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Determinants of Foreign Direct Investment Inflows to Africa

Master-thesis in Economics

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Jönköping August 2012

Abstract

This paper aims to explore the determinants of foreign direct investment inflow to African countries by estimating a panel regression model over the period of 1985-2009. Fixed effects regression is estimated on FDI inflow as a function of GDP per capita, GDP growth rate, Exports, trade openness, human capital, labor force growth rate, number of telephone lines per 1000 people, exchange rates, inflation and the share of oil and minerals in total exports. The estimations use 47 countries together as well as in three different income groups i.e. 17 Low Income, 16 Lower Middle Income and 8 Upper Middle Income countries. According to the findings, export is found to be a strong determinant of FDI in the case of aggregate of all countries and in the two groups of middle income countries while GDP per capita, labor force growth rate and inflation are found to be significant for the aggregate and the Lower Middle Income groups. While trade openness has also proved to affect FDI inflow in the low income and lower middle income countries, the coefficient of telephone lines per 1000 people in the case of upper middle income countries is found to be negative and significant. The variable that represented natural resources availability did also turn out to have no significant effect on FDI inflow.

Acknowledgement

First, I should mention that I have studied for Masters in Economics courtesy of a free admission from the Swedish Institute.

I would like acknowledge my supervisors whose patience and invaluable feedbacks have helped me a lot throughout the process of writing this paper.

Finally, I want to thank my aunt for her immense help and encouragement and my friends whose encouragement and assistance have been important.

Abbreviation

ECA	Economic Commission for Africa
FDI	Foreign Direct Investment
GDP	Gross Domestic Product
GNI	Gross National Income
LDC	Least Developed Countries
MNE	Multinational Enterprises
ODI	Overseas Development Institute
OECD	Organization for Economic Cooperation and Development
UNCTAD	United Nation's Conference Trade and Development
WIR	World Investment Report

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1. INTRODUCTION

Foreign direct investment (FDI) by multinational corporations resulting from the ever increasing globalization has been one of the most salient features of today's global economy. In the past few decades, the growth in FDI has outpaced the growth rate of international trade (Bloningen, 2005). However, its flow to different regions of the world has not been even. Many developing countries, especially in Africa have received insignificant amount of FDI inflow while the concentration was high in small number of countries in the continent and elsewhere. The inflow to Africa is not only very low as share of the world total flow of FDI, it has also been on a declining trend in recent years. According to the world investment report (2010), FDI inflows to Least Developed Countries still account for only 3 per cent of global FDI inflows and 6 per cent of flows to the developing world, down from 6 and 28 percent in 1970s respectively. In absolute terms, FDI flows to Africa have shown a decline from \$ 72 billion in 2008 to \$ 59 billion in 2009. It also remains concentrated in a few countries that are rich in natural resources.

1.1. Background

1.1.1. FDI inflow to Africa and developing countries

The foreign direct investment to Africa in 1990s was three times that of 1980s and from 2000 to 2010 it grew as much as 6 times its amount in the previous decade. On average FDI inflow has been growing 27.8% per year from 1985 to 2009. However, comparisons with global FDI flows show that Africa's share of global FDI was quite small with 2.37% in the 1980s and it fell to 1.66% in 1990s. Its share of the total FDI inflow to developing countries has also been inconsistent and below the desired level. It was 10.68% in 1980s, 5.6% in 1990s and it grew back to around 10.2% in 2000s while the FDI to other developing countries has been growing consistently.¹

Table 1: Distribution of FDI inflow: Africa, developing countries and the world (in million dollars)

	1980-1989	1990-1999	2000-2009
Africa	22,017.35	67,004.87	371,235.4
Africa's share of total world FDI (%)	2.37	1.66	3.22
Developing countries	205,988.3	1,180,587	3,628,215
Developing countries share of total world FDI (%)	22.17312	29.35878	31.50741
World Total	928,999.9	4,021,241	11,515,434

Source: author's own compilation using the data from UNCTAD database

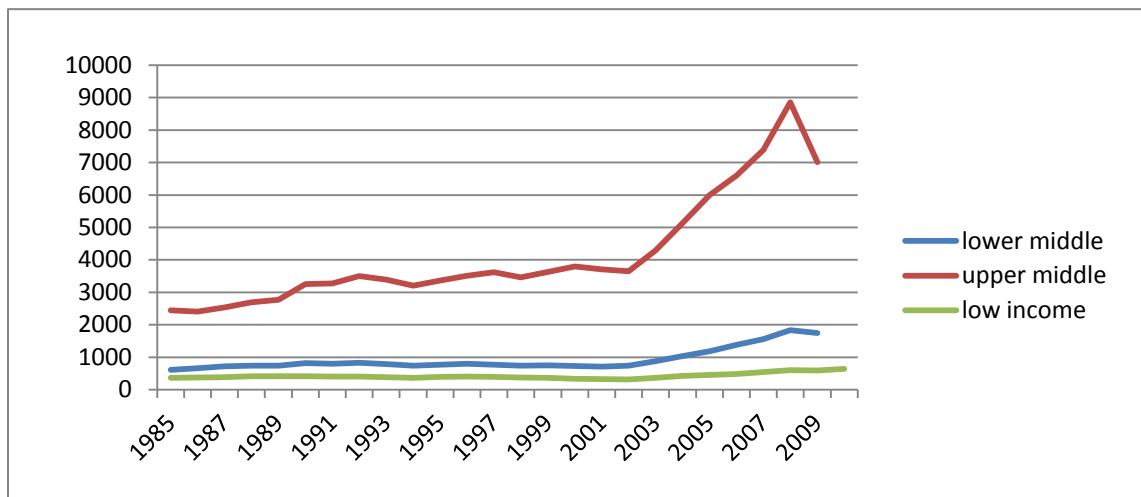
¹ *The percentage figures are the author's own calculations from the UNCTAD data used in the study unless other sources are mentioned.*

1.1.2. Trends of FDI inflow, GDP per capita and Exports

The relevance of higher income levels and export potentials in promoting the inflow of foreign investment is supported by theories and various empirical studies and it will be discussed further in the paper. Therefore, it will be useful to see the trends of FDI inflow, GDP per capita and exports. In the time period this study covers, average per capita income has grown by about 4 % on average per year while export earnings increased by about 8% and FDI inflow increased by 27.8% annual average growth rate.

Figure 1 (below) shows the trend of percapita income in the different income groups of African countries. In countries such as Angola, Equatorial Guinea, Morocco and Congo republic which have high resource abundance as well as small countries like Djibouti and Cape Verde, per capita income have been growing at a higher rate. The sharp increase in GDP per capita after the year 2000 is mostly due to growth rates in Angola and Equatorial Guinea. There have also been growth income level in a number of Low Income countries. A report by IMF (2012) mentions Ethiopia, Malawi, Rwanda, Uganda, Mozambique, Tanzania, Zambia, Cape Verde, Liberia and The Gambia as the fastest growing non-oil economies from 2006-2011. This implies that there have been growth in income in countries of different income levels even though the rate of increase varies from country to country.

Figure 1: Average per capita GDP of African countries, 1985-2009



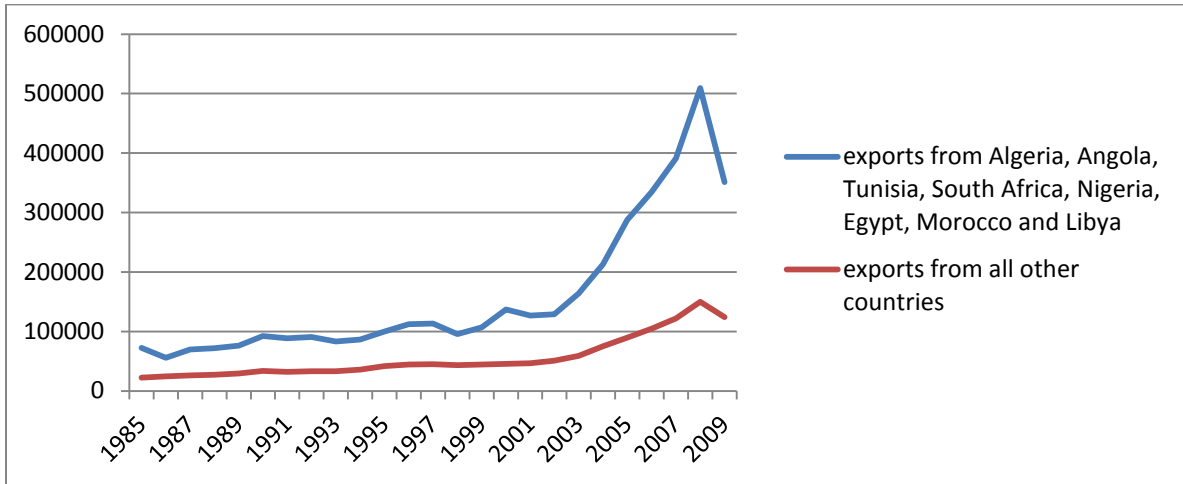
Source: author's own compilation using the data from UNCTAD database

Exports have also shown the same trend of high growth with significant disparity between countries. Algeria, Angola, Tunisia, South Africa, Nigeria, Egypt, Morocco and Libya accounted for about 74% of the total exports from Africa. However, the average annual growth rate of exports from these countries and the rest of Africa has been more or less the same with 8% and 7.7% respectively.

The peak in the graphs of FDI, GDP per capita and exports in 2007 and the falling trend afterwards can be related with the fact that highest FDI inflow to Africa was registered in 2007. From 2008-2009 economic growth rate was hampered by the global economic downturn (African

Development Bank group, 2009) and the fall in FDI and exports can possibly be explained by this global economic situation.

