

Evidence on the Co-Integration of the Determinants of Foreign Direct Investment in Ghana

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Abstract

The mining industry has traditionally been a major recipient of foreign direct investment in sub-Saharan Africa and has commonly been an important foreign exchange earner for the region. The purpose of this study is to empirically determine the factors that have influence FDI flows in Ghana from 1983 to 2012, using co-integration analysis. The major empirical and methodological contribution of this study is the use of co-integration approach to determine FDI inflows to the mining sector in Ghana. The results of the study registered exchange rate, inflation and openness of trade to be significant in the long run. Natural resources were designated to have a negative long-run relationship between FDI inflows. GDP was used as a proxy for market size and economic liberalization were also registered to be insignificant. In the short run all the variables were found to be insignificant except natural resources which contributed negatively and significant to the mining sector. One economic task facing Ghana, therefore, is how to articulate the necessary policies that can attract the right kind of FDI in the mining sector.

JEL Classifications: F3, F21

Keywords: foreign direct investment; natural resources; co-integration; unit root; augmented dickey-fuller; mining

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1. Introduction

Following the financial and political transformation, Foreign Direct Investment (FDI) has become a global economic activity that is highly sought by developing, transition and developed countries in the world. Global flows of FDI including mineral investments are overwhelmingly concentrated within the Organization for Economic Cooperation and Development (OECD) countries. The relatively higher levels of FDI inflows coincided with the period of economic and political reforms, albeit with a time lag. The post-1992 period marked the period of transition from a military regime (but stable government) to a constitutional democracy. The government, as part of economic reforms, ordained the Investment Code and Minerals Act which was later revised by the GIPC Act 1994. This act provides substantial enticements for investment in Ghana (The Ghana Chamber of Mines (2005, 2006).

There exist several studies on the relationship between FDI inflows and economic growth. As remarked by Asafu-Adjaye (2005), the distrust of foreign direct investment (FDI) in the 1960s and early 1970s evaporated very fast and governments of developing countries have now come to cuddle it recently. He noted that the growing interest in FDI is not only a result of globalization but also a corollary of the steady deterioration in official development assistance. According to the UNCTAD (2012), there have been enormous inflows of FDI into Ghana in recent times following the discovery of oil. According to Asiedu (2013) Africa still lags far behind in terms of capacity of attracting FDIs and the required conducive environment for investment to blossom. It has, for example, been argued that most of the FDI flows are in the natural resource sector, and that very little gains has been made in terms of attracting efficiency- and market-seeking FDIs to the region. Crucially, empirical evidence to guide policies that can help upsurge foreign investment flows to Africa is still very narrow. Most of the available evidence is not yet inconclusive on the role of financial development, macroeconomic and institutional factors.

The mining industry has traditionally been a major recipient of foreign direct investment in sub-Saharan Africa and has been an important foreign exchange earner for the region. The flows of FDI to sub-Saharan Africa had traditionally been in the oil and natural resources (Allaoua & Atkin, 1993; Morisset, 2000), although there has been a trend in recent years to invest in services and manufacturing (UNCTAD, 1999). For example, 75% of FDI in Africa during the period 1985-1991 was concentrated in the mining and oil extraction industries (Allaoua & Atkin, 1993; Morisset, 2000). The mining industry is an important segment of the Ghanaian economy and had played a significant role in the country's socioeconomic development since the colonial period. From the inception of Ghana's economic policy changes in 1993, the mining sector has witnessed a considerable increase in investment and production, particularly in the gold mining sector. There has been a considerable growth in the number of new mines, exploration companies, expanding minerals output and sales value (UNCTAD, 1999). The industry, therefore, presents a strong potential to generate substantial revenue, employment and economic benefits to the country. Foreign Direct Investment (FDI) has been viewed as a major stimulus to economic growth in developing countries. Its ability to deal with two major obstacles, namely: shortages of financial resources, and technology and skills, have made it the center of attention for policy makers in low-income countries in particular (Owusu-Antwi, Antwi & Poku, 2013).

Foreign direct investment inflows into the mining sector in Ghana from 1983 to 2011 were estimated to be \$6.2 billion (Quandzie, 2012). Beginning 2000, the mining sector has contributed an average of 38% of the foreign exchange. The mining industry continues to be one of the biggest contributors to the Ghana Revenue Authority (GRA) through the payment of mineral royalties, employee income taxes, corporate taxes and ancillary levies. It also contributed to about 7.81 percent of Ghana's Gross Domestic Product (GDP) in 2010 (The Ghana Chamber of Mines, 2006). The purpose of this study is to empirically determine the factors that have influenced FDI flows in Ghana specifically in the mining sector, using a time series data from 1983 to 2012. Djokoto and

Dzaha (2012) used time series data to determine the factors that influenced foreign direct investments in the telecommunication and education sectors. Our paper contributes insights on the FDI-determinant nexus in several ways. First, firms seeking FDI support in the mining industry can draw information obtained from the study to better their policies. The major empirical and methodological contribution of this study is the use of co-integration approach to determine FDI inflows to the mining sector in Ghana. To the best of our knowledge, few or no evidence of works on the effects of FDI inflows to the mining sector have used co-integration and unit root test. The rest of the paper is as follows. Section II presents the performance of FDI in Ghana, theoretical and empirical literature, while section III describes the methodology. Section IV presents the results and interpretation. Section V deals with conclusion and section VI provides policy implication and recommendation.

2. Literature Review

2.1. FDI Performance in Ghana

The country has a long history of gold mining. Between 1493 and 1997 the estimated gold produced in this period was amount to 2,488 metric tons (80 million ounces) (Kesse, 1985; The Ghana Chamber of Mines, 1998). Ghana accounted for 36% of total world gold output (8,153,426 ounces) between 1493 and 1600 (F. S. Tsikata, 1997). It is the second largest producer of gold in Africa after South Africa and the third-largest African producer of aluminum metal and manganese ore. The country also produces a significant amount of bauxite and diamond (Coakley, 1999). The mining sector of Ghana received priority attention than any other sector in the country under the Economic Recovery Program (ERP) in 1983. Apart from the general macro-economic policy reforms for the country, there were specific sector policy reforms that sought to boost investor interest in the mining sector. For instance, between 1984 and 1995, there were significant institutional development and policy changes that offered generous incentives to investors to reflect the new paradigm. The establishment of the Minerals Commission in 1984; the promulgation of the minerals and mining code in 1986; the promulgation of the small scale mining law in 1989 and the establishment of the Environmental Protection Agency in 1994 were all to boost the mining industry in Ghana (Ghana Minerals Commission, 2012).

Mineral production in the country has been on the rise after the reforms. This had been in the reflection in the export earnings ensued to the state. Ghana recorded a significant increase in all mineral productions in 2005 with gold taking over from cocoa as the leading foreign exchange earner for the country. Mineral revenue went up from 798 million dollars in 2004 to 995.2 million dollars in 2005 contributing about 13% of the total collection of the Internal Revenue Service. Gold production recorded an increase of 63% with its export revenue increasing from 731.2 million dollars to 903.9 million dollars. Bauxite revenue increased from 11.9 million dollars in 2004 to 18.1 million dollars in 2005, while that of diamond rose from 26 million dollars to 34.7 million dollars. Manganese exports realized 39.1 million dollars in 2005, up from 30.2 million dollars in the previous year (The Ghana Chamber of Mines, 2005). The benefits accrued to mining companies as a result of the dynamic evolution of mineral laws and policies have led to a rapid growth of Ghana's mining economy. Between 1983 and 1998, the mining industry brought approximately US\$4 billion in FDI to Ghana, representing more than 60% of all such investment in the country (Ghana Minerals Commission, 2000).

The mining sector is credited with bringing in a significant amount of foreign exchange earnings, employment generation, mineral royalties, employee income, taxes payments etc. It is noteworthy that mining's contribution to GDP increased from 1.3% in 1991 to an average of about 5.2% between the years 2001-2004 (Ghana Minerals Commission, 2006). The sector's contribution to the nation's gross foreign exchange earnings has also increased progressively from 15.60% in 1986 to

46% in 1998. In absolute terms, the sector generated US\$ 124.4 million in 1986, and US\$793 million in 1998 (Ghana Minerals Commission, 2000). The country's mining industry achieved substantially well in 2012. Gold mining took the lead in this performance. In this sphere, Ghana became the 8th leading producer of gold in the world as its output increased by 6% to 96.8 tones, regaining its position in 2010. This was an improvement on the 9th position it attained in 2011. The augmented concert of the mining industry reflected in its significant contributions to the country's economy in 2012. According to the Ghana Minerals Commission (2012) the mining industry contributed to about 43% to the total merchandise export earnings in 2012. Figures obtained from the Ghana Statistical Service confirms the 23.5% increased in the mining sub-sector in 2012. This compares optimistically with the 18.8% it achieved in 2011. The mining sub-sector furthermore maintained its position as the leading contributor to the Authority's domestic tax collections in 2012. The total payments from the mining industry to the Authority's torso was approximately GH¢1.5 billion in 2012. This amount denotes about 27.04% of GRA's total domestic collections in the year. The 2012 collection was an increase of 45% on the GH¢1.03 billion it collected from the mining industry in 2011 (Ghana Minerals Commission, 2012). The ramble was as a result of augmented mineral proceeds due to higher gold price and marginal increase in output which translated into higher mineral royalty payments and corporate tax for qualifying companies. In line with developments on the global mining landscape, outturn in the country's solid mineral sector in 2013 was subdued relative to the previous year. Ghana's output, in terms of gold, increased by 2.1 percent to 97.8 tons in 2013 but its share in total gold output remained constant at 3 percent (Ghana Minerals Commission, 2012). In the light of this the country lost its position as the 8th leading producer of gold in the world in 2012 to 9th position in 2013. This contributed to 37.6 percent of total merchandize exports in 2013 as compared to 43 percent in 2012.

