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Data Analysis**

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Foreign aid and Foreign direct investment in Sub-Saharan Africa: A panel data analysis

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Abstract

Funding constraints experienced by Sub-Saharan African (SSA) countries has led to reliance on foreign direct investment (FDI) and foreign aid as alternative sources of finance. Despite the importance of FDI for growth, SSA has failed to attract an increasing share of global FDI and at the same time faces volatile aid flows. This study examines the role of foreign aid in enhancing FDI inflows to 31 SSA countries for the period 1995 to 2012. Using panel data estimation techniques, the results suggest that productive infrastructure aid is complementary to FDI inflows and socio-economic infrastructure aid has no significant impact on FDI inflows. When resource (oil) motive of FDI is considered, the results indicate that productive and socio-economic infrastructure aid to oil-producing SSA countries results in less FDI inflows compared to non-oil producing SSA countries. Finally, the significance of sectoral aid analysis is highlighted by the finding of a complementary role of energy infrastructure aid to FDI inflows and an insignificant impact of transport infrastructure aid.

Classification-JEL: F35, F 21

Keywords: Foreign aid, foreign direct investment, Sub-Saharan Africa

1 Introduction

"Official development assistance (ODA) plays an essential role as a complement to other sources of financing for development, especially in those countries with the least capacity to attract private direct investment. We recognize that a substantial increase in ODA and other resources will be required if developing countries are to achieve the internationally agreed development goals and objectives, including those contained in the Millennium Declaration" (Monterrey Consensus, March 2002).

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Significant resource constraints has meant increased reliance on external sources of funding such as foreign direct investment (FDI) and foreign aid (ODA) for many Sub-Saharan Africa (SSA) countries. Since 1970, SSA has received over 0.43 trillion and 1.071 trillion USD in FDI and ODA respectively. FDI provides resource constrained countries with an important source of funding for development purposes and is stated to transfer superior technology and management skills, stimulate investment and growth, generate efficiency spill-overs, enhance job creation and assist in infrastructure development. Foreign aid, especially development assistance has provided funding for socio-economic development in the region, with varied success. Despite these importances, SSA consistently fails to attract an increased share of global FDI. Asiedu (2002) explains that between 1980 and 1998 while FDI to Europe, Central Asia, East Asia and Pacific, South Asia and Latin America grew by 5,200 percent, 942 percent, 740 percent and 455 percent respectively while FDI to SSA grew by only 59 percent. At the same time, global financial and economic instabilities as experienced in the recent 2007/2008 period has negatively impacted on donors ability to continue providing development aid to SSA to the same degree as before the crisis.

The continued lagging behind in FDI inflows coupled with volatility in aid flows means that SSA faces increasing pressures to access innovative means of generating much needed resources, crucial for the region's development. FDI is considered to be a more stable financial flow, compared to foreign aid and over the years means of attracting much needed FDI to SSA became a topical issue in development studies and in the last few years, the linkages between FDI and foreign aid has become significant in the discus. Why would foreign aid be important for FDI inflows? Generally foreign aid to developing countries is provided on the basis of improving infrastructure, human capital development, improving governance and fostering macroeconomic stability, all of which if present, are suggested to be incentives for FDI inflows. Theoretically, the link between aid and FDI can be observed in (i) the vanguard effect, in which a donor nation also undertakes FDI in the recipient nation(ii) the infrastructure effect, in which aid directed to infrastructure projects and human capital development lead to improved domestic conditions and thus attract FDI inflows, (iii) the Dutch disease effect in which foreign aid increases the supply of tradable goods while decreasing the price of non-tradable goods, hence reducing FDI inflows and (iv) a financing effect in which foreign