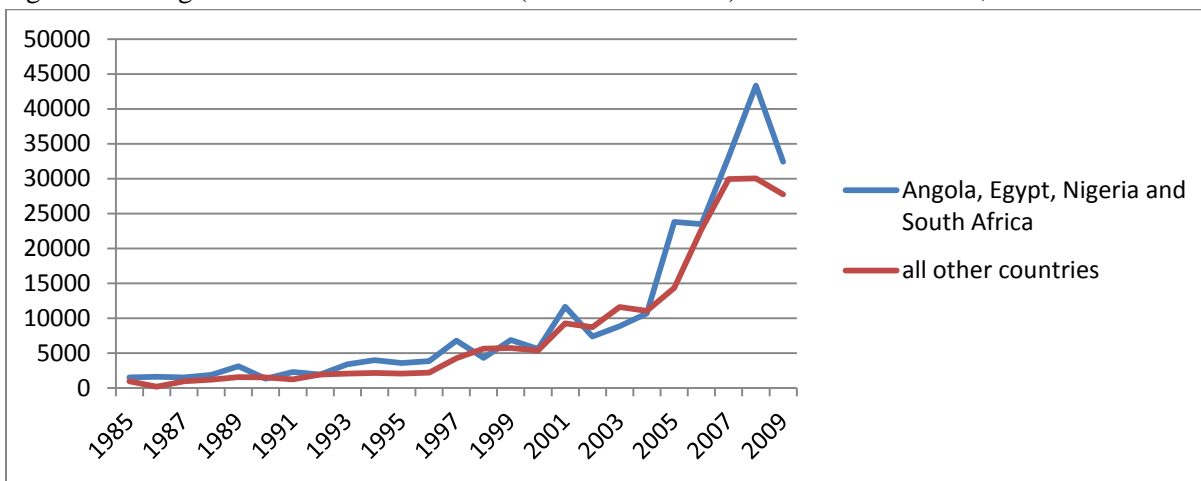
Figure 2: Total export earnings of African countries (in million dollars) 1985-2009



Source: author's own compilation using the data from UNCTAD database

Figure 3 shows the trend of FDI in selected African countries (highest FDI recipient countries) and in the rest of Africa. The selected countries are Nigeria, South Africa, Egypt and Angola which are the four highest FDI recipient countries. FDI inflow in these selected countries as well as the rest of the continent has been on an increasing trend.

Figure 3: Foreign Direct Investment inflow (in million dollars) to African countries, 1985-2009

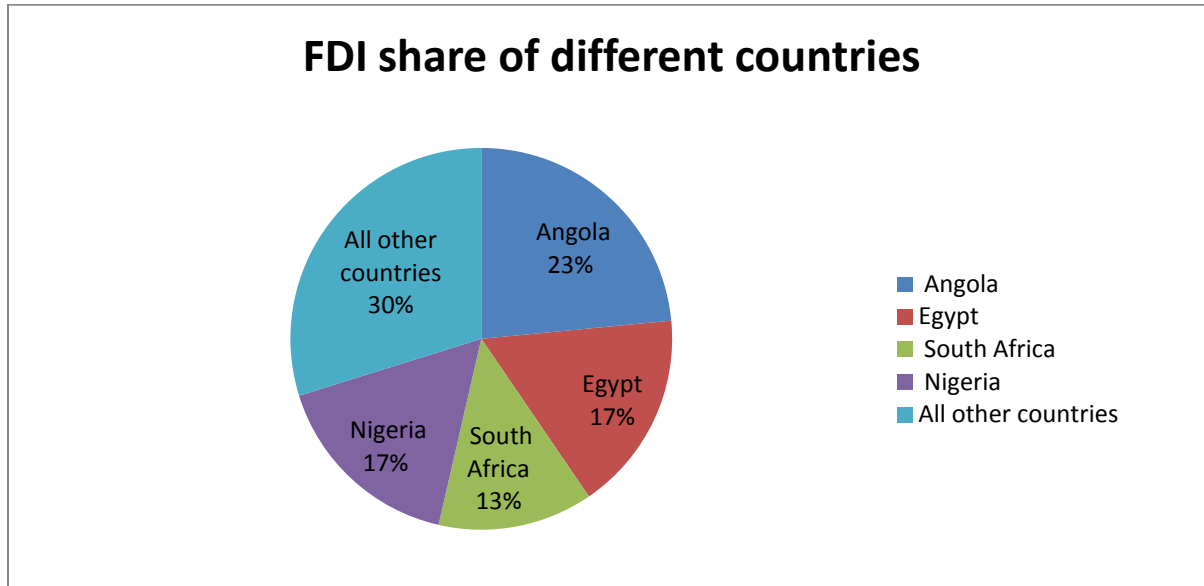


Source: author's own compilation using the data from UNCTAD database

1.1.3. Distribution of FDI among African countries

The FDI inflow to African countries has also been uneven as the global inflow, with few countries enjoying most of the foreign investment. The four highest FDI recipient countries i.e. Angola, Egypt, Nigeria and South Africa take about 70% of the total inflow. The increase in FDI to these countries particularly after 2000 has been remarkable.

Figure 4: Major recipients of the FDI inflow to Africa, 1985-2009



Source: author's own compilation using the data from UNCTAD database

Even though significant share of the FDI is towards countries with natural resource advantages such as oil, minerals, coffee and timber, the FDI inflow in Africa is not limited to these sectors. According to Ajayi (2006) the FDI inflows to the oil exporting countries such as Morocco, Nigeria and Egypt have been diversifying to manufacturing and service sectors in recent years. Ajayi also mentions that survey of multinational corporations in 2000 indicated tourism, natural resources industries and industries such as telecommunications which require higher domestic demand as sectors with increasing involvement of foreign investors.

1.2. Statement of the problem

Many studies in literature have discussed the potential benefits of FDI for developing countries as an engine to economic growth in terms of creation of job opportunities, technology transfers, source of capital and knowledge. More importantly, given the fact that most African countries are Low Income countries where national savings are too low to finance domestic investment expenditure, FDI inflows are considered as source of foreign capital in addition to the aforementioned potential benefits.

Based on this belief that foreign direct investment has a positive role of accelerating economic growth and development, many African countries have been striving to implement different policy initiatives and incentives to attract capital inflows which can fill the saving-investment gap in their economies. However, the expected high inflow of FDI into the continent has not occurred and many explanations have been given in the literature for Africa's small share in the global FDI flows. The various explanations can be summarized into poverty, the overall image of riskiness related to frequent conflicts and wars, inappropriate environment and adoption of poor economic policies.

As a result of the observed variation in the trends and distribution and growth of FDI inflows through time and across regions, substantial recent interest has been given by several researchers to studying the determinants of FDI and various papers have been written on groups of different developed and developing countries. With regard to Africa, there have been studies on individual African countries and very few studies on groups of countries and the studies by Asiedu in 2002 and 2006 on 22 African countries is one of the very few notable contributions to mention. Therefore this study will intend to close the gap in the existing literature by analyzing the determinants of FDI inflow in Africa as a whole and in groups of countries with different income levels.

Due to the variation of determinants of FDI inflow to different countries based on motives of investors and the specific characteristics of countries, there cannot be any single variable or a specified set of variables that can explain FDI inflow. Therefore, following the same standard procedure as many studies on FDI, this study will analyze the effects of relevant variables that are to be selected based on theoretical considerations.

1.3. Purpose

This study intends to find the significance of determinants of FDI inflow in the case of African countries using panel regression method which will be explained in the methodology section. The possible determinants/explanatory variables are to be chosen based on theories and previous researches. The regression models will be estimated on time series data from 1985 to 2009 on the all African countries together and on different income groups in order to compare the effects of the factors on different income groups. Therefore this study will attempt to answer the questions:

- What are the factors that attract FDI to Africa in general
- What factors determine FDI inflow in Low Income, Lower Middle Income and Upper Middle Income countries
And based on the importance of the variables in explaining FDI inflow;
- What do foreign investors target when they invest in Africa, serving the domestic markets or export?

1.4. **Paper outline**

The introduction section shows the growth trends and distribution of FDI inflows to Africa together with the growth trends of income and exports which are relevant in the FDI context. The chapter also motivates the relevance of studying the determinants of FDI inflow and discusses purpose of the research in the last part.

The next section of this paper will review how different trade theories explained foreign direct investment. The theoretical framework to be followed by this paper, which is the ownership, localization and Internalization framework will also be discussed in this section. Besides, empirical studies on the subject will be discussed. The next section will consist of methodology where the variables will be explained, and the data and econometric model will be discussed.

Finally, results of the econometric analysis of the selected variables and based on that conclusions will be forwarded.

2. THEORETICAL FRAMEWORK AND PREVIOUS STUDIES

2.1. Theoretical framework

The most fundamental question a research on FDI would aspire to answer is why firms would opt to engage in foreign production instead of exporting from their own location or simply licensing their ownership advantages. According to Faeth (2008, p.166), early empirical studies on FDI were mainly undertaken in the form of field studies without a sound theoretical foundation because the theory of MNEs did not exist. In these studies, FDI from a single or a group of home countries to a single or a group of host countries was analyzed using time-series, cross-section or panel data in an aggregated or disaggregated form and the determinants can be macroeconomic, microeconomic or both. However, various theoretical models have also discussed FDI in terms of theories of market structure and international trade and several empirical studies were written on the basis of these theories and it will be important to see the direct and indirect implications of the theories of international trade towards FDI.