The minerals sector continued to be a leading source of foreign exchange for the country. Without hesitation, the downswing in mineral export revenue was a major causal factor for the steep depreciation of the local currency in 2013. According to the GRA, total outflows from the sector to the nation's purse were approximately GH¢ 1.1 billion in 2013 (Ghana Minerals Commission, 2013). The outturn of the country's minerals sector was relatively subdued in 2014. According to the GFMS Gold Survey, the output of the preponderant mineral, Gold, expanded from 107.4 tons in 2013 to 108.2 tons in 2014, a marginal lift of 0.7 percent (Ghana Minerals Commission, 2014). Notwithstanding the slow growth, the mining industry contributed significantly to the overall economic progress of the country in 2014. The subdued revenue inflow from the sector impacted negatively on the government's capacity to finance the country's recurrent and capital expenditure programs. According to the Bank of Ghana the share of mineral export in total merchandise exports reduced to 34 percent as compared to 37 percent in the previous year. This outcome stemmed mainly from the bearish price of gold on the world market. In addition, the producing member companies of the Chamber reported that 77.5 percent of their total revenue, amounted to US\$ 2.8 billion, was returned to the country through the commercial banks and the Bank of Ghana. This amount, which was far in excess of the statutory minimum requirement of 25 percent, was instrumental in shoring up the Balance of Payments position of the country (Ghana Minerals Commission, 2014). The mining industry thus, presents a strong potential to generate substantial revenue and employment enough to provide more visible economic benefits to the mining areas and the country as a whole.

2.2. Theoretical Framework

A number of theories have been cultivated to explain foreign direct investment (FDI) since the 1960s. These theories decree several determinants that could explicate foreign direct investment flows, which involves the micro dimension (e.g. organizational aspects) and the macro dimension (e.g. resource allocation) (Dunning & Lundan, 2008). Theoretical studies on the determinants to FDI flows can be traced back to Adam Smith, Stuart Mill and Torrens; however, it was Ohlin

(1933/1971) who first lectured the topic of FDI determinants. Bestowing to Ohlin (1933/1971), foreign direct investment can be included, mainly by the likelihood of high profitability in the growing market, along with the chances of financing these investments at relatively low rates of interest in the host country. Other early explanations of FDI were based on the model established by MacDougall (1960) and Nunnenkamp and Spatz (2003). According to them FDI was motivated by higher profitability in foreign market relishing growth and lower labor costs and exchange risks.

Hymer (1976) and Kindleberger (1973) deem that, there must be imperfections in the markets for goods or factors of production for there to be FDI. Hymer (1976) ratifies that investment abroad involves high costs and risks inherent in the drawbacks confronting multinationals because they are foreign. The costs include information acquisition resulting from cultural and language differences as well as the cost of unfavorable treatment by the of host countries governments'.

Buckley and Casson (1976, 1981 & 1985) studied the determinants of FDI based on the idea of transaction cost internationalization. They hypothesized that the intermediate product markets are imperfect leading to higher transaction costs when managed by different firms. The internationalization theory stresses on intermediary product market and the formation of international production networks. It addresses the dilemma between the licensing of production to a foreign agent and its own production. Caves (1996) argued that if product differentiation is based on the knowledge, then FDI has an advantage over export and licensing. Based on the study of the relationship between FDI and the oligopoly rivalry between firms, Knickerbocker (1973) (as cited in Hill, 2007) asserted that FDI flows show the strategic rivalry between companies in the global market because of reactive behavior to the entry of competitors in certain markets. Vernon (1966) studied the theory of product life cycle and concluded that firms elect to invest in a given place compare to exporting, in so far as goods follow the theory of product life cycle to the extent that as they decline they have fewer needs in terms of specialized labor and innovative technology. Companies invest in other developed countries where markets are growing and local production can be absorbed at the growth stage. In the maturity and declines stages production is moved to developing countries when products are less innovative and markets are saturated, thereby generating pressure to reduce costs (Hill, 2007).

Dunning's (1997) eclectic theory of FDI, also known as the *OLI* paradigm, brings together a number of explanations for FDI that can be classified either as ownership-specific advantages (O), location-specific advantages (L), or internalization advantages (I). Ownership-specific 13 advantages arise because FDI allows a business organization to retain ownership of its foreign subsidiaries (though FDI may involve control without full ownership). Ownership allows firm exclusive use of research, patents, supply chains, technology, management, marketing techniques and financial sources. These factors allow the business organization to benefits from economies of scale. Location-specific advantages closely relate to the traditional theories of FDI. The Location provides access to low-cost labor, raw materials, and markets. Dunning (1997) argues that because of the relative immobility of labor, business organization should capitalize on cheap labor when a labor-intensive production is involved. Business location could help an organization avoid government restrictions as well as trade barriers. As FDI offer's a firm the opportunity to remain or become integrated, internationalization advantages emerge. Horizontal and/or vertical integration help a firm to reduce transaction costs that could emerge between two independent business organizations. Important determinants of FDI include Ownership-specific advantages, internationalization advantages, and location-specific advantages; however, location-specific advantages can be influenced directly by the host government's actions, because other two determinants are firm-specific (Boateng & Glaister, 2000). Ownership advantages are not firm-specific. It also relates to the core competencies that offer the company a comparative advantage vis-a-vis rival in the alien environment, and more than offset the advantages that host country's firms have already developed, Hymer (1976).

2.3. Empirical Literature

Foreign direct investment (FDI) has played a significant function in several economies of African regions. There is a prevalent principle amid policymakers that foreign direct investment (FDI) augments the productivity of host countries and upholds development. There are several studies done on FDI and economic growth as well as natural resources. Some of the studies investigated the relationship between FDI and economic growth and found causality between two variables. This finding varies from different methods used. Morisset (2000) is one of the architects who investigated factors that determine FDI flows to Africa. African countries should work to improve their business climate instead of relying on natural resources or the size of local markets to attract FDI. Using a panel data from 1990-1997, Morisset (2000) found GDP growth rate and trade openness as an indicator to improve business climate.

Between 1970 and 1997, FDI into the mining industry of Ghana did not depend on the size of the local economy (Gyapong & Karikari, 1999; Karikari 1992; G. K. Tsikata, Asante & Gyasi, 2000). Benacek, Gronicki, Holland and Sass (2000) reviewed several studies for Eastern and Central Europe, producing evidence of the importance of market size and growth potential as determinants of FDI. Using panel data for several regions of China, Buckley and Casson (1976) noticed that GDP has a negative effect on FDI whereas Frimpong and Oteng-Abayie (2008), observed FDI to have positive impacts on the economy. Anyanwu (2012) analyzed factors that influence FDI inflows in Africa. His paper indicates market size, openness to trade, rule of law, foreign aid, natural resources, and past FDI inflows to have a positive effect on FDI inflows. He however, found higher financial development to have a negative effect on FDI inflows. The paper also found that, East and Southern African sub-regions appear positively disposed to obtain higher levels of inward FDI. The paper uses cross-country data from 53 countries for the period 1996-2008. Khaliq and Noy (2007) investigated the impact of foreign direct investment (FDI) on economic growth using detailed sectoral data for FDI inflows to Indonesia over the period 1997-2006. In the aggregate level, FDI was observed to have a positive effect on economic growth. However, when they accounted for the different average growth performance across sectors, the beneficial impact of FDI was no longer apparent. When they examined different impacts across sectors, the estimated results showed that the composition of FDI matters for its effect on economic growth with very few sectors that showed a positive impact on FDI.

The mining and quarrying sectors showed a robust negative impact of FDI inflows (mining and quarrying). Li and Liu (2005) applied both single equation and simultaneous equation system techniques to investigate endogenous relationship between FDI and economic growth. Based on a panel of data for 84 countries over the period 1970-1999, they found positive effect of FDI on economic growth through its interaction with human capital in developing countries, but a negative effect of FDI on economic growth via its interaction with the technology gap. Bengoa and Sanchez-Robles (2003) found that the benefit to the host country requires adequate human capital, political and economic stability and liberalized market environment. Carkovic and Levine (2005) utilized General Method of Moment (GMM) to observe the relationship between FDI and economic growth. They use data for 1960-1995 for a large cross-country data set, and found that FDI inflows do not exert influence on economic growth directly or through their effect on human capital. Sackey, Compah-Keyekeye and Nsoah (2012) investigated the effect of FDI on economic growth in Ghana and tested for the presence of the long run linear relationship between FDI inflows and Economic Growth for Ghana. The study employed Vector Auto Regression (VAR) and Johansen Co-integration test. Their findings reveal a long run relationship between the variables. They further concluded that there existed a positive relationship between FDI and economic growth.

