balanced) observations 112

	Coefficient	Std. Error	t-Statistic	Prob.
C(1)	0.863914	0.296320	2.915480	0.0047
C(2)	-0.288437	0.244959	-1.177489	0.2427
C(3)	3.84E-12	1.45E-11	0.265131	0.7916
C(4)	4.82E-12	1.40E-11	0.343920	0.7319
C(5)	0.284050	0.368920	0.769951	0.4437
C(6)	-0.347897	0.374711	-0.928441	0.3561
C(7)	0.127116	0.133167	0.954559	0.3428
C(8)	0.102110	0.141712	0.720541	0.4734
C(9)	4.510149	5.985971	0.753453	0.4535
C(10)	1.52E+10	4.52E+09	3.356009	0.0012
C(11)	-5.07E+09	3.74E+09	-1.356438	0.1790
C(12)	0.666824	0.220986	3.017495	0.0035
C(13)	-0.081858	0.213824	-0.382829	0.7029
C(14)	-7.98E+09	5.63E+09	-1.417312	0.1605
C(15)	1.63E+10	5.72E+09	2.858196	0.0055

C(16)	-4.28E+09	2.03E+09	-2.106728	0.0384
C(17)	-1.97E+09	2.16E+09	-0.911542	0.3649
C(18)	-2.27E+11	9.13E+10	-2.480143	0.0153
C(19)	0.643421	0.279232	2.304255	0.0239
C(20)	-0.176061	0.230833	-0.762720	0.4480
C(21)	5.96E-12	1.36E-11	0.436926	0.6634
C(22)	-5.01E-12	1.32E-11	-0.379561	0.7053
C(23)	0.399486	0.347645	1.149120	0.2541
C(24)	0.330647	0.353103	0.936406	0.3520
C(25)	-0.146565	0.125488	-1.167958	0.2465
C(26)	-0.094184	0.133540	-0.705288	0.4828
C(27)	1.962422	5.640779	0.347899	0.7289
C(28)	1.080178	0.474235	2.277725	0.0256
C(29)	-1.048155	0.392037	-2.673611	0.0092
C(30)	3.93E-12	2.32E-11	0.169384	0.8659
C(31)	-2.15E-11	2.24E-11	-0.958232	0.3410
C(32)	0.573912	0.590426	0.972030	0.3341
C(33)	0.907715	0.599694	1.513629	0.1343
C(34)	0.426263	0.213123	2.000077	0.0491
C(35)	-0.078836	0.226799	-0.347603	0.7291
C(36)	-18.52836	9.580062	-1.934055	0.0568

Determinant residual covariance	6.79E+14

Equation: LMR = C(1)*LMR(-1) + C(2)*LMR(-2) + C(3)*LGDP(-1) + C(4)

*LGDP(-2) + C(5)*LGE(-1) + C(6)*LGE(-2) + C(7)*LFDI(-1) + C(8)*LFDI(

-2) + C(9)

Observations: 28

R-squared	0.969982	Mean dependent var	18.55101
Adjusted R-squared	0.957343	S.D. dependent var	1.298445
S.E. of regression	0.268175	Sum squared resid	1.366444
Durbin-Watson stat	1.937723		

Equation: LGDP = C(10)*LMR(-1) + C(11)*LMR(-2) + C(12)*LGDP(-1) +

C(13)*LGDP(-2) + C(14)*LGE(-1) + C(15)*LGE(-2) + C(16)*LFDI(-1) +

C(17)*LFDI(-2) + C(18)

Observations: 28

R-squared	0.976227	Mean dependent var	2.58E+10
Adjusted R-squared	0.966217	S.D. dependent var	2.23E+10
S.E. of regression	4.09E+09	Sum squared resid	3.18E+20

Durbin-Watson stat	1.969968		

Equation: LGE = C(19)*LMR(-1) + C(20)*LMR(-2) + C(21)*LGDP(-1) + C(22)
*LGDP(-2) + C(23)*LGE(-1) + C(24)*LGE(-2) + C(25)*LFDI(-1) + C(26)
*LFDI(-2) + C(27)