Faeth (2008) refers the Heckscher–Ohlin Factor Abundance Model of the neoclassical trade theory, where FDI was seen as part of international capital trade as the first theoretical attempt to explain foreign direct investment. As Faeth puts it, “The Heckscher-Ohlin model was a 2x2x2 model with only two countries characterized by two homogenous goods/products and two factors of production. And it was based on the assumptions of perfectly competitive markets both for commodities and factors, identical production functions with constant returns to scale, and zero transportation cost. Besides, commodities are assumed to differ in relative factor intensities and countries in relative factor endowments, and these differences caused international factor price differentials”(p.167). Based on these assumptions, the Heckscher–Ohlin model states that countries would specialize in the production of goods which require relatively large inputs of factors with which they are comparatively well endowed and would export these in exchange for others which require relatively large inputs of resources with which they are relatively less endowed. However, this theory has been criticized in the literature on various grounds related with its unrealistic assumptions. In view of Dunning (1988, p.14), the implication of three of the assumptions of Heckscher-Ohlin model, namely, immobility of factors between countries, the identity of production functions and the presence of perfectly competitive markets is that “All markets function efficiently, there are no external economies of production or marketing; and third, information is freely available and there are no barriers to trade. And such a situation would make international trade the only possible form of international involvement.” This is to mean that if there are no ownership advantages/imperfect competition and barriers to trade/ transport costs, and if the only factor to be considered were resource endowment, production for foreign markets must have been undertaken within the exporting countries and there would be no need for foreign direct investment.

According to Markusen and Venables (2000, p.210), the emergence of New Theoretical Models that consider increasing returns to scale, imperfect competition, and product differentiation is

motivated by empirical evidences of large volume of intra-industry trade between countries with similar endowments, which are at odds with the predictions of Heckscher-Ohlin model. However, Markusen and Venables state that “this exposition of the new trade theory by Helpman and Krugman (1985) is not found to be useful for any trade-policy analysis, for analyzing factor mobility, nor for most models of multinational firms because of two reasons; first, the reliance of most theoretical analyses on models that are restricted by factor-price equalization assumptions precluded the use of Helpman-Krugman model in the presence of tariffs and trade costs. The second reason is that the new trade theory pays relatively little attention to multinational firms despite the fact that the industries discussed in the new trade theory are often dominated by these multinational firms”(p.210).

In an effort to deal with the shortcomings of this model by Helpman and Krugman; Markusen and Venables (2000) developed the Monopolistic-Competition Model of International Trade which includes positive trade costs and endogenous multinational firms. Their model demonstrates that the presence of trade costs changes the pattern of trade, motivates factor mobility and consequently, leads to agglomeration of production in a single country and multinational firms. In addition to Markusen and Venables, Hymer (1976) and Kindleberger (1969) were also notable in their focus on the ownership advantages and monopolistic competition to explain why firms enter foreign markets. In the words of Faeth (2008, p.167); “Hymer (1976) and Kindleberger (1969) argued that foreign firms need imperfect goods markets (ownership advantages such a product differentiation), imperfect factor markets (such as managerial expertise, new technology or patents), the existence of internal or external economies of scale and government incentives to balance out the disadvantages of entering foreign markets to compete with local firms.”

The Knowledge Capital model by Markusen (1996, 1997, and 2002) should also be mentioned as it integrates the motivations for horizontal FDI (the desire to avoid trade costs by producing closer to consumers) with the motivations for vertical FDI (to utilize relatively abundant unskilled labor and carry out unskilled-labor intensive production). In this model, Similarities in market size, factor endowments and transport costs were determinants of horizontal FDI, while differences in relative factor endowments determined vertical FDI.

The Ownership, Localization and Internalization model of Dunning (1980) is the first theory to provide a more comprehensive analysis of the determinants of foreign direct investment and because of this; it is the most referenced one by authors writing on FDI. The principal hypothesis of the paradigm of international production by Dunning (1988, p.25) is that “firms become MNE or engage in production in a foreign country if and when three interrelated conditions are satisfied; ownership, localization and internalization advantages.” Dunning (1988, pp.21-27) defines the three advantages as follows:

Ownership advantage refers to the advantages firms may have over others producing in the same location in terms of exclusive possession of intangible assets such as patents, trademarks and management skills and human capital experience. This can be in the form of firm size which can generate scale economies and inhibit effective competition and access to markets or raw materials that are not available to competitors. Such advantages give MNEs higher level of technical and price efficiency and more market power. The second form of ownership advantages is in the form of better resource capacity and usage foreign MNEs enjoy over new local entrants due to size and established

position i.e. economies of scope and specialization. This can be explained in terms of favored access to input and product markets due to monopolistic influence and access to resources of parent company at zero marginal cost. The other advantage arises specifically due to multinationality in the forms of favored access and better knowledge about international markets, ability to take advantage of geographical differences in factor endowments and ability to diversify risk.

Location advantages: location represents the physical and psychic distance between countries while location advantages are motives for producing abroad including spatial distribution of natural and created resource endowments and markets; price, quality and productivity of inputs (labor, energy, materials and components), economic system and government policies (tariffs, quotas, taxes government incentives), infrastructure provision, and costs of communication.

Internalization advantages: if a firm has the ownership advantages mentioned above, it will be more beneficial to use them itself than lease or sell them to foreign firms; and this it does through an extension of its existing value added chains or adding new ones in foreign markets. In other words, internalization of transactions works through protecting against undesirable market failure (by avoiding trade costs such as costs of enforcing property rights, quotas, tariffs and price controls) and exploit government incentives that encourage MNEs.

Firms engage in affiliate production in a foreign country to exploit additional market failures and gain ownership advantages over host country firms to the end of internalizing transactions. However, due to the presence of undesirable market failures in the form of economic and political risks; firms need location specific advantages to enter foreign markets. Firms which already have ownership advantages choose between the three options; exporting from their own location, licensing the different ownership advantages they have or involving in affiliate production in a foreign country by comparing the location specific advantages and internalization advantages they have in their country of origin and possibly have in the foreign country. Dunning concludes that if the economics of production and marketing favors a foreign location (due to location attractions), foreign direct investment will be the preferred form of involvement. Based on this theoretical assumption that firms will consider investing in a foreign country are those which already have any one or more of the ownership advantages described, this study intends to look into the location specific factors that attract foreign investment to African countries.

Empirical studies on the determinants of FDI have found that in combination with ownership advantages of MNEs; location specific characteristics such as market size and characteristics, factor costs, transport costs and trade barriers, risk factors (such as exchange rate and interest rate), infrastructure, property rights and regime type determine FDI (Faeth, 2008). Therefore, the economic variables are chosen from various empirical studies of FDI inflow based on the OLI approach. Previous empirical studies on the subject are discussed as follows.

2.2. Review of previous studies

In addition to/and on the basis of the theoretical models discussed above, a number of empirical studies suggest different location specific variables that should be considered in models as determinants of FDI.

Campos and Kinoshita (2003) studied the factors accounting for the geographical patterns of FDI inflows among 25 transition economies using panel data for the period 1990–98 and they found out that, agglomeration economies and institutions outweigh the economic variables as the main determinants of FDI location. Economic variables such as abundance of natural resources, large markets, low labor cost, more openness to trade, external liberalization and fewer restrictions did also attract more FDI while poor bureaucracy was found to have a deterring effect.

Biswas (2002), using panel data for 44 countries from 1983 to 1990, also attempts to integrate a number of traditional and nontraditional variables into the standard theory of investment based on the maximization of the expected value of the firm. According to his findings, the traditional factors (better infrastructure and low wages) interact with the nontraditional factors (regime type and duration, index of secured property and contractual rights) to determine the decisions of foreign investors. A study by Cheng and Kwan (2000) also estimates the effects of the determinants of foreign direct investment (FDI) in 29 Chinese regions from 1985 to 1995 and conclude that large regional market, good infrastructure, preferential policy and low wage costs were significant. A strong self-reinforcing effect of FDI on itself was also observed in the study by Cheng and Kwan.

Singh and Jun (1995) studied the determinant of FDI inflow to developing countries and concluded that export orientation is the strongest variable for explaining high FDI inflows while the study by Noorbakhsh, Paloni and Youssef (2001) on 36 developing countries from Africa, Asia and Latin America found the growth rate of labor force, Human capital, trade openness, shortage of energy, lagged change in FDI to GDP ratio and growth rate of GDP as significant in explaining FDI.

The effects of level and volatility of exchange rates on FDI has also been specifically examined by Froot and Stein (1991) and Bloningen (1997). Froot and Stein argue that depreciation of the host country's currency attracts foreign investors. Due to imperfect capital markets, the internal cost of capital is lower than borrowing from external sources and an appreciation of currency leads to increased firm wealth and provides the firm with greater low-cost funds to invest relative to the counterpart firms in the foreign/devaluating country. According to Bloningen (1997), depreciation of domestic currency promotes FDI inflow through its effect of increasing acquisition of local firms by foreign investors.

3. METHODOLOGY

3.1. Variables

Based on the theories and empirical models discussed, panel regression of FDI inflow as a function of GDP per capita, GDP growth rate, exports, trade openness, human capital, labor force growth rate, exchange rates, inflation, telephone lines per one thousand people and natural resources share of total exports is estimated. Explanation of variables used in the regression is presented as follows.

$$FDI_{it} = (GDPpc_{it}, GDPgr_{it}, EXP_{it}, OPEN_{it}, HC_{it}, LF_{it}, EXR_{it}, INFL_{it}, TELE_{it}, RES_{it})$$

Where i represent the countries and t represents time (years)

3.1.1. Foreign Direct Investment inflow:

According to the definition by OECD (2008, p.17), “foreign direct investment is cross-border investment made by a resident in one economy (the direct investor) with the objective of establishing a lasting interest in an enterprise (the direct investment enterprise) that is resident in an economy other than that of the direct investor. The motivation of the direct investor is a strategic long-term relationship with the direct investment enterprise to ensure a significant degree of influence by the direct investor in the management of the direct investment enterprise. The ‘lasting interest’ is evidenced when the direct investor owns at least 10% of the voting power of the direct investment enterprise.” The impact of FDI inflow on a country’s economic growth through its impact on productivity and export competitiveness been argued by several authors. Particularly in developing countries where national savings are not enough to finance domestic investments, FDI is considered as a source of foreign capital, technology transfer, additional employment opportunities and access to foreign markets (Ajayi, 2006). In this study, FDI inflow to African countries is taken as the dependent variable. The data used is annual FDI inflows from 1985 to 2009 in (million dollars) is and it is taken from UNCTAD database.