Several measures of institutional quality have been used to analyze the effect of institutional quality on FDI. Most of the studies found that countries that have weak institutions, in particular, high corruption and an unreliable legal system tend to receive less FDI (Wei, 2000). However, a

few studies such as Wheeler and Mody (1992) and Poelhekke and van der Ploeg (2010) did not find a significant relationship between FDI and institutional quality. In contrast, the measure of institutional quality employed by Wheeler and Mody (1992) and Poelhekke and van der Ploeg (2010) was a composite measure and was derived by combining the data for different indicators of institutional quality, such as corruption, rule of law, etc. It is possible that different types of institutions may have different effects on FDI. This result is consistent with the findings of Ahlquist (2006) who finds that FDI inflows tend to increase under more stable and democratic governments.

Exchange rate can be defined as the price for which the currency of a country can be converted into another country's currency. The currency area hypothesis states that the weaker the currency of a country, the less likely it is that the foreign firms will invest in that region. A study by Aliber (1970) however, found the volatility of exchange rate to have a strong negative impact on FDI inflow to the Ghana's economy. Other empirical investigations have identified macro-economic stability as an important determinant of FDI (Asiedu, 2006; Campos & Kinoshita, 2008). Over the period of 1970 – 2010, inflation had a negative impact on FDI inflow to Ghana (Djokoto, 2012; Djokoto & Dzeha, 2012). Infrastructure covers a wide range of areas such as roads, ports, railways and telecommunication systems (Ajayi, 2006). Exploration takes mining companies to remote areas and setting up mining operations in these areas can be a challenge due to inadequate roads. Loree and Guisinger (1995) in studying the determinants of foreign direct investment by the United States in 1977 and 1982 (both towards developed and developing countries), concluded that variables related to the host country's policy were significant in developed countries only when infrastructure was an important determinant in all regions. Contrary, Onyeiwu and Shrestha (2004) found infrastructural development and political stability to be insignificant in sub-Saharan Africa. Trade policy is the ease with which investors can move capital in and out of a country (the openness of the economy). A country's opening up to trade across borders is essential for further attraction of resources for development. It is known to be an important determinant of FDI inflow (Asiedu 2002; Jenkins & Thomas, 2002) in line with the Eclectic Theory. A few papers that examined the role of trade established a positive relation between trade and FDI inflow, either to specific sectors or the whole economy. Balasubramanyam, Salisu and Sapsford (1996) analyzed the relation between trade strategy, FDI and growth in developing countries in the context of endogenous growth theory and asserted that trade openness is very important in order to obtain the growth-effect of FDI. For a sample of LDCs, they show that the effect of FDI, in terms of enhanced growth is stronger in those countries that pursue export promotion than in countries pursuing an inward oriented Import Substitution (IS) policy. This finding is also true according to Jun and Singh (1996) who used standard regressions analysis and Granger causality tests to identify that, export is a strong independent variable for attracting FDI.

According to Olatunji and Shahid (2015) Ghana has attracted the non-marketing seeking type of FDI. The major categories of FDI attracted into Ghana have been lured by natural resources and actively promotional campaigns, plus structural reforms and privatizations. The mining sector, mainly gold, has become almost synonymous with FDI in Ghana, but it gradually deteriorated prior to the Economic Recovery Program (ERP). The several reasons identified for this include shortages of foreign exchange to maintain and rehabilitate the mines; lack of capital investments for exploration and development; poor management and lack of mining skills; infrastructure deterioration. Dunning (1980) argues that natural resources and market size are components in the locational attraction that attract FDI into a country. The more natural resources available in a country, the more FDI it is able to attract. Asiedu (2002) analyzed the relative influence of natural resources and market size *vis-à-vis* government policy, host country's institutions and political instability in attracting FDI to sub-Saharan Africa. His result indicated that countries that are endowed with natural resources or have large markets will attract more FDI. Eshun and Jellicoe (2011) employed both primary and secondary data to analyze the impact of FDI on the development of the Ghanaian mineral industry. It was divulged that FDI had been the livewire of large scale

mining operations in Ghana and had infiltrated the operations of small scale mining which is otherwise preserved for the local Ghanaian artisanal mining community. In summary, it is equitable to conclude that no single factor influences the movement of FDI in an economy. Instead the peculiar fundamentals of the country and region could differ in attracting foreign capital flow Asiedu (2004) and Ajayi (2006).

3. Methodology

3.1. Data Consideration

The study used time series data from 1983 to 2012. All the data were obtained from various issues of International Financial Statistical year book. The 1983–2012 periods was chosen for three reasons. First, the early 1980s was a period in which FDI flows in Ghana was slackened due to political upheaval and sluggishness of economic growth. Second, many policy changes were made in this period to strengthen the economy through economic reforms. Thirdly, the 1990s saw political stability and economic growth. Owusu-Antwi *et al.* (2013) used time series data to determine the factors that influence FDI flows in Ghana.

3.2. Variable Measurement and Model

Our choice of variables is largely informed by both theoretical and empirical literature. The effect of exchange rate volatility slows down FDI inflows into a host country. Volatility in exchange rate has the tendency of increasing risk and uncertainty in international transactions, the upshot discourages trade and investment flows. Kyereboah-Coleman and Agyire-Tettey (2008) employed real exchange rate as an explanatory variable to examine the impact on FDI flows in Ghana. Owusu-Antwi *et al.* (2013) defined the real exchange rates by cedis/dollar real exchange rate divided by host countries currency. The exchange rate variable is denoted by (EXCRATE) and is employed in this study. The variable is hypothesized to have positive relationship with FDI. Several studies have highlighted the role of physical infrastructure in economic growth and development (Asiedu, 2002; Kinda, 2010). Beyond its direct effect on economic growth, good infrastructure may also affect economic growth by increasing the productivity of investment. Wheeler and Mody (1992) empirically found that good infrastructure is a significant factor for developing countries seeking to attract FDI from the United States. Kinda (2010) and Jenkins and Thomas (2002) found a positive effect of infrastructure on FDI. As a proxy for available physical infrastructure (INFRAS), we use the natural logarithm of the sum of the road network in kilometers, and it is expected to have a positive effect on FDI inflows to the mining sector.

The effect of trade openness on FDI inflows depends on the type of FDI. When a country receives market-seeking FDI, i.e. when foreign firms aimed at serving local market, trade openness may reduce FDI inflows. The reason is the “tariff jumping” theory, which argues that multinational firms that seek to serve local markets may decide to set up subsidiaries in the host country when it is difficult to import their products in that country. In contrast, multinational firms that are engaged in export-oriented activities may prefer to locate in a more open economy, since trade protectionism may increase transaction costs thereby, reducing economic competitiveness and exports. Thus, the effect of trade openness on FDI inflows is ambiguous. According to Aizenman and Noy, (2006) countries that are more engaged in international trade, receive more FDI. As an indicator for trade openness (TRDOPN), we use the sum of exports and imports as a percentage of GDP; this is a commonly used indicator for trade openness in the literature.

Macroeconomic stability is generally cited as one of the factors that MNEs consider when deciding to locate in developing countries. For instance, Asiedu (2006) reviewed the results of four surveys on business environment. He found that macroeconomic instability is cited as one of the deterrents to FDI in Africa. High inflation rate is a sign of macroeconomic instability and a source

of uncertainty in the economy. High inflation rate may create an uncertain economic environment and makes it difficult for economic agents to extract correct signals from relative prices (Barro, 1976). By creating an uncertain economic environment, high inflation rate reduces the expected return on investment and the volume of investment. Asiedu (2006) empirically found African countries with high inflation rate to be less attractive to FDI. Based on case studies relating to seven African countries that had attracted a significant amount of FDI, Basu and Srinivasan (2002) concluded that macroeconomic stability was one of the factors that rendered these countries more attractive to FDI. As a measurement for inflation rate (INFL), we use annual growth rate of consumer price index. To correct for the effect of outlier observations, we use $\log(1 + \text{inflation rate})$ and expect a negative effect of the inflation rate on FDI inflows into the mining sector.

Previous studies show that market size of a host country positively affects FDI, and GDP is used as a measure of market size. The expected sign of the estimated coefficient of market size is positive. As Jenkins and Thomas (2002) observed, resource-seeking investors would locate subsidiaries abroad to secure a more stable or cheaper supply of raw materials and energy sources. Morisset (2000) also showed that natural resource availability is very significant for the flow of FDI to developing countries. In this study total export (in \$ dollars) is used as a proxy for natural resources (NATRESO), since about 90 percent of Ghana's exports consist of natural resources. A positive sign is expected for the estimated coefficient. Owusu-Antwi *et al.* (2013) employed natural resources in their studies and found a positive relationship with FDI inflows in Ghana. Chuhan, Perez-Quiros and Popper (1996) identified domestic economic reforms in the 1990s as important in attracting FDI to developing countries. Specifically, economic reforms such as privatization of public enterprise, liberalization of currency and capital accounts, coupled with a stable macroeconomic environment have improved credit worthiness and expanded investment opportunities. Basu and Srinivasan (2002) adduced political and macroeconomic stability, well designed structural reforms, and natural resources as contributors to the increase in FDI in these countries. However, trade restriction and poor policy discouraged FDI to Africa (Asiedu, 2002). Financial and economic restructuring is indicated by liberalization (LIB) and is not computed, since it is treated as a dummy variable. LIB has a value of one in the years of financial and economic restructuring and the value zero otherwise.