Observations: 28

R-squared	0.944505	Mean dependent var	21.29560
Adjusted R-squared	0.921139	S.D. dependent var	0.899897
S.E. of regression	0.252711	Sum squared resid	1.213391
Durbin-Watson stat	1.812673		

Equation: LFDI = C(28)*LMR(-1) + C(29)*LMR(-2) + C(30)*LGDP(-1) + C(31)
*LGDP(-2) + C(32)*LGE(-1) + C(33)*LGE(-2) + C(34)*LFDI(-1) + C(35)
*LFDI(-2) + C(36)

Observations: 28

R-squared	0.954068	Mean dependent var	20.12070
Adjusted R-squared	0.934728	S.D. dependent var	1.679927

S.E. of regression	0.429193	Sum squared resid	3.499928
Durbin-Watson stat	1.455585		

Table 4.13: Residual Test

VAR Residual Serial Correlation

LM Tests

Null Hypothesis: no serial

correlation at lag order h

Date: 03/27/21 Time: 20:16

Sample: 1990 2019

Included observations: 28

Lags	LM-Stat	Prob
1	14.47337	0.5635
2	17.57758	0.3492

Probs from chi-square with 16 df.

Errors are not serially correlated

VAR Residual Normality Tests

Orthogonalization: Cholesky (Lutkepohl)

Null Hypothesis: residuals are multivariate normal

Date: 03/27/21 Time: 20:21

Sample: 1990 2019

Included observations: 28

Component	Skewness	Chi-sq	df	Prob.
1	-0.026188	0.003201	1	0.9549
2	-0.394314	0.725590	1	0.3943
3	0.634537	1.878976	1	0.1705
4	0.261419	0.318920	1	0.5723
Joint		2.926687	4	0.5702

Component	Kurtosis	Chi-sq	df	Prob.
1	1.685498	2.015902	1	0.1557
2	2.809483	0.042346	1	0.8370
3	3.574378	0.384894	1	0.5350
4	2.723893	0.088941	1	0.7655
Joint		2.532083	4	0.6389

Component	Jarque-Bera	Df	Prob.
1	2.019102	2	0.3644
2	0.767936	2	0.6812
3	2.263870	2	0.3224
4	0.407861	2	0.8155
Joint	5.458770	8	0.7076

The errors in the VAR system are normally distributed.

Table 4. 14: Production of Major Minerals in Ghana

Year	**Gold (Ounces)**	**Diamond (M/t)**	**Bauxite (M/t)**	**Manganese (M/t)**
1990	522517	484877	381373	364373
1991	946269	702172	352921	325964
1992	1006943	596236	338244	353476
1993	1251010	584848	423747	294789
1994	1396887	746949	426128	271989
1995	1630309	627319	512977	245432
1996	1550814	714717	473218	161690

1997	1644622	698585	504401	273224
1998	2353000	823125	442514	348406
1999	2257681	680343	355260	638937
2000	2315000	627000	503825	638937
2001	2205473	870490	715455	1212338
2002	2115196	924638	647231	1132000
2003	2208154	927000	494716	1509432
2004	1794497	911809	498060	1593778
2005	2149372	1062930	726608	1714797
2006	2244680	970751	885770	1658701
2007	2486821	837586	748232	1156339
2008	2585993	598042	693991	1089021
2009	2930328	354443	490367	1012941
2010	2970080	308679	512208	1194074
2011	2924385	283369	400069	1827692
2012	3166483	1490634	752771	1490634
2013	3192648	2003176	826994	2003176
2014	3167755	241120	798114	1353486
2015	2,848, 574	174188	1014605	1288624
2016	4131440	141530	1143676	2018254
2017	4222410	86925	1476966	3003580
2018	4792287	57531	1011302	4551754
2019	4577637	33789	1116334	5383014

Source: 1970 -1999 - Minerals Commission, Statistical Overview of Ghana's mining industry 2000 – 2013; 2017 -2019 - Chamber of Mines Annual Reports 2014-2019 - Minerals Commission.

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