3.1.2. GDP per capita and growth rate of GDP:

Per capita GDP represents market size i.e. the economic conditions and potential demand in the host country which is one of the factors that foreign investors consider to invest in a different country. Asiedu (2002) argues that high Per capita GDP implies a better business prospect in the host country. In addition to per capita GDP, the growth rate of GDP is also included as an indicator of market potential. Though the importance of growth rate is arguable, Demirhan and Musca (2008) suggest that where the current size of economies is very small, the growth performance can be more relevant to FDI decisions. However, there is also an argument in favor of a negative relationship between FDI inflow and GDP per capita. Edwards (1990) and Jaspersen, Aylward and Knox (2000) argue that there is an inverse relationship between return on capital and real per capita GDP (Cited in Asiedu, 2002).

The data on Per capita GDP and growth rate of GDP from 1985 to 2009 is taken from the same source as FDI. Per capita GDP is in USD.

3.1.3. Export

The study by Singh and Jun (1995) concludes that export orientation is the strongest variable why countries attract FDI. Due to high export propensity of foreign firms, export orientation is assumed to give them more confidence to invest and consequently encourage more FDI inflow. Therefore, export is also expected to have a positive effect FDI. The export data is taken from the UNCTAD database and the values are in millions of USDs. The study by Asiedu (2006) on 22 African countries did also report a significant positive effect of exports.

3.1.4. Trade openness

Multinational firms engaged in export oriented production in a foreign country and horizontally fragmenting firms producing at different places will be highly dependent on exporting and importing. Therefore, increased imperfections as a consequence of trade restrictions will discourage foreign direct investment. Singh and Jun (1995), Demirhan and Musca (2008), and, Campos and Kinoshita (2003) implied that trade openness is a significant determinant. As in most other studies, trade openness is approximated by the ratio of export plus import to GDP and it is expected to have a positive effect on FDI. The data is taken from UNCTAD database.

3.1.5. Human capital

The level of skill and availability of skilled labor will significantly affect the amount of FDI inflow and the activities MNEs undertake in the host country (Dunning, 1988). Empirical studies by Schneider and Frey (1985) and Root and Ahmed (1979) also proved the importance of human capital in developing countries to attract FDI inflow. Secondary school enrollment rate is taken to represent human capital and it is expected to have a positive relationship with FDI. The data is collected from the World Bank database, African development indicators.

3.1.6. Exchange rates

Due to the significant amount of capital at stake, investing in a foreign country exposes MNEs to high risk of exchange rate fluctuations. Froot and Stein (1991) presented empirical evidence that appreciation of currency (in terms of the investors' country's currency) will increase the wealth of investors and provide them with low cost capital to invest in the foreign country. Consequently, depreciation of exchange rate in a host country will increase inward FDI. Bloningen (1997) also

confirmed that depreciation of the US dollar increased inward acquisition FDI by Japanese firms. In this study exchange rate is represented by the price of one US dollar in each country's currency. Therefore increase means depreciation and decrease means appreciation of the local currencies and since FDI will increase with increase in exchange rate/depreciation of local currency, the exchange rate coefficient is expected to have a positive sign. The data on exchange rates from 1985-2009 is taken from UNCTAD statistical database.

3.1.7. Inflation

Successful economic policies and a consequently stable macroeconomic environment can be perceived by foreign investors as an indicator of less risk for investment (Campos and Kinoshita, 2003) and the stability of price levels is widely used to represent macroeconomic stability. This is because high and volatile price levels entail uncertainties. Studies by Asiedu (2003) on 22 African countries, a co-integration analysis on gross FDI and inflation in Spain by Bajo-Rubio and Sosvilla-Rivero (1994) and a study by Demirhan and Musca (2008) on 38 developing countries confirmed a negative relationship between FDI inflow and inflation. Therefore the coefficient of inflation is expected to be negative in this study as well. The data on annual consumer price indices is taken from the World Bank database.

3.1.8. Number of Telephone Lines per thousand People

Development of infrastructure encompasses various aspects that investors may see as necessary for a good business environment ranging from communication facilities such as roads, railways, ports, and transport and telecommunication systems to the availability of institutions that provide financial, legal, consultancy etc. services. As a well developed infrastructure is believed to facilitate businesses, a positive relationship between infrastructure development and FDI inflow is assumed. However, unavailability of good infrastructure is also argued to have a potential to attract foreign investment in the infrastructure sector. Based on Asiedu (2006) and Demirhan and Musca (2008), telephone lines per t people (in logarithms) is used as proxy to infrastructure. The data for this variable is taken from World Bank database, African development indicators.

3.1.9. Percentage Share of Fuel and Minerals in Exports

The availability of natural resources is also mentioned by empirical studies as a critical factor for attracting foreign investors. Several countries in Africa possess large reserves of oil, gold, diamond and other highly tradable natural resources, and a number of countries have been beneficiaries of high FDI inflow due to their resources. Following Asiedu (2006), the percentage share of oil and minerals in total exports is taken as a proxy to the availability of resources and it is expected to have a positive

marginal effect on FDI inflow. The data is taken from the World Bank database, African development indicators.

3.1.10. Labor force Growth rate

The availability of labor and lower wage costs are also regarded as important to attract resource-seeking and efficiency-seeking MNEs that engage in labor-intensive activities (Dunning, 1988). In this study, labor force growth rate is used as proxy for the availability of labor and based on the basic economic theory of low prices as a consequence of abundance, it is also assumed to imply lower wage costs. This is because of the unavailability of time series data on labor wages in African countries. The data is taken from the same source as infrastructure and natural resources.

Table 2: Summary of the variables and expected signs of their coefficients

Variable	Definition	Expected sign	units of measurement
<i>GDPpc</i>	GDP per capita	+	units (USD)
<i>GDPgr</i>	GDP growth rate	+	percentage
<i>EXP</i>	Export	+	millions (USD)
<i>OPEN</i>	Trade openness	+	percentage
<i>HC</i>	Human capital	+	percentage
<i>LF</i>	Labor force growth rate	+	percentage
<i>logTEL</i>	No. of telephone lines per 1000 people	+	logarithm
<i>RES</i>	Share of minerals and oil in total exports	+	percentage
<i>EXR</i>	Exchange rate	+	USD/local currency
<i>INFL</i>	Inflation	-	percentage

It should be pointed out that due to the unavailability of data; some variables that are relevant in the African context were omitted. The study by Asiedu (2006) on the case of 22 African countries from 2000 to 2004 used variables such as political risk index, tax rates as well as wage rates. Therefore it was initially intended to include these variables as well as real interest rates.

3.2. Econometric Model

In this part, description of the econometric model will be presented. First, panel regression will be estimated on the data of all countries together and then on three groups of countries based on their level of per capita income. The country groups based on income level which is in accordance with the classification by World Bank (2012) are Low Income, Lower Middle Income and Upper Middle Income, each with per capita income of 1,005 USD and less, 1,005 to 3,975 USD and 3,976 to 12,275 USD respectively. Classifying countries in different income groups is important because countries within similar income levels are assumed to show relatively similar trends in other macroeconomic indicators such as growth rates, human capital, inflation and exchange rates.

Panel data may have group effects, time effects, or both. These effects are either fixed effect or random effect. Fixed effects estimation is used when unobserved individual or cross section specific effects are assumed to be correlated with the predictor variables while the assumptions underlying random effects model are that the error terms are random drawings from a larger population and, there is no correlation between the error terms and explanatory variables (Gujarati, 2004). Therefore, the right type of panel regression technique has to be chosen from fixed effects model and random effects model. In the case of this study, a number of time-invariant country-specific characteristics such as differences in language, culture and historical ties with different countries based on colonial history, availability of natural resources and many other unobservable differences with possible correlation with the predictor variables are expected to exist. And since fixed effects estimator is used for the case of studying the effects of time varying variables after controlling for the time invariant effects, it is assumed to be the right method of estimation.

Besides, the Hausman specification test is used for the group of All Countries as well as the three income groups. The Hausman specification test compares the fixed versus random effects under the null hypothesis that the individual effects are uncorrelated with the other regressors in the model (Hausman 1978). In general, random effects is the efficient method and it should be preferred if the null hypothesis is true. If there is correlation between the individual effects and the other regressors, random effects model produces biased results and fixed effects method shall be used. According to Hausman's result, the covariance of an efficient estimator with its difference from an inefficient estimator is zero (Greene 2003). Therefore, the null hypothesis of this test can be stated as there is no significant difference between the fixed and random effects estimators, which if rejected would imply that fixed effects estimator is more appropriate to use.

The null and alternative hypotheses are:

H_0 : difference in coefficients is not systematic

H_1 : difference in coefficients is systematic

And the following results are found from the test.