It should be lettered that virtually all empirical literature on the determinants of FDI to developing countries has universally alerted on spotting the location-specific factors and pertinent government policies that power FDI and use models that do not have strong micro-foundation, Chakrabarti (2001) and Haile and Assefa (2005) are examples of such studies. Kamaly (2002) disputes that, given that there is no common admitted presumption of FDI, empirical studies on FDI should espouse a realistic approach in selecting the independent variables to be contained in the regression. The specification of the equation and the selection of variables should be motivated by the extensive empirical literature on FDI. Following this recommendation, the general form of the model estimated in this study has the following form:

$$Y = \alpha_0 + \alpha_1 X_1 + \alpha_2 X_2 + \alpha_3 X_3 + \alpha_4 X_4 + \alpha_5 X_5 + \dots + \alpha_n X_n \quad (1)$$

The underlying objective is to establish whether the explanatory variables determine the FDI (Y) into the mining sector. A FDI inflow to the mining sector is regarded as the dependent variable with seven independent variables (i.e. TRDOPN, INFL, EXCRATE, GDP, NATRESO, INFRAS and LIB).

The assumption is that FDI inflow into the mining sector is a function of the variables:

$$FDIMIN = f(\text{TRDOPN}, \text{INFL}, \text{EXCRATE}, \text{GDP}, \text{NATRESO}, \text{INFRAS} \text{ and } \text{LIB}) \quad (2)$$

Where: FDI – total annual FDI flow to the mining sector, TRDOPN – trade openness; INFL - inflation; EXCRATE - exchange rate; GDP- gross domestic product; NATRESO - natural resources; INFRAS - infrastructure and LIB - economic liberalization.

To reduce the variation in the variables a natural log (ln) is incorporated into the model. This is expressed in equation (3). The liberalization variable is represented as a dummy and therefore is not in log linear form. The relationship between FDI and its determinants is estimated by regressing the following equation

$$\ln FDI_t = \beta_1 + \beta_2 \ln TRDOPN + \beta_3 \ln INFL_2 + \beta_4 \ln EXCRATE_4 + \beta_5 \ln GDP_5 + \beta_6 \ln NATRESO_6 + \beta_7 \ln INFRAS_7 + \beta_8 LIB_n + \varepsilon \quad (3)$$

Where ln is the natural log and ε is the error term.

To continue with our analysis, we examine the time series properties of the data set. Engle and Granger (1987) argued that a regression that is based on time series data may give results that are spurious when the data is non-stationary. They concluded that the use of non-stationary variables in time series analysis may cause problems which can produce invalid and questionable results. Hence, there is a need to test for stationarity of all the variables chosen and to determine each variable’s order of integration. A variable is stationary when its mean and variance are constant over time. To this effect we use both the Augmented Dickey-Fuller (Dickey & Fuller, 1981) at both levels and first differences. The structural tests in the data are carried out to maintain the stability of the variables. Engle and Granger (1987) proved that an error correction model can represent the short-run disequilibrium relationship among variables if the set of variables are co-integrated (thus when an equilibrium relationship exists). In estimating the short-run equilibrium relationship between variables, Engle and Granger proposed a two-step methodology. This method first requires the establishment of a long-run model after an integrating relationship among the variables has been developed. The second step involves the usage of the information on the error term in the long-run model as an additional variable in the short-run model. The error correction model can then be used to analyze the short-run dynamic setting of an economy.

4. Empirical Results

4.1. Analysis of the Descriptive Statistics

Table 1. Descriptive statistics

Variables	Mean	Median	Maximum	Minimum	Standard Deviation	Kurtosis
FDI	4.04 mil.	2.96	1bil.	3690000	2.98	1.74
EXRA	5376.88	2337.135	19500	30.003	5832.2	2.572
GDP	1.19 bil.	6.53	4.18	4.06	1.12	4.196
INFL	30.173	25.471	11.15	11.15	22.364	11.65
INFRAS	48944.17	38019.00	112569	16721	24870.50	3.471
TRDOPN	19.67	17.324	35.759	8.885	7.493	2.456
NATRESO	2.99	2.32	8.03	2.25	2.56	2.594
Observation	30	30	30	30	30	30

Author’s Calculations

Table 1 summarizes descriptive statistics for variables used in this study. The average amount of Inward flow of FDI into the mining industry in Ghana from 1983 to 2012 is \$404 million. This can be attributed to the relaxation of regulations that were bidding in the mining sector. The mean value of GDP is \$11.9 billion. This large figure is most likely attributed to the infusion of oil revenue injecting into the system. The mean value of exchange rate is recorded at cedis 5,376.88 per US dollar. This high value can be explained by the high depreciation of the cedi. The average annual values for the infrastructure and natural resources were recorded at 48,944.17 kilometers and \$2.99 billion respectively. The high figure for the natural resources is accounted for by the oil industry. From 1983 to 2012, Inflation and Trade openness had average values of 30.17% and 19.66.

4.2. Results of the Correlation Analysis

Table 2 presents the correlation matrix of the model. As expected, the dependent variable exhibits a weak correlation with the explanatory variables. Noticeably, low values are reported for INFL, NATRESO, and TRDOPN. These figures suggest the possibility of finding close-to-zero and nonsignificant elasticities in the next step of the analysis, which is devoted to the estimation of the econometric model presented above. The model was assessed using variance inflation factors (VIFs) and quantile-quantile plots. The VIFs show how much the variance of the coefficient estimate is being inflated by multicollinearity (Greene, 2000). VIFs are a measure of the effect of multicollinearity on the standard error of a variable. Higher VIF values indicate that the variance of an estimator is inflated due to multicollinearity. To avoid the problem of multicollinearity, variables that were highly correlated were removed from the model. The yield of the variance inflation factors (VIFs) shows a low degree of inflation in the variances of the estimators, to this effect, multicollinearity is not considered as an issue and did not have any impact on the model.

Table 2. Correlation analysis

Correlation	FDI	EXCRATE	GDP	INFL	INFRAS	TRDOPN	LIB	NATRESO
FDI	1.000000							
EXCRATE	0.492859	1.000000						
GDP	0.645904	0.578307	1.000000					
INFL	-0.388380	-0.294229	-0.232801	1.000000				
INFRAS	0.512033	0.634120	0.664235	-0.332852	1.000000			
TRDOPN	-0.098800	-0.194657	-0.205986	-0.177906	-0.180459	1.000000		
LIB	0.656769	0.717362	0.486230	-0.259279	0.592504	0.191304	1.000000	
NATRESO	0.519899	0.647074	0.641146	-0.308565	0.668577	-0.195907	0.683649	1.000000

4.3. Results of the Analysis of the Time-Series Properties of the Variables

We examine the univariate time series properties of the variables. To this effect, the Augmented Dickey-Fuller (ADF) tests were employed. The essence of these tests is to determine the roots that characterized the data. We conducted these tests on the entire variables except the Liberalization variable which is classified as dummy and thus will give us a result close to a singular matrix. The critical values of the variables were tested at 1%, 5% and 10% significance levels. The results of Augmented Dickey-Fuller tests proved exchange rate and inflation were found to be significant at all levels. Nonetheless GDP, natural resources and trade openness were found to be insignificant at all levels. Having to confirm that some of the variables are not stationary at levels, we were compelled to conduct a unit root test for the first difference of the data. It was noticed that the Augmented Dickey-Fuller test gave a significant result at first difference for all the seven variables. Table 3 presents the results of ADF unit root test.

Table 3. Summary of ADF unit root tests on variables

Variables	ADF-Statistics	Critical Values at 1%	Critical Values at 5%	Critical Values at 10%	P-Value	Test Conclusion on variables
LNFDI	-1.187552	-3.769597	-3.004861	-2.642242	0.6607	I(1)
LNGDP	0.719549	-3.679322	-2.967767	-2.622989	0.9905	I(1)
LNINFL	-5.313627	-3.679322	-2.967767	-2.622989	0.0002	I(0)
LNINFRAS	-0.824368	-3.679322	-2.967767	-2.622989	0.7971	I(1)
LNTRDOPN	-1.83783	-3.679322	-2.967767	-2.622989	0.3556	I(1)
LNNATRESO	-2.590054	-3.679322	-2.967767	-2.622989	0.1064	I(1)
LNEXCRATE	-3.454612	-3.679322	-2.967767	-2.622989	0.017	I(1)
D(LNGDP)	-4.241657	-3.689194	-2.971853	-2.625121	0.0026	I(0)
D(LNINFL)	-5.269636	-3.72407	-2.986225	-2.632604	0.0002	I(0)
D(LNINFRAS)	-3.673561	-3.689194	-2.971853	-2.625121	0.0104	I(0)
D(LNTRDOPN)	-5.366112	-3.689194	-2.971853	-2.625121	0.0001	I(0)
D(LNNATRESO)	-4.011211	-3.689194	-2.971853	-2.625121	0.0046	I(0)
D(LNEXCRATE)	-4.112432	-3.689194	-2.971853	-2.625121	0.0036	I(0)

The results of the first difference of the variables are summarized in Table 3. ADF test showed that all the variables fell beyond their respective critical values, indicating a rejection of the null hypothesis of a unit root in favor of the alternative hypothesis of no unit root. The implication of these results for the modeling strategy is that all variables entering the Error Correction Model appear as rates of change or growth rate. Thus, all the variables entering the model are integrated of order 1.

4.4. Results for Co-Integration Analysis

Having established the univariate properties of the variables for the model, we further determined if any long run relationship exists among the variables. Hence, a Johansen Co-integration test was performed to determine the co-integrating rank of the model and the number of common stochastic trends that exist among the variables. The rationale for supplementing the analysis with this test is to provide a strong basis for the Engle-Granger test that was performed. The results of the Johansen Co-integration test is presented in table 4.

Table 4. Johansen cointegration test

Unrestricted cointegration rank test (Trace)

Hypothesized No. of CE(s)	Eigenvalue	Trace Statistic	0.05 Critical Value	Prob.**
None *	0.921497	232.0852	125.6154	0.0000
At most 1 *	0.849903	160.8359	95.75366	0.0000
At most 2 *	0.808453	107.7346	69.81889	0.0000
At most 3 *	0.707818	61.46113	47.85613	0.0016
At most 4	0.493096	27.01055	29.79707	0.1014
At most 5	0.214271	7.986393	15.49471	0.4669
At most 6	0.043128	1.234385	3.841466	0.2666

Trace test indicates 4 Cointegration eqn(s) at the 0.05 level

* denotes rejection of the hypothesis at the 0.05 level

**MacKinnon-Haug-Michelis (1999) p-values

Unrestricted Cointegration Rank Test (Maximum Eigenvalue)

Hypothesized No. of CE(s)	Eigenvalue	Max-Eigen Statistic	0.05 Critical Value	Prob.**
None *	0.921497	71.24933	46.23142	0.0000
At most 1 *	0.849903	53.10129	40.07757	0.0010
At most 2 *	0.808453	46.27348	33.87687	0.0010
At most 3 *	0.707818	34.45058	27.58434	0.0056
At most 4	0.493096	19.02416	21.13162	0.0961
At most 5	0.214271	6.752008	14.26460	0.5189
At most 6	0.043128	1.234385	3.841466	0.2666

Max-eigenvalue test indicates 4 cointegrating eqn(s) at the 0.05 level

* denotes rejection of the hypothesis at the 0.05 level

**MacKinnon-Haug-Michelis (1999) p-values

Both the Trace and Maximum Eigen value statistics indicate that, at most, there are three co-integrating vectors that can be established at the 5% significance level among the seven variables. In order to have a full understanding of the extent of relationship among the independent variables and the dependent variable, the long run model was estimated with the understanding of how the variables were assumed to have an effect on the inflow of FDI into the mining industry based on the Engel-Granger methodology.

The estimated long run equation is given in equation 4 below:

$$D(LNFDI) = 34.67 + 1.08 * D(LNGDP) + 0.44 * D(LNINFRAS) - 2.40 * D(LNNATRESO) + 1.16 * D(LNEXCRATE) - 0.97 * D(LNINFL) + 0.31 * D(LNTRDOPN) + 0.25 * LIB \quad (4)$$

Table 5 presents the results of the estimated long run equation with all seven variables.

Table 5. Long run static equation

Variable	Coefficient	Std. Error	t-Statistic	Prob.
LNEXCRATE	1.156237	0.535233	2.160248	0.0419
LNGDP	1.082585	1.004810	1.077403	0.2930
LNINFL	-0.969638	0.413675	-2.343963	0.0285
LNINFRAS	0.440588	2.751275	0.160140	0.8742
LNNATRESO	-2.400903	1.352154	-1.775614	0.0896
LNTRDOPN	0.305493	0.550930	0.554505	0.5848
LIBERA	0.244555	1.287142	0.189998	0.8511
C	34.66513	14.04158	2.468749	0.0218
R-squared	0.701647	Mean dependent var		19.19135
Adjusted R-squared	0.606716	S.D. dependent var		1.580107
S.E. of regression	0.990921	Akaike info criterion		3.042815
Sum squared resid	21.60236	Schwarz criterion		3.416468
Log likelihood	-37.64223	Hannan-Quinn criter.		3.162350
F-statistic	7.391164	Durbin-Watson stat		1.341525
Prob(F-statistic)	0.000131			

The P-value indicated that inflation and exchange rate were significant at five percent significance level. However; GDP, infrastructure, natural resources, trade openness and liberalization were found not to have significant effects on the inward flow of FDI into the mining industry in Ghana. This is not surprising, as elements of multicollinearity seemed to be present among most of the explanatory variables. A clear example is the very high correlation between infrastructure and natural resources. Hence, using these variables together as explanatory variables could provide some multicollinearity problems which need to be resolved. To this effect we dropped the infrastructure variable and tested for multicollinearity using variance inflated factor (VIF). The results of the VIF indicated that multicollinearity was not an issue. To this end we estimated the long run equation again without the infrastructure variable. The estimated long run equation is given below in equation 5 below.

$$D(LNFDI) = 34.01 + 1.20 * D(LNGDP) - 2.29 * D(LNNATRESO) + 1.20 * D(LNEXCRATE) - 0.96 * D(LNINFL) + 0.32 * D(LNTRDOPN) + 0.09 * LIB \quad (5)$$

Table 6 presents the results of the estimated long run equation with six variables after excluding infrastructure (LNINFRAS) variable from the model.

Table 6. Long run static equation

Variable	Coefficient	Std. Error	t-Statistic	Prob.
LNEXCRATE	1.203091	0.438588	2.743102	0.0116
LNGDP	1.198510	0.681941	1.757498	0.0921
LNINFL	-0.961896	0.402043	-2.392518	0.0253
LNNATRESO	-2.289548	1.134823	-2.017538	0.0555
LNTRDOPN	0.320088	0.531707	0.602000	0.5531
LIBERA	0.087273	0.814117	0.107199	0.9156
C	34.01136	13.14734	2.586938	0.0165
R-squared	0.701299	Mean dependent var		19.19135
Adjusted R-squared	0.623377	S.D. dependent var		1.580107
S.E. of regression	0.969705	Akaike info criterion		2.977314
Sum squared resid	21.62754	Schwarz criterion		3.304260
Log likelihood	-37.65971	Hannan-Quinn criter.		3.081907
F-statistic	9.000021	Durbin-Watson stat		1.339197
Prob(F-statistic)	0.000041			

The results changed dramatically after removing the infrastructure variable from the model in Equation 4. The estimated regression equation explains 70.12 percent in the long run equation. The test confirms the chosen independent variables are highly explanatory. The F test was used to determine whether the regression equation explained a significantly greater amount of the FDI inflows into the mining sector than would be accounted for by random chance. The F-statistic of 9.0 was significant at .05 levels. The t-statistics were used to determine the significance of the explanatory variables. The coefficient for the exchange rate is highly significant, but has a positive sign. A positive change in the variable means an appreciation of the local currencies, vis-à-vis the US dollar. The result runs against expectations that a depreciation of the host currency should make FDI attractive. However, if an appreciation of the domestic currency is perceived as a signal for

further appreciation, perhaps due to better management of the economy or improved political/social stability, then this could lead to an increase in FDI inflows. This is in line with evidence from Uganda (Bende-Nabende, 2002) where exchange rate significantly affects the inward flow of FDI into the mining industry. Market size represented by GDP is in compliance with the economic a priori expectation with a positive sign. There exists a positive relationship between GDP and FDI. This estimate is however insignificant. This result is inconsistent with the results obtained by Asiedu (2006) who found positive and significant relationship between market size and the level of FDI inflows. The insignificant coefficient for market size might be due to the resource seeking motives of inflows into Ghana. It has been suggested that foreign investors operating in the extractive sector generally export their products and are therefore not particularly concerned with the size of the host country's market. The negative and significant inflation coefficient suggests that inflation plays an important role for the determination of the FDI into the mining sector.

The result confirms earlier studies such as Addison and Heshmati (2003) among others and signifies the importance of a more focused macroeconomic policy environment that strengthens the economy and builds confidence for potential investors. The results show a negative long-run relationship between natural resource endowment and FDI inflows. Specifically, a 10% increase in natural resource leads to a decrease of approximately 2.3% in FDI inflows into the mining sector in the long run. The estimate is statistically significant at the 10% level. Previous studies by Ezeoha and Cattaneo (2012), and Asiedu (2002) have shown that natural resource endowments play a leading role in attracting inflow to countries in Africa. The long-run negative relationship between FDI and natural resource endowment may appear to be surprising considering the position in theory. However, the result is practically not out of place. Earlier research by Poelhekke and van der Ploeg (2010) provided explanation as to why in the long-run natural resource endowment might negatively impact FDI inflows in a country. According to the scholars, the ruling choice of a country may form an alliance with foreign resource companies to appropriate resource rents at the expense of the people. This is usually the case in an environment where information on resource exploration and returns to companies and the government are not transparent.