Table 3: Hausman test results

All		Low Income		Lower middle		Upper middle	
Chi2(8)	17.91	Chi2(9)	30.71	Chi2(10)	146.82	Chi2(9)	18.39
Prob>chi2	0.0219	Prob>chi2	0.0003	Prob>chi2	0.0000	Prob>chi2	0.0301

Therefore, we will reject the null hypothesis and fixed effects regression model will be used for all groups. The test for the presence of trend in FDI data proved also that a trend component should be included in the regression model. Accordingly, the following fixed effects model will be estimated for the group of all countries combined, and Lower Middle and Upper Middle Income groups. Year dummies on these groups are found to be statistically insignificant through an F test.

$$FDI_{it} = \alpha_0 + \alpha_1 trend + \alpha_2 GDPpc_{it} + \alpha_3 GDPgr_{it} + \alpha_4 EXP_{it} + \alpha_5 OPEN_{it} + \alpha_6 HC_{it} + \alpha_7 LF_{it} + \alpha_8 EXR_{it} + \alpha_9 INFL_{it} + \alpha_{10} TEL_{it} + \alpha_{11} RES_{it} + \epsilon_{it} \quad (1)$$

In this study, it is chosen not to follow the usual trend of taking logarithm of the variables on both side of the regression equation because the FDI data have a significant number of negative observations and changing such data to logarithm would significantly reduce the number of observations available for the estimation. For the sake of convenience in interpreting the effect of its change, only the number of telephone lines per thousand people is taken in logarithms.

Colonialism dummies to control for the country specific effects related with language, culture and relationships with former colonies were also considered to be included in the model. But they had to be omitted due to collinearity.

For the group of Low Income Countries, the above model is used with time dummies because significant variation through time from the mean FDI inflow has been observed in this group. Therefore, the following model is estimated for the group of Low Income Countries.

$$FDI_{it} = \alpha_0 + \alpha_1 trend + \alpha_2 GDPpc_{it} + \alpha_3 GDPgr_{it} + \alpha_4 EXP_{it} + \alpha_5 OPEN_{it} + \alpha_6 HC_{it} + \alpha_7 LF_{it} + \alpha_8 EXR_{it} + \alpha_9 INFL_{it} + \alpha_{10} TEL_{it} + \alpha_{11} RES_{it} + \gamma_2 T_2 + \gamma_3 T_3 + \dots + \gamma_{24} T_{24} + \epsilon_{it} \quad (2)$$

4. EMPIRICAL RESULTS AND ANALYSIS

4.1. Descriptive statistics

Descriptive statistics of the data used for estimation on all African countries together and in different income groups is presented in the tables below. A time series data from 1985 to 2009 is used for the regression on All Countries. Initially it was intended to include all (53) countries but due to unavailability of data one or more variables, 47 of the 53 countries are included in the study.² The number of observations used in each variable is also incomplete for the same reason which means that unbalanced panel data is used for this regression. According to Wooldridge (2002), fixed effects estimation on unbalanced panel gives consistent and asymptotically normal results if the missing data are of random causes and are not correlated with the idiosyncratic errors.

As the statistical summary shows, the mean GDP per capita of the 47 African countries was 1,310 USD which is above the lower boundary of lower middle income group (1,005 USD) and it also exceeds the average income in low income and lower middle income groups. The upper middle income group shows the highest per capita average with 4,621 USD. Regarding growth rate of income, the low income group shows the highest rate of growth with 17.7% while the growth at the other groups is around 3.7% per year.

The mean FDI inflow to Africa is 352 million US dollars and this figure is less than the mean inflow to the lower and upper middle income countries but more than 4 times as much as the mean inflow to Low Income countries. The minimum inflow in all the groups have been negative with the lowest net inflow (-793.87) recorded in an Upper Middle Income group. According to UNCTAD (2002), FDI flows with a negative sign indicate that at least one of the three components of FDI i.e. equity capital, reinvested/retained earnings or intra-company loans is negative and not offset by positive amounts of the remaining components. In other words, negative FDI inflow may imply reverse investments or disinvestments.

The data for telephone lines per 1000 people is shown in logarithms and hence a negative value means less than one in thousand people have access to telephone lines. Upper middle income countries have the highest number of telephone lines per thousand people as it would be expected. The summary in the rest of the variables show that low income countries have the lowest exports, highest rate of inflation and lowest openness to trade.

² Countries omitted due to unavailability of sufficient data one or more variable are Comoros, Eritrea, Guinea, Sao Tome, Sierra Leone and Somalia.

Table 4: descriptive statistics for all (47) countries, 1985-2009

Variable	Obs	Mean	Std. Dev.	Min	Max
FDI inflow	1285	352.1098	1183.594	-793.87	16581.02
GDP per capita	1293	1310.147	2104.416	81.56	23656.49
GDP growth rate	1316	3.728701	7.393127	-51.03	106.28
Export	1287	4154.013	10135.11	7.96	98923.3
Openness	1286	35.48048	25.79411	4.42	377.34
Human Capital	1212	30.4706	21.82534	3.28	111.18
Telephone lines per 1000 people	1314	-.0549916	.6161742	-2.239637	1.47527
Labor force growth rate	1324	2.849675	1.386472	-7.13	11.13
Inflation	1122	75.65732	1039.396	-100	24411.03
Exchange rate	1314	572.5112	1803.849	0	20025.33
Minerals and Oil as % of Export	1325	14.55283	26.75178	0	99.66927

Table 5: descriptive statistics for Low Income countries, 1985-2009

Variable	Obs	Mean	Std. Dev.	Min	Max
FDI inflow	523	92.717	200.4622	-279.22	1808
GDP per capita	525	324.4827	161.7016	81.56	1121.17
GDP growth rate	497	17.70423	11.76756	-1.77	60.17
Export	525	32.36349	155.9947	1.911454	1630.29
Openness	524	4.504332	9.981086	-51.03	106.28
Human Capital	517	1.278762	4.312574	.01	37.07
Telephone lines per 1000 people	498	.4094177	.2714768	-.87	1.05
Labor force growth rate	456	145.9762	1610.349	-100	24411.03
Inflation	511	942.6204	1143.913	.33	8222.94
Exchange rate	519	51.24753	105.2637	4.42	733.04
Minerals and Oil as % of Export	452	1.60e+08	3.36e+08	0	2.91e+09

Table 6: descriptive statistics for Lower Middle Income countries, 1985-2009

Variable	Obs	Mean	Std. Dev.	Min	Max
FDI inflow	400	723.6744	1837.143	-334.8	16581.02
	425	921.9416	576.9008	166.49	4666.74
GDP per capita					
GDP growth rate	425	3.803718	4.663551	-23.98	33.74
Export	419	5214.05	10246.48	7.96	82879.05
Openness	418	39.10744	20.1758	5.31	103.35
Human Capital	396	32.05174	16.56703	10.39	86.59
Telephone lines per 1000 people	425	.0666118	.4390371	-.68	1.19
Labor force growth rate	425	2.887671	.9192793	-1.18	8.55
Inflation	388	41.33693	264.7876	-100	4145.11
Exchange rate	425	585.7255	1902.821	0	16208.5
Minerals and Oil as % of Export	425	19.69936	29.96354	0	99.66927

Table 7: descriptive statistics for Upper Middle Income countries, 1985-2009

Variable	Obs	Mean	Std. Dev.	Min	Max
FDI inflow	200	507.1169	1259.111	-526.76	9006.3
GDP per capita	200	4621.86	2665.959	933.08	13232.72
GDP growth rate	200	3.60125	4.511012	-17.15	18.4
Export	200	12739.11	18040.99	139.89	98923.3
Openness	200	43.06975	17.58435	13.92	119.65
Human Capital	189	61.54286	25.05616	12.2	111.18
Telephone lines per 1000 people	200	.8489	.349476	-.05	1.48
Labor force growth rate	200	2.69435	1.478444	-.78	6.19
Inflation	200	6.53505	6.904958	-11.69	36.97
Exchange rate	200	69.98535	162.4954	.28	733.04
Minerals and Oil as % of Export	200	31.64794	39.41266	0	98.874

4.2. Regression results

Table 8: results of the fixed effects (within) estimation

	All	Low income	Lower middle	Upper middle
Constant	-24319.87** (12115.97)	-25785.23* (8209.77)	36977.82*** (21706.01)	-149334.6** (63619.82)
Trend	12.08149** (6.107124)	13.000* (4.1399)	-19.25127*** (10.91486)	75.39902** (32.40154)
GDP per capita	.0659807*** (.0347776)	-.3407** (.17732)	1.055292*** (.1164163)	-.071177 (.0685767)
GDP growth rate	4.358108 (3.637229)	2.130 (2.863)	14.00557* (7.121411)	1.768147 (14.13191)
EXPORT	.0978292* (.0034972)	0.9065 (0.9574)	.1124209* (.0054923)	.0537202* (.0076166)
OPENNESS	1.284246 (2.724288)	5.589* (2.032)	24.44623* (4.422762)	-6.604445 (7.891289)
Human capital	-5.847924*** (3.379638)	13.199 (16.693)	-25.54616* (5.733512)	7.916262 (12.58745)
logTEL	-104.6687 (143.5553)	-13.69 (60.336)	12.75985 (262.6719)	-1737.15* (662.1325)
Labor force	46.28706 ** (20.32268)	-0.372 (0.3772)	127.9174** (52.69996)	111.5942 (108.399)
Inflation	-.0522053** (.026)	0.491** (0.2125)	-.9203164* (.128131)	7.457971 (10.53521)
Exchange rate	.0326769 (.1195133)	0.274 (0.4989)	.1132894 (.0959948)	-3.027428** (1.478532)
Mineral	.4972405 (1.018392)	-9.33e-08** (4.17e-08)	2.182128 (1.34793)	1.477646 (2.928632)
R-sq: within	0.5561	0.4311	0.8251	0.4738
between	0.5174	0.052	0.5964	0.5915
overall	0.5272	0.2779	0.7193	0.3893
No. of Obs	998	363	343	189

Note *p<0.01 ** p<0.05 ***p<0.1 standard errors are reported in brackets.