The coefficient on openness is positive and significant. This is consistent with foreign investment to developing countries such as those in Africa which are mainly export-oriented. It is also consistent with the FDI theory that openness is indicative of the host country's ease of access to the world market for material inputs, so the MNCs can obtain the raw materials at low price. It also suggests that economies in which trade is important have relatively higher FDI. Thus, implementation of more liberal economic policies would certainly attract more foreign investments. The result concurs with the work of Kokko (2002) who found open economies encourage more foreign direct investment. In his analysis, he pointed out that Nigeria has strived to achieve this objective by granting concessions to multinational corporations and private foreign companies that are willing to invest in the country. Economic reforms have given the needed platform for the mining sector to operate on the basis of functional autonomy and operational flexibility, thereby improving productivity, efficiency, and profitability. Also, the reforms brought structural changes in the financial and economic sectors and succeeded in relaxing external constraints on its operation, introducing transparency in reporting procedures, restructuring and enhancing the competitive element in the market (Aryeetey & Kanbur, 2005). The regression coefficient for the dummy variable (LIB) captures the effect of economic restructuring during the pre- and post-liberalization period. The liberalization dummy is found to be an insignificant determinant of FDI inflows to the mining sector, with the estimated coefficient of 0.087273, possessing the expected sign in the regression model. This result suggests that liberalization of the Ghanaian economy has not encouraged much FDI inflows to the mining sector, and it does not support the proposition that foreign investors are more likely to invest in countries that have opened up to the outside world. It can be deduced that investment requirement to the mining sector has not much relaxed. This result is not consistent with the results obtained by Owusu-Antwi *et al.* (2013).

4.5. Results of the Error Correction Model Analysis

Having confirmed a co-integration relation for the variables, the next stage of the Engle-Granger methodology requires estimating the short run error correction model using the estimate of the disequilibrium from the long run model to obtain information on the speed of adjustment to equilibrium. The dynamic version of the long run relation in Equation 5 can be specified as an error correction model.

The estimated short-run model is shown below in Equation 6 below:

$$D(LNFDI) = 0.68 + 0.29 * D(LNGDP) + 0.87 * D(LNINFRAS) - 4.10 * D(LNNATRESO) - 0.55 * D(LNEXCRATE) - 0.29 * D(LNINFL) + 0.44 * D(LTRDOPN) - 0.15 * D(LIB) + 0.01 * D(LNFDI(-1)) \quad (6)$$

Table 7 below presents the results of the error correction model.

Table 7. Parsimonious short run static equation

Variable	Coefficient	Std. Error	t-Statistic	Prob.
D(LNEXCRATE)	-0.551003	2.084744	-0.264302	0.7944
D(LNGDP)	0.285456	2.160011	0.132155	0.8963
D(LNINFL)	-0.290504	0.438819	-0.662012	0.5159
D(LNNATRESO)	-4.099901	1.730302	-2.369471	0.0286
D(LNTRDOPN)	0.440511	1.008815	0.436662	0.6673
D(LNINFRAS)	0.871235	3.197178	0.272501	0.7882
LIBERA	-0.153622	0.497117	-0.309025	0.7607
D(LNFDI(-1))	0.010377	0.212599	0.048809	0.9616
C	0.674959	0.763640	0.883870	0.3878
R-squared	0.323400	Mean dependent var		0.101665
Adjusted R-squared	0.038516	S.D. dependent var		1.114491
S.E. of regression	1.092817	Akaike info criterion		3.270486
Sum squared resid	22.69072	Schwarz criterion		3.698695
Log likelihood	-36.78680	Hannan-Quinn criter.		3.401394
F-statistic	1.135200	Durbin-Watson stat		2.256806
Prob(F-statistic)	0.385104			

Where D represents the first difference operator and D(LNFDI(-1)) is the error term from the long run model. The empirical result derived from Equation 6 indicates that in the short run only natural resource variable has absolute t-statistics greater than one. With regards to the p-value, only one variable (Natural resources) was significant in determining the inward flow of FDI into the mining industry. In the short run however, natural resource endowment contributes negatively toward FDI inflows into the mining sector. This estimate is statistically significant at 5% levels. The result of the short-run estimate is consistent with UNCTAD (2005) which found that as high as 80% of FDI inflow to Africa is concentrated in the extractive sector. All the other variables were statistically proven to be insignificant. That is, in the short run GDP, the Exchange rates, Infrastructure, Trade openness, Inflation and Liberalization do not significantly influence the inflow

of FDI into the mining industry. The F-statistic indicates that the coefficients are jointly not significant at five percent, since the independent variables explain about 32.34 percent of the variation in the inflow of FDI.

5. Conclusions

This study has empirically determined the factors that have influenced FDI flows into the mining sector. The study used time series data from 1983 to 2012 obtained mainly from various issues of International Financial Statistical year book. The study examines the univariate time series properties of the variables. The Augmented Dickey-Fuller (ADF) test and Phillips-Perron (PP) tests were also employed an econometric techniques used to examine the unit roots of the involved variables. The study then proceeded to find whether there are any long run and short run relationships, after all the variables, were found to have unit roots – integrated of order one I (1). We tested for a Johansen Co-integration test to determine the co-integrating rank of the model and the number of common stochastic trends that existed among the variables. This was to determine whether any long run relationship exists among the variables. We also employed the Engle-Granger two-step co-integration methodology and the Error Correction Mechanism in addition to the multiple regression analysis. Variance inflated factor were used to solve multicollinearity issues in the model. The results of the VIF indicated that multicollinearity was not an issue. The results of the study registered exchange rate, inflation and openness of trade to be significant in the long run. The results as presented designate a negative long-run relationship between natural resource endowment and FDI inflows. The significant of these variables confirms the vital role it plays in the determinants of FDI inflows into the mining sector in Ghana. The GDP which was used as a proxy for market size registered to be insignificant. This can be explained by the small nature of Ghana's population and income. The study also found liberalization to be insignificant implying a unrelaxation nature of the Ghana's economic and institutional policies towards the investment in the mining industry. In the short run all the variables were found to be insignificant except natural resources that were found to be significant and contributed positively to the mining sector.

The results of this study are consistent with the work of Ezeoha and Cattaneo (2012) and Asiedu (2002) and other researches such as Poelhekke and van der Ploeg (2010) who provides some elucidation as to why in the long-run natural resource endowment might negatively impact FDI inflows in a country. This study has extended and strengthened some earlier results on FDI inflows in Ghana. Three innovations of the current study are the use of a comprehensive data source, the consideration of a longer period of time covering two decades (1983–2012), and the incorporation of the liberalization factor. Obviously, the purpose is to provide a reliable background for an accurate application of the Co-integration and Unit root test approach in determining the FDI inflows into the mining sector.

5.1. Policy Implication and Recommendation

It has been asserted that FDI flows to Africa are mostly resource seeking - and market-seeking, and that such FDIs have not insinuated the required economic modification and progress in the region (Asiedu, 2002 & 2006; Dupasquier & Osakwe, 2006). One economic task facing Africa, therefore, is how to articulate the necessary policies that can attract the right kind of FDI in the region. According to Asiedu (2013) the challenge facing countries in Sub-Saharan Africa, in particular, oil-exporting countries in the region, such as Ghana, is to find ways to avoid the FDI resource curse and attract FDI in non-extractive industries. The government should work toward increased openness to foreign trade so that the domestic enterprise sector can participate fully in the global economy. This approach should be undertaken jointly with efforts to increase business sector competition. A combined approach would allow a greater domestic and international openness to business, which works well with safeguards against the negative effects of a rise in concentration. Moreover, the

successful elimination of global and regional trade barriers makes participating countries more attractive for FDI, owing to the concomitant expansion of the “relevant” market. Anyanwu (2012) emphasized that, augmenting regional cooperation and integration will also increase market size in Ghana and help attract investors currently constrained in part by the small size of the domestic markets. This confirmed with Asiedu (2006) that large market size attracts FDI to Africa.

An export-oriented regime opens up the economy of the nation to the outside world especially in terms of increase in demand, which is necessary for a higher return of investment to be achieved by investors. However, Africa's international development partners should continue to facilitate the establishment of a more open and equitable trade regime. Countries that have diversified their exports suffer from problems of quality and lack knowledge of export markets and appropriate technology (Anyanwu, 2012). Regulatory and “behind-the-border” policies create additional indirect trade barriers and impede technology flows. Unnecessary and unreasonable regulatory requirements for imported inputs have created small, highly fragmented markets, which discourages international firms from entering, reducing the flow of imported technologies. Instead of reforming regulations that stifle trade in inputs, efforts to expand input use have so far focused mainly on measures to either directly intervene in input marketing or provide heavy, and usually untargeted, subsidies. These measures prevent private sector development in input markets and crowd out more effective programs of public expenditure (Jayne & Rashid, 2013). Every aspect of host countries' economic and governance practices affects the investment climate.

The overall goal for policymakers must therefore be to strive for the greatest possible macroeconomic stability and institutional predictability; pursue sound macroeconomic policies that are geared to sustain high economic growth and employment, price stability and sustainable external accounts. The government must critically consider the small scale mining industry for financial and technical support as they contribute greatly to employment, revenue and also serve as a source of raw material for local jewelers. The framework of recent mining legislation in Ghana which seeks to encourage foreign investment is not necessarily well-matched with the attainment of social and economic development, and the protection of the environment. Ghana therefore needs to undertake a complete evaluation of the fiscal regime, investment and stabilization agreements in the mining industry.

References

- [1] Addison, T., & Heshmati, A. (2003). *The new global determinants of FDI flows to developing countries: The importance of ICT and democratization* (WIDER Working Paper, No. 2003/45). Finland: World Institute for Development Economics Research. Retrieved from <https://www.wider.unu.edu/sites/default/files/dp2003-045.pdf>.
- [2] Ahlquist, J. S. (2006). Economic policy, institutions, and capital flows: Portfolio and direct investment flows in developing countries. *International Studies Quarterly*, 50(3), 681-704. doi:10.1111/j.1468-2478.2006.00420.x
- [3] Aizenman, J., & Noy, I. (2006). FDI and trade – Two-way linkages? *The Quarterly Review of Economics and Finance*, 46(3), 317 – 337. doi:10.1016/j.qref.2006.02.004
- [4] Ajayi, S. I. (2006). The determinants of foreign direct investment in Africa: A survey of the evidence. In S. I. Ajayi (Ed.), *Foreign direct investment in Sub-Saharan Africa: Origins, targets, impact and potential* (pp.11-32). Nairobi, Kenya: African Economic Research Consortium.
- [5] Aliber, R. (1970). A theory of foreign direct investment. In C. P. Kindleberger (Ed.), *The international corporation: A symposium* (5th ed. pp.17–34). Cambridge: MIT Press.
- [6] Allaoua, A., & Atkin, M. (1993). *Foreign direct investment in Africa: Trends, constraints and challenges*. Paper presented at the Meeting of Ad-hoc Expert Group on the Revitalization of

- Investment for Africa's Development: Prospects in the 1990s and Beyond, 29 November—1 December. Addis Ababa: United Nations Economic Commission for Africa.
- [7] Anyanwu, J. C. (2012). Why does foreign direct investment go where it goes? New evidence from African countries. *Annals of Economics and Finance*, 13(2), 425-462.
- [8] Aryeetey, E., & Kanbur, R. (2005). *Ghana's economy at half century: An overview of stability, growth and poverty*. Paper presented at the "Ghana at the Half Century" conference organized by the Institute of Statistical, Social and Economic Research, University of Ghana, and Cornell University. Retrieved from <http://www.arts.cornell.edu/poverty/kanbur/AryeeteyKanbur.pdf>.
- [9] Asafu-Adjaye, J. (2005). What has been the impact of foreign direct investment in Ghana? *The Institute of Economic Affairs*, 1(9). Retrieved from <http://ieagh.org/wp-content/uploads/2014/07/polina-v1-n10.pdf>.
- [10] Asiedu, E. (2002). On the determinants of foreign direct investment to developing countries: Is Africa different? *World Development*, 30(1), 107-119. doi:10.1016/S0305-750X(01)00100-0
- [11] Asiedu, E. (2004). Policy reform and foreign direct investment in Africa: Absolute progress but relative decline. *Development Policy Review*, 22(1), 41-48. doi:10.1111/j.1467-8659.2004.00237.x
- [12] Asiedu, E. (2006). Foreign direct investment in Africa: The role of natural resources, market size, government policy, institutions and political instability. *The World Economy*, 29(1), 63-77. doi:10.1111/j.1467-9701.2006.00758.x
- [13] Asiedu, E. (2013). *Foreign direct investment, natural resources and institutions* (Working Paper). London, UK: International Growth Center. Retrieved from <http://www.theigc.org/wp-content/uploads/2014/09/Asiedu-2013-Working-Paper.pdf>.
- [14] Balasubramanyam, V. N., Salisu, M., & Sapsford, D. (1996). Foreign direct investment and growth in EP and IS countries. *The Economic Journal*, 106(434), 92-105. doi:10.2307/2234933
- [15] Barro, R. J. (1976). Rational expectations and the role of monetary policy. *Journal of Monetary Economics*, 2(1), 1-32. doi:10.1016/0304-3932(76)90002-7
- [16] Basu, A., & Srinivasan, K. (2002). *Foreign direct investment in Africa: Some case studies* (IMF Working Paper, WP/02/61). Washington, DC.: International Monetary Fund (IMF). Retrieved from <https://www.imf.org/external/pubs/ft/wp/2002/wp0261.pdf>.
- [17] Benacek, V., Gronicki, M., Holland, D., & Sass, M. (2000). The determinants and impact of foreign direct investment in Central and Eastern Europe: A comparison of survey and econometric evidence. *Transnational Corporations*, 9(3), 163-212.
- [18] Bende-Nabende, A. (2002). Foreign direct investment determinants in Sub-Saharan Africa: A co-integration analysis. *Economics Bulletin*, 6(4), 1-19.
- [19] Bengoa, M., & Sanchez-Robles, B. (2003). Foreign direct investment, economic freedom and growth: New evidence from Latin-America. *European Journal of Political Economy*, 19(3), 529-545. doi:10.1016/S0176-2680(03)00011-9
- [20] Boateng, A., & Glaister, K. W. (2000). Foreign direct investment in Ghana: Patterns of activity, distribution and the role of government policy. *Journal of Euromarketing*, 8(4), 51-74. doi:10.1300/J037v08n04_03
- [21] Buckley, P. J., & Casson, M. (1976). *The future of the multinational enterprise*. London, UK.: Macmillan.
- [22] Buckley, P. J., & Casson, M. (1981). The optimal timing of a foreign direct investment. *The Economic Journal*, 91(361), 75-87. doi:10.2307/2231697

- [23] Buckley, P. J., & Casson, M. (1985). *The economic theory of the multinational enterprise*. London, UK: MacMillan.
- [24] Campos, N.F., & Kinoshita, Y. (2008). *Foreign direct investment and structural reforms: Evidence from Eastern Europe and Latin America* (IMF Working Papers, WP/08/26). Washington, DC: IMF. Retrieved from <https://www.imf.org/external/pubs/ft/wp/2008/wp0826.pdf>.
- [25] Carkovic, M., & Levine, R. (2005), Does foreign direct investment accelerate economic growth? In T. H. Moran, E. M. Graham & M. Blomström (Eds.), *Does foreign direct investment promote development?* (pp. 195-220). Washington, DC: Institute for International Economics.
- [26] Caves, R. E. (1996). *Multinational enterprise and economic analysis* (2nd ed.). Cambridge, MA.: Cambridge University Press.
- [27] Chakrabarti, A. (2001). The determinants of foreign direct investment: Sensitivity analyses of cross-country regressions. *Kyklos*, 54(1), 89-114. doi:10.1111/1467-6435.00142
- [28] Chuhan, P., Perez-Quiros, G., & Popper, H. (1996). *International capital flows: Do short-term investment and direct investment differ?* (Policy Research Working Paper, WPS1669). Washington DC.: The World Bank. doi:10.1596/1813-9450-1669
- [29] Coakley, G. J. (1999). *The mineral industry of Ghana — U.S. geological survey minerals yearbook* (Vol. III). Washington, DC. U.S. Department of the Interior. Retrieved from <http://minerals.usgs.gov/minerals/pubs/country/1999/9213099.pdf>.
- [30] Dickey, D. A., & Fuller, W. A. (1981). Likelihood ratio statistics for autoregressive time series with a unit root. *Journal of Econometrics*, 49(4), 1057-1072. doi:10.2307/1912517
- [31] Djokoto, J. G. (2012). The effect of investment promotion on foreign direct investment inflow into Ghana. *International Business Research*, 5(3), 46-57. doi:10.5539/ibr.v5n3p46
- [32] Djokoto, J. G., & Dzeha, G. C. (2012). Determinants and effects of foreign direct investment in Ghana – Review of literature. *Developing Country Studies*, 2(11/12), 25-35.
- [33] Dunning, J. H. (1997). *Knowledge capitalism: Competitiveness reevaluated — A macro-organizational viewpoint*. Paper presented at the Proceedings of Academy of Management Symposium on Knowledge Capitalism: Competitiveness Reevaluated, 8-13 August (pp.18-28). Boston, Massachusetts: Academy of Management.
- [34] Dunning, J. H. (1980). Toward an eclectic theory of international production: Some empirical tests. *Journal of International Business Studies*, 11(1), 9-31.
- [35] Dunning, J. H., & Lundan, S. M. (2008). Theories of foreign direct investment. In *Multinational enterprises and the global economy* (2nd ed., pp.79-115). Cheltenham: Edward Elgar Publishing Limited.
- [36] Dupasquier, C., & Osakwe, P. N. (2006). Foreign direct investment in Africa: Performance, challenges, and responsibilities. *Journal of Asian Economics*, 17(2), 241–260. doi:10.1016/j.asieco.2005.07.002
- [37] Engle, R. F., & Granger, C. W. J. (1987). Co-integration and error correction: Representation, estimation and testing. *Econometrica*, 55(2), 251-276. doi:10.2307/1913236
- [38] Eshun, P. A., & Jellicoe, S. A. (2011). The impact of foreign direct investment on the development of the Ghanaian mineral industry. *Asian Journal of Business and Management Science*, 1(1), 148-167.
- [39] Ezeoha, A. E., & Cattaneo, N. S. (2012). FDI flows to Sub-Saharan Africa: The impact of finance institution and natural resource endowment. *Comparative Economic Studies*, 54(3), 597-632. doi:10.1057/ces.2012.18