4.2.1. All countries

The result of the first regression on 47 countries shows that FDI inflow to Africa increases by 12.08 million dollars per year. GDP per capita, export and labor force growth rate are also reported to attract FDI with a one unit increase in GDP per capita and exports increasing the mean of FDI inflow by 0.659 and 0.098 units respectively while an increase by percentage point of labor force growth rate has an effect of increasing mean FDI inflow by 46.28 units. A correlation of 0.7015 is also observed between the FDI inflow and export variables. A change of one percentage point in inflation is shown to have an effect of reducing FDI inflow by 0.052 units while human capital have unexpected negative effect. GDP growth rate, trade openness, exchange rates and the minerals share of exports are not found to be relevant variables. The changes in FDI inflow are to be interpreted as in million dollars.

4.2.2. Low Income countries

The regression in this group includes 19 countries and time dummies were also used. The regression shows results that are theoretically unexpected for all variables except trade openness and the trend component. While the time trend of FDI inflow and the effect of openness to trade are positive and both significant at 1% level, the effects of GDP per capita and exports share of mineral and oil turn out to be negative. The effect of inflation is also positive in this case while the other variables do not have any significant effect on FDI. The model explains 43 percentage points of the variation within FDI inflow and only 27.79 percent of the overall variation. Therefore, significant part of the within as well as overall variation in FDI inflow left unexplained in the case of Low Income countries.

4.2.3. Lower Middle Income

The Lower Middle Income group consists of six of the ten highest FDI recipients in the continent and there is a negative trend of FDI inflow per year. The estimations for this group also show that GDP per capita, GDP growth rate, export, trade openness, human capital, labor force growth rate and inflation are found to be significant in explaining the variations in FDI inflow, with the time trend and GDP per capita significant at 10%, labor force at 5% while growth rate, exports and openness to trade at 1% significance level. The export share of minerals and the infrastructure variable are insignificant while human capital have a significant negative effect. The regression result shows that more than 82 percent of the variation from the mean FDI inflow in this group of countries is explained by the model.

4.2.4. Upper Middle Income

The regression in this group is estimated on eight of the ten Upper Middle Income countries and the results for this groups show the highest rate of increase in FDI inflow per year. While export, telephone lines per thousand people and exchange rate are significant determinants of FDI inflow, export is the only variable with the theoretically expected promoting effect. FDI inflow decreases with

1737 units for a one percentage point increase in the number of telephone lines per thousand people. The effect of increasing exchange rates i.e. depreciation of local currencies is also deterring. None of the other variables which represent market size and growth, openness to trade, natural resources and growth of human capital and labor force are found to have any significant effect on FDI inflow.

4.3. Analysis

The ownership, localization and internalization framework of Dunning, which is the theoretical background of this study claims that firms with ownership advantages would prefer to engage in foreign production and internalize the market transaction if there are sufficient location specific advantages. Dunning also classifies the types of foreign direct investment as market seeking (domestic, adjacent or regional markets), resources (natural, physical or human resources), efficiency seeking and strategic asset seeking) based on the motives of involvement (Faeth, 2008).

Therefore, the determinants of FDI considered in the regression model can be classified as:

- Actual and potential market size
(GDP per capita and GDP growth rate)
- Availability of resources
(Labor force, human capital and natural resources)
- Favorable economic situations
(Inflation rates, exchange rates, openness to trade and the availability of good infrastructure)
- Exports

The significance of the market size variables would imply the involvement of foreign investors with a purpose of serving local markets and the significance of Export variable will give an implication that foreign firms involve with the purpose of making use of cheap local resources and export to foreign countries. Therefore, the other variables which represent the availability of resources and favorable economic conditions can have implications in both market seeking and export oriented FDI.

4.3.1. Market size

The estimation result shows that increase in GDP per capita promotes FDI inflow in the case of All African countries combined and the group of Lower Middle Income countries. This complies with the theoretical argument for higher GDP per capita as better prospects for FDI in terms of market size as well as favorable economic situations (Asiedu, 2004). Studies by Asiedu (2006) on the determinants of FDI in 22 African countries and by Cheng and Kwan (2000) on 29 Chinese regions have also found out the promoting effect of large markets on FDI. The growth rate of GDP, which represents potential markets size, is also highly significant in the case of Lower Middle Income group. The study by Demirhan and Musca (2008) on 38 developing countries has concluded the positive effect of growth rate.

The effect of GDP per capita is found to be negative in the group of Low Income countries and positive but statistically insignificant in the Upper Middle Income group. The observed negative relationship between the GDP per capita and FDI inflow can be unexpected since theories argue the attracting effect of large markets which are represented by higher income levels. However, Asiedu (2006) argues that a positive relationship between the two is valid in the case of market seeking FDI and therefore negative effect of GDP per capita can possibly imply that foreign investment to the Low Income countries is attracted more by the high rate of return on capital than market size. However, the effect of interest rates is not considered in the study and there is no evidence to conclude that rate of return on capital explains FDI inflow to the low income countries. Besides, given that the overall variation in FDI explained by the model is quite low in the case of this group of countries, it should be concluded that FDI inflow to Low Income countries could be better explained with the inclusion of variables such as real interest rate.

4.3.2. Exports

In the case of all countries combined as well as in the Lower Middle Income and Upper Middle Income countries, FDI inflow is shown to have increased with higher exports. While the marginal effect of a unit increase in Export earnings in the Lower Middle Income group is the highest, it is significant at 5% significance level in all the three cases. Several previous studies have concluded that countries with more exports attract more FDI and the study by Singh and Jun (1995) should be mentioned. Their study on the determinants of FDI to developing countries state that export orientation is the strongest variable explaining why a country can get more FDI inflow. In the Low Income group, no effect of export on FDI is observed from the estimation.

In addition to the export variable, looking into the effects of human capital, labor force growth rate and the availability of natural resources can be helpful in the discussion of whether FDI inflows are export oriented or not.

4.3.3. Availability of Resources

The study considers the availability of human resources in terms of human capital and labor force growth rate and natural resources in terms of the share of minerals and oil in total exports.

Accordingly, labor force growth rate is found to have a significant positive effect in all countries combined and in the Lower Middle Income group while its effect is insignificant in the Low Income and Upper Middle Income groups. Labor force growth rate represents the availability of labor and cheap labor cost, and according to Dunning (1988) it is important in attracting labor-intensive and efficiency seeking FDI. It is also mentioned in the study by Noorbakhsh, Paloni and Youssef (2001) that the availability of cheap labor matters in low-technology activities such as production of low-end garments.

The negative effects of human capital in the case of all countries and Lower Middle Income countries is also theoretically unexpected as the importance of increased local skills is argued by many

studies to attract FDI especially in high value added industries. The study by Noorbakhsh et al. (2001) can be mentioned. Therefore, the negative coefficient of human capital can be a result of limitations of the data.

Resource based exports may include agriculture, minerals and natural oil. In this study, the mineral and oil share of total exports is found to have an adverse effect on FDI in Low Income group while the effect on the other groups is not statistically significant. This one is also different than theoretical expectations and many empirical evidences. The availability of natural resources is widely considered to be the major source of attraction to developing countries. The same proxy for the availability of resources was used by Asiedu's study (2006) on 22 African countries and it proved to have a positive effect on FDI.

However, it should be noted that the effect of availability of natural resources on resource based and non-resource based investors requires further studies; and the negative effect of resources found in this study can be supported by empirical studies. A research by Poelhekke and van der Ploeg (2010) using a sector level data proved that the availability of subsoil assets have a positive effect on resource based FDI and negative effect on non-resource based FDI-and the overall effect on FDI is negative especially in countries that are geographically closer to large markets. Sachs and Warner (1997) have also argued for the adverse effects of natural resource availability on economic growth rates on the basis of Dutch diseases i.e. the incompetence of manufacturing sector, volatility of world price of natural resources and its effect of making it risky to engage in other sectors of resource abundant economy as well as the inevitability of higher corruption, inefficient bureaucracy and the distraction of governments from investing in productive sectors such as infrastructure and better institutions. Even though Sachs and Warner discussed these as deterring effects on growth, their effect on FDI inflow to non resources sector is understandable.

The availability of natural resources such as oil and minerals which are exportable by themselves and not used as raw materials for production of other exportable items can possibly affect FDI inflow through its effect of increasing GDP per capita and exports in addition to attracting FDI to mining and exploration sector. Therefore the export share of minerals and fuel may not be sufficient to explain the effect of natural resources and further studies require classifying exports and FDI inflows in two categories i.e. resources based and non resources based. The effect of natural resources that can be used as raw materials for exportable goods should also be considered separately.

4.3.4. Favorable Economic Environment

Openness to trade have shown a promoting effect on FDI in the case of Low Income and Lower Middle Income countries while the effect is insignificant in Upper Middle Income group and in the case of all countries combined. The positive response to more openness is supported by other studies such as Asiedu (2006), Singh and Jun (1995), Demirhan and Musca (2008), and Campos and Kinoshita (2003). However, the attracting effect of openness cannot tell whether FDI is market seeking or export oriented because basically any type of FDI would depend on importing and exporting. While both market seeking and export targeting investors would find it important to import

machineries and equipments, the export targeting investors would also consider the ease of exporting their products. Therefore openness to trade is desirable irrespective of the motive of investors and low ratio is believed to imply high restrictions.

Low Inflation and less volatile exchange rates are considered as indicators of good economic policies and consequently less risky environment for investors. Studies also examined the implications of exchange rate levels in addition to their volatility. Bloningen (1997) and Froot and Stein (1991) argued that higher exchange rates/depreciation of local currencies attract foreign investment. According to Bloningen, depreciations encourage acquisition of domestic firms by foreign investors. Despite this theoretically expected positive relationship between FDI inflow and exchange rates, the positive coefficient of exchange rate did turn out to be insignificant in all countries combined, in Low Income and Lower Middle Income groups while the relationship in Upper Middle Income group was found to be negative.