- [40] Frimpong, J. M., & Oteng-Abayie, E. F. (2008). Bivariate causality analysis between fdi inflows and economic growth in Ghana. *International Research Journal of Finance and Economics*, 15, 103-112.
- [41] Ghana Minerals Commission. (2000). *Statistics on Ghana's mineral exports (1997-99)*. Accra, Ghana: Minerals Commission.
- [42] Ghana Minerals Commission. (2006). *Statistical overview of Ghana's mining industry (1990-2004)*. Accra, Ghana: Minerals Commission.
- [43] Ghana Minerals Commission. (2012). *Report on the Performance of the Mining Industry*. Accra, Ghana: Minerals Commission.
- [44] Ghana Minerals Commission. (2013). *Report on the Performance of the Mining Industry*. Accra, Ghana: Minerals Commission.
- [45] Ghana Minerals Commission. (2014). *Report on the Performance of the Mining Industry*. Accra, Ghana: Minerals Commission.
- [46] Greene, W. H. (2000). *Econometric analysis* (4th ed.). New Jersey, USA: Prentice Hall.
- [47] Gyapong, A. O., & Karikari, J. A. (1999). Direct foreign investment strategies and economic performance in Ghana and Ivory Coast. *Journal of Economic Development*, 24(1), 133-147.
- [48] Haile, G., & Assefa, H. (2005). *Determinants of foreign direct investment in Ethiopia: A time-Series analysis*. Paper presented at the 4th International Conference on the Ethiopian Economy, Addis Ababa, Ethiopia, 10-12 June. Retrieved from http://westminsterresearch.wmin.ac.uk/2892/1/Haile_Assefa_2006_final.pdf.
- [49] Hill, C. W. L. (2007). *International Business: Competing in the global marketplace* (6th ed. pp. 236-261). USA: McGraw-Hill/Irwin.
- [50] Hymer, S. H. (1976). *The international operations of national firms: A study of direct foreign investment*. Cambridge, MA.: M.I.T. Press.
- [51] Jayne, T. S., & Rashid, S. (2013). Input subsidy programs in sub-Saharan Africa: A synthesis of recent evidence. *Agricultural Economics*, 44(6), 547-562. doi:10.1111/agec.12073
- [52] Jenkins, C., & Thomas, L. (2002). *Foreign direct investment in South Africa: Determinants, characteristics and implications for economic growth and poverty alleviation*. Center for the Study of African Economics, University of Oxford. Retrieved from http://r4d.dfid.gov.uk/PDF/Outputs/Mis_SPC/R7619FDIrep2002-02.pdf.
- [53] Jun, K. W., & Singh, H. (1996). Determinants of foreign direct investment in developing countries. *Transnational Corporations*, 5(2), 67-105.
- [54] Kamaly, A. (2002). *Evaluation of FDI Flows into the MENA region*. Paper presented in the 9th Annual Conference on Regional Trade, Finance and Labor, organized by the Economic Research Forum, American University in Sharja, the United Arab Emirates.
- [55] Karikari, J. A. (1992). Causality between direct foreign investment and economic output in Ghana. *Journal of Economic Development*, 17(1), 7-17.
- [56] Kesse, G. O. (1985). The mineral and rock resources of Ghana. *Journal of African Earth Sciences*, 7, 601-610.
- [57] Khaliq, A., & Noy, I. (2007). *Foreign direct investment and economic growth: Empirical evidence from sectoral data in Indonesia* (Working paper No. 200726). USA: University of Hawaii at Manoa. Retrieved from http://www.economics.hawaii.edu/research/workingpapers/WP_07-26.pdf.

- [58] Kinda, T. (2010). Investment Climate and FDI in Developing Countries: Firm-Level Evidence. *World Development*, 38(4), 498-513. doi:10.1016/j.worlddev.2009.12.001
- [59] Kindleberger, C. P. (1973). *International economics* (5th ed.). Homewood, IL.: Richard. D. Irwin.
- [60] Knickerbocker, F. T. (1973). *Oligopolistic reaction and multinational enterprise*. Cambridge, MA: Harvard University Press.
- [61] Kokko, A. (2002). Globalization and FDI policies. In *The development dimension of FDI: Policy and rule-making perspectives*. Paper presented at the Proceedings of the Expert Meeting held in Geneva, 6-8 November (pp.29-39). Retrieved from http://unctad.org/en/Docs/iteia20034_en.pdf.
- [62] Kyereboah-Coleman, A., & Agyire-Tettey, K. F. (2008). Effect of exchange-rate volatility on foreign direct investment in Sub-Saharan Africa: The case of Ghana. *Journal of Risk Finance*, 9(1), 52-70. doi:10.1108/15265940810842410
- [63] Li, X., & Liu, X. (2005). Foreign direct investment and economic growth: An increasingly endogenous relationship. *World Development*, 33(3), 393-407. doi:10.1016/j.worlddev.2004.11.001
- [64] Loree, D. W., & Guisinger, S. E. (1995). Policy and non-policy determinants on U. S. equity foreign direct investment. *Journal of International Business Studies*, 26(2), 281-299. doi:10.1057/palgrave.jibs.8490174
- [65] MacDougall, G. D. A. (1960). The benefits and costs of private investment from abroad: A theoretical approach. *Economic Record*, 36(73), 13-35. doi:10.1111/j.1475-4932.1960.tb00491.x
- [66] Morisset, J. (2000). Foreign direct investment in Africa: Policies also matter. *Transnational Corporation*, 9(2), 107-125.
- [67] Nunnenkamp, P., & Spatz, J. (2003). *Foreign direct investment and economic growth in developing countries: How relevant are host country and industry characteristics?* (Kiel working paper, No. 1176). Germany: Kiel Institute for the World Economy. Retrieved from <https://www.econstor.eu/bitstream/10419/3028/1/kap1176.pdf>.
- [68] Ohlin, B. (1971). *Comercio interregional e internacional*. Oikos, Barcelona. (Original work published 1933).
- [69] Olatunji, L.A., & Shahid, M. S. (2015). FDI and economic growth in Nigeria: A co-integration analysis. *Business and Economic Research*, 5(1), 243-261. doi:10.5296/ber.v5i1.6647
- [70] Onyeiwu, S., & Shrestha, H. (2004). Determinants of foreign direct investment in Africa. *Journal of Developing Societies*, 20(1-2), 89-106. doi:10.1177/0169796X04048305
- [71] Owusu-Antwi, G., Antwi, J., & Poku, P. K. (2013). Foreign direct investment: A journey to economic growth in Ghana - Empirical evidence. *International Business and Economics Research Journal*, 12(5), 576-584. doi:10.19030/iber.v12i5.7832
- [72] Poelhekke, S., & van der Ploeg, F. (2010). *Do natural resources attract FDI? Evidence from non-stationary sector-level data* (CEPR Discussion Paper No. 8079). Available at http://cepr.org/active/publications/discussion_papers/dp.php?dpno=8079.
- [73] Quandzie, E. (2012). *FDI inflows to Ghana's mining sector between 1983 to 2011*. Ghana Chamber of Mining
- [74] Sackey, F. G., Compah-Keyeke, G., & Nsoah, J. (2012). Foreign direct investment and economic growth in Ghana. *Journal of Economics and Sustainable Development*, 3(10), 120-133.
- [75] The Ghana Chamber of Mines. (1998). *The impact of mining on local economy — Annual report of the Chamber mines*. Accra, Ghana: The Ghana Chamber of Mines.

- [76] The Ghana Chamber of Mines. (2005). *The impact of mining on local economy — Annual report of the Chamber mines*. Accra, Ghana: The Ghana Chamber of Mines.
- [77] The Ghana Chamber of Mines. (2006). *Annual General Meeting*. Accra, Ghana: The Ghana Chamber of Mines.
- [78] Tsikata, F. S. (1997). The vicissitudes of mineral policy in Ghana. *Resources Policy*, 23(1-2), 9-14. doi:10.1016/S0301-4207(97)00006-8
- [79] Tsikata, G. K., Asante, Y., & Gyasi, E. M. (2000). *Determinants of foreign direct investment in Ghana*. London: Overseas Development Institute. Retrieved from <https://www.odi.org/publications/7134-determinants-foreign-direct-investment-ghana>.
- [80] UNCTAD. (1999). *Foreign direct investment in Africa: Performance and potential* (UNCTAD/ITE/IIT/Misc. 15). New York and Geneva: United Nations. Retrieved from <http://unctad.org/en/Docs/poiteiitm15.pdf>.
- [81] UNCTAD. (2005). *Economic development in Africa – Rethinking the role of foreign direct investments*. New York and Geneva: United Nations.
- [82] UNCTAD. (2012). *World investment report — 2012: Towards a new generation of investment policies*. New York and Geneva: United Nations. Retrieved from http://unctad.org/en/PublicationsLibrary/wir2012_embargoed_en.pdf.
- [83] Vernon, R. (1966). International investment and international trade in the product cycle. *The Quarterly Journal of Economics*, 80(2), 190-207. doi:10.2307/1880689
- [84] Wei, S.-J. (2000). Local corruption and global capital flows. *Brookings papers on Economic Activity*, 2, 303-354.
- [85] Wheeler, D., & Mody, A. (1992). International investment location decisions: The case of US firms. *Journal of International Economics*, 33(1-2), 57-76. doi:10.1016/0022-1996(92)90050-T