The effect of inflation on the other hand was negative in the case of all countries combined and in Lower Middle Income Countries and this complies with the theoretical expectations. However, unexpected positive effect of inflation on Low Income group and statistically insignificant effect in the Upper Middle Income group was also observed. Even though the effect of rates of inflation on FDI is estimated and discussed in many papers which use aggregate data of FDI, there are also studies which suggested the important implications of differentiating between vertical and horizontal FDI. According to Sayek (2009), the effects of domestic inflation have both qualitative and quantitative difference in the case of vertical and horizontal FDI. Domestic rates of Inflation are reported to have more quantitative effect on vertical FDI. Therefore using aggregate data to study the link between inflation and FDI would give biased estimates and mixed results across countries.

The positive impact of availability of good infrastructure on FDI inflows is also supported by several empirical studies. In this study, infrastructure is represented by number of telephone lines per 1000 people (in logarithms) and the estimation results show that availability of telephone lines does not have any significant effect on FDI inflows to Africa in total, to Low Income Countries and Lower Middle Income Countries, while it is found to have a negative effect in the case of Upper Middle Income countries. With the poor state of basic infrastructure in many African countries, an improvement in infrastructure would be expected to encourage more FDI inflow. However, the negative role of infrastructure in the Upper Middle Income group can possibly show an interest towards infrastructure development sector by foreign investors. If we consider that the countries in the Upper Middle Income group have the highest economic level in the continent in terms of per capita GDP, it can be inferred that the infrastructure in these countries is well developed that an improvement in infrastructure may not have a significant positive marginal effect on FDI inflow. ODI (1997) mentions that poor infrastructure in the areas of telecommunication and airlines in some countries can be perceived by investors as opportunities provided that those sectors are open for foreign investors while lack of basic infrastructure in the form of roads will be more of an indication to low return and high cost of investment than an opportunity.

The study shows that both local market size and export competitiveness attract FDI inflow to Africa as a whole and to the Lower Middle Income countries. Labor force growth rate have also shown a positive effect in these two groups. The inflow to Upper Middle Income group is determined

by exports only. The availability of good infrastructure, human capital and natural resources were found to have negative effect on some cases and insignificant effect on other cases. While the irrelevance of human capital and infrastructure can be expected, the findings about the effects of natural resources and the negative effects of human capital are unexpected. Such outcomes can possibly be due to the limitations of the data or omitted variable bias. The difference in the significance of different factors across the groups can also partly be due to the economic differences and consequently different targets of investors while the limitations of the data and failure to include variables that can be particularly relevant to each group might be the other reasons.

5. CONCLUSION

This study investigated the determinants of foreign direct investment inflow to African countries and the analysis is based on 47 countries all together as well as in three income groups over the period 1985-2009. Export is found to be the strongest determinant of FDI in all countries together, in Lower Middle Income group and Upper Middle Income group while market size and labor force growth rate are also reported to have a significant positive effect in all countries together and in the Lower Middle Income countries. In the low income group, the only significant variable with the theoretically expected effect is openness to trade.

The rate of inflation is also reported to have a negative role in the case of all countries and in the lower middle income group while its effect is positive in low income countries and insignificant in the upper middle income group. The availability of natural resources, human capital, infrastructure and exchange rates has shown results that are at odds with theories and empirical evidences.

This study could not include some widely studied determinants of FDI such as interest rates, wage, tariffs and taxes as well as political risk variables due to the unavailability of sufficient data for analysis. Besides, there was difficulty in finding complete data on all variables and unbalanced panel data is utilized. Therefore, the results of the regression analysis cannot be argued to be free of problems related with omitted variable bias.

A study on the determinants of FDI inflow is of an enormous interest specifically to least developed and developing countries that are in continuous effort to attract more FDI inflow. Therefore it will be important to mention possible topics that can be explored by studies of determinants of FDI inflow. Given the fact that several countries in Africa particularly the low income countries are mostly characterized by unstable economies with poor economic policies and political instabilities being among the main factors, a suggested approach to research on this area for these countries would be to take these unique pre-existing conditions as well as economic policy variables such as government expenditure, budget deficit, money supply, inflation, interest rates and political risk variables. The effect of natural resources also requires further investigation through separately considering FDI inflows and exports towards and from resource based and non resource based sectors. The effects of regional trade blocs and increase in the intra-continental trade on FDI inflow can also be indicated as areas open for future research.

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Appendices

A. Countries

<i>Low income</i>	<i>Lower middle income</i>	<i>Upper middle income</i>
Chad	Morocco	Algeria
Central African Republic	Egypt, Arab Rep.	Botswana
Kenya	Swaziland	Equatorial Guinea
Burundi	Djibouti	Gabon
Burkina Faso	Sudan	Libya
Benin	Côte d'Ivoire	Mauritius
Guinea-Bissau	Mauritania	Namibia
Guinea	Congo, Rep.	Seychelles
Tanzania	Cape Verde	South Africa
Togo	Senegal	Tunisia
Madagascar	Lesotho	
Uganda	Cameroon	
Malawi		
Gambia, The	São Tomé And Príncipe	
Niger	Angola	
Zimbabwe	Ghana	
Congo, Dem. Rep	Nigeria	
Eritrea	Zambia	
Mozambique		
Mali		
Ethiopia		

B. Regression results

All countries

```
. xtreg fdi t gdppc gdpgr exports openness hc logtel laborforce inflation exchangerate mineralandoilexports, fe
```

```
Fixed-effects (within) regression      Number of obs   =      998
Group variable: country1              Number of groups =       47

R-sq:  within = 0.5561                Obs per group:  min =       5
      between = 0.5174                  avg =            21.2
      overall  = 0.5272                  max =            25

corr(u_i, Xb) = -0.3282                F(11,940)       =    107.06
                                          Prob > F        =     0.0000
```

fdi	Coef.	Std. Err.	t	P> t	[95% Conf. Interval]	
t	12.08149	6.107124	1.98	0.048	.0963141	24.06666
gdppc	.0659807	.0347776	1.90	0.058	-.0022701	.1342315
gdpgr	4.358108	3.637229	1.20	0.231	-2.779921	11.49614
exports	.0978292	.0034972	27.97	0.000	.0909659	.1046925
openness	1.284246	2.724288	0.47	0.637	-4.062143	6.630636
hc	-5.847924	3.379638	-1.73	0.084	-12.48043	.7845847
logtel	-104.6687	143.5553	-0.73	0.466	-386.3947	177.0573
laborforce	46.28706	20.32268	2.28	0.023	6.403983	86.17013
inflation	-.0522053	.026	-2.01	0.045	-.1032301	-.0011806
exchangerate	.0326769	.1195133	0.27	0.785	-.2018668	.2672206
mineraland-s	.4972405	1.018392	0.49	0.625	-1.501344	2.495825
_cons	-24319.87	12115.97	-2.01	0.045	-48097.35	-542.3886
sigma_u	573.40444					
sigma_e	611.04397					
rho	.46825396	(fraction of variance due to u_i)				

```
F test that all u_i=0:      F(46, 940) =    12.15      Prob > F = 0.0000
```

Lower middle income countries

```
. xtreg fdi t gdppc gdpgr export openness hc logtel laborforce inflation exrate mineralandoilexport, fe
```

```
Fixed-effects (within) regression      Number of obs   =      343
Group variable: country1              Number of groups =       16

R-sq:  within = 0.8251                obs per group:  min =       9
      between = 0.5964                  avg =            21.4
      overall  = 0.7193                  max =            25

corr(u_i, Xb) = -0.0752                F(11,316)       =    135.55
                                          Prob > F        =     0.0000
```

fdi	Coef.	Std. Err.	t	P> t	[95% Conf. Interval]	
t	-19.25127	10.91486	-1.76	0.079	-40.72625	2.223704
gdppc	1.055292	.1164163	9.06	0.000	.8262431	1.284341
gdpgr	14.00557	7.121411	1.97	0.050	-.0057992	28.01694
export	.1124209	.0054923	20.47	0.000	.1016147	.123227
openness	24.44623	4.422762	5.53	0.000	15.74445	33.14801
hc	-25.54616	5.733512	-4.46	0.000	-36.82684	-14.26548
logtel	12.75985	262.6719	0.05	0.961	-504.0469	529.5666
laborforce	127.9174	52.69996	2.43	0.016	24.23027	231.6046
inflation	-.9203164	.128131	-7.18	0.000	-1.172414	-.6682188
exrate	.1132894	.0959948	1.18	0.239	-.0755804	.3021591
mineraland-t	2.182128	1.34793	1.62	0.106	-.4699243	4.83418
_cons	36977.82	21706.01	1.70	0.089	-5728.744	79684.39
sigma_u	722.98347					
sigma_e	566.51975					
rho	.61957597	(fraction of variance due to u_i)				

```
F test that all u_i=0:      F(15, 316) =    18.42      Prob > F = 0.0000
```

Low income countries

. xtreg fdi t gdppc gdppr export openness inflation exchangerate hc logtel laborforcegr mineralandoil exports i.year, fe
 note: 2009.year omitted because of collinearity

```
Fixed-effects (within) regression      Number of obs   =   363
Group variable: country1              Number of groups =   19

R-sq:  within = 0.4311                 Obs per group:  min =    5
      between = 0.0522                    avg   =   19.1
      overall  = 0.2779                    max   =   25

corr(u_i, xb) = -0.4453                F(34,310)      =    6.91
                                          Prob > F       =   0.0000
```

fdi	Coef.	Std. Err.	t	P> t	[95% Conf. Interval]	
t	13.00256	4.139918	3.14	0.002	4.856671	21.14846
gdppc	-.3407402	.1773208	-1.92	0.056	-.6896447	.0081642
gdppr	2.137972	2.863366	0.75	0.456	-3.496118	7.772062
export	.9065975	.9574999	0.95	0.344	-.9774233	2.790618
openness	5.589295	2.032595	2.75	0.006	1.589867	9.588723
inflation	.0491917	.0212547	2.31	0.021	.00737	.0910134
exchangerate	.2743785	.4989456	0.55	0.583	-.7073698	1.256127
hc	-13.19936	16.69366	-0.79	0.430	-46.04656	19.64785
logtel	-13.69409	60.33587	-0.23	0.821	-132.4137	105.0256
laborforcegr	-.0372129	.0377281	-0.99	0.325	-.1114485	.0370226
mineraland~s	-9.33e-08	4.17e-08	-2.24	0.026	-1.75e-07	-1.12e-08
year						
1986	5.900566	64.71418	0.09	0.927	-121.434	133.2352
1987	5.283845	64.20105	0.08	0.934	-121.0411	131.6088
1988	-27.53665	62.93778	-0.44	0.662	-151.3759	96.30261
1989	-21.34992	61.52294	-0.35	0.729	-142.4053	99.70544
1990	-41.67589	61.06534	-0.68	0.495	-161.8309	78.47908
1991	-70.98997	59.84176	-1.19	0.236	-188.7374	46.75743
1992	-76.71663	62.91711	-1.22	0.224	-200.5152	47.08198
1993	-100.1343	62.35826	-1.61	0.109	-222.8332	22.5647
1994	-147.1253	64.10461	-2.30	0.022	-273.2605	-20.99012
1995	-128.9724	62.37978	-2.07	0.040	-251.7137	-6.231069
1996	-158.6627	60.46646	-2.62	0.009	-277.6393	-39.68614
1997	-134.0965	61.93243	-2.17	0.031	-255.9576	-12.23541
1998	-134.8502	63.92795	-2.11	0.036	-260.6378	-9.062645
1999	-141.2814	66.53361	-2.12	0.035	-272.1959	-10.36677
2000	-130.2938	68.20417	-1.91	0.057	-264.4955	3.907863
2001	-120.0463	68.47604	-1.75	0.081	-254.7829	14.69025
2002	-98.09889	69.87113	-1.40	0.161	-235.5805	39.38275
2003	-98.65736	69.75852	-1.41	0.158	-235.9174	38.60271
2004	-132.6054	70.26249	-1.89	0.060	-270.8571	5.646277
2005	-187.3302	69.08221	-2.71	0.007	-323.2596	-51.40088
2006	-136.716	70.83629	-1.93	0.055	-276.0967	2.664749
2007	140.7594	71.4862	1.97	0.050	.0998222	281.4189
2008	138.9765	73.82712	1.88	0.061	-6.289106	284.2421
2009	(omitted)					
_cons	-25785.23	8209.777	-3.14	0.002	-41939.16	-9631.296
sigma_u	144.07303					
sigma_e	160.30169					
rho	.44683313	(fraction of variance due to u_i)				

F test that all u_i=0: F(18, 310) = 4.28 Prob > F = 0.0000

Upper middle income countries

```
. xtreg fdi t gdppc gdpggr export openness hc logtel laborforce inflation exchangerate mineralandoiexports, fe
```

```
Fixed-effects (within) regression
Group variable: country1
Number of obs   =   189
Number of groups =    8
R-sq:  within = 0.4738
      between = 0.5915
      overall  = 0.3893
Obs per group: min =    21
              avg  =   23.6
              max  =    25
corr(u_i, xb) = -0.8115
F(11,170)      =   13.92
Prob > F       =   0.0000
```

	Coef.	Std. Err.	t	P> t	[95% Conf. Interval]	
fdi						
t	75.39902	32.40154	2.33	0.021	11.43785	139.3602
gdppc	-.071177	.0685767	-1.04	0.301	-.2065486	.0641946
gdpggr	1.768147	14.13191	0.13	0.901	-26.12849	29.66478
export	.0537202	.0076166	7.05	0.000	.0386848	.0687555
openness	-6.604445	7.891289	-0.84	0.404	-22.18198	8.973091
hc	7.916262	12.58745	0.63	0.530	-16.93157	32.76409
logtel	-1737.15	662.1325	-2.62	0.009	-3044.21	-430.0889
laborforce	111.5942	108.399	1.03	0.305	-102.3872	325.5756
inflation	7.457971	10.53521	0.71	0.480	-13.33872	28.25466
exchangerate	-3.027428	1.478532	-2.05	0.042	-5.946074	-.1087815
mineraland~s	1.477646	2.928632	0.50	0.615	-4.303522	7.258815
_cons	-149334.6	63619.82	-2.35	0.020	-274921.2	-23748.04
sigma_u	1056.9634					
sigma_e	784.00728					
rho	.64507822	(fraction of variance due to u_i)				

```
F test that all u_i=0: F(7, 170) = 2.27 Prob > F = 0.0313
```

C. correlation matrices

All countries

	fdi	gdppc	gdpggr	exports	openness	hc	logtel	laborf~e	inflat~n	exchan~e	minera~s
fdi	1.0000										
gdppc	0.1322	1.0000									
gdpggr	0.1130	0.0076	1.0000								
exports	0.7015	0.3011	0.0234	1.0000							
openness	0.1030	0.3532	0.2305	0.0111	1.0000						
hc	0.1634	0.5259	0.0021	0.4848	0.2384	1.0000					
logtel	0.1157	0.7086	0.0463	0.3325	0.4067	0.7423	1.0000				
laborforce	-0.0177	-0.2188	0.0152	0.0163	-0.2035	0.0553	-0.1406	1.0000			
inflation	-0.0114	-0.0350	-0.0573	-0.0137	-0.0154	-0.0308	-0.0808	0.0200	1.0000		
exchangerate	-0.0770	-0.2206	0.0209	-0.1560	-0.0984	-0.2519	-0.2910	0.0484	-0.0352	1.0000	
mineraland~s	0.1781	0.0722	-0.0787	0.3173	-0.0932	0.2131	0.1433	0.1411	-0.0275	0.0533	1.0000

Low income

	fdi	gdppc	gdpggr	export	openness	inflat~n	exchan~e	hc	logtel	laborf~r	minera~s
fdi	1.0000										
gdppc	0.0400	1.0000									
gdpggr	0.1854	0.5616	1.0000								
export	-0.0629	0.1256	-0.2062	1.0000							
openness	0.1461	0.0888	-0.1698	0.6442	1.0000						
inflation	0.4269	0.4551	0.6762	-0.1583	-0.0400	1.0000					
exchangerate	-0.0332	0.1190	-0.1710	0.9595	0.6499	-0.1192	1.0000				
hc	-0.0539	0.1722	-0.1520	0.9877	0.6257	-0.1180	0.9606	1.0000			
logtel	0.0476	-0.0141	0.2460	-0.5426	-0.3058	0.1619	-0.5222	-0.5156	1.0000		
laborforcegr	-0.0458	-0.0703	0.0424	-0.0251	-0.2177	0.0388	-0.0318	-0.0311	0.0343	1.0000	
mineraland~s	0.1957	0.1991	0.2012	-0.0814	-0.0667	0.4378	-0.0396	-0.0870	0.0569	0.1043	1.0000

Lower middle income

	fdi	gdppc	gdpg	export	openness	hc	logtel	laborf~e	inflat~n	exrate	minera~t
fdi	1.0000										
gdppc	0.4607	1.0000									
gdpg	0.2347	0.1357	1.0000								
export	0.8359	0.3444	0.1705	1.0000							
openness	0.0614	0.1970	0.0646	-0.0571	1.0000						
hc	-0.0108	0.4587	0.0584	0.1166	0.1149	1.0000					
logtel	-0.0260	0.5074	0.1030	0.0413	0.2121	0.6613	1.0000				
laborforce	-0.0240	0.1020	-0.1095	-0.1074	-0.1022	-0.0394	-0.0791	1.0000			
inflation	-0.0084	-0.0782	0.1101	-0.0103	0.0995	-0.1470	-0.1225	0.0250	1.0000		
exrate	-0.0888	-0.1685	-0.0903	-0.1006	-0.0633	-0.1993	-0.0910	-0.0263	-0.0508	1.0000	
mineraland~t	0.1804	-0.1512	-0.1391	0.2843	-0.2316	0.0260	-0.0351	-0.0232	-0.0288	0.2575	1.0000

Upper middle income

	fdi	gdppc	gdpg	export	openness	hc	logtel	laborf~e	inflat~n	exchan~e	minera~s
fdi	1.0000										
gdppc	-0.0241	1.0000									
gdpg	0.0165	-0.0896	1.0000								
export	0.7341	-0.0805	-0.0531	1.0000							
openness	-0.1462	0.3419	0.2753	-0.3889	1.0000						
hc	0.3659	-0.1763	-0.0639	0.5443	-0.4838	1.0000					
logtel	0.1509	0.4707	0.0216	0.1338	0.3315	0.1926	1.0000				
laborforce	0.0063	-0.4786	-0.1541	0.1900	-0.6922	0.4312	-0.6073	1.0000			
inflation	-0.0227	-0.1862	-0.0323	0.0022	0.0566	-0.0372	-0.1222	0.2303	1.0000		
exchangerate	-0.1264	0.0796	-0.1906	-0.1487	-0.0560	-0.1805	-0.4201	0.0837	-0.1531	1.0000	
mineraland~s	0.0787	-0.1116	-0.1992	0.2835	-0.4999	0.2906	-0.2690	0.4810	0.0106	0.2893	1.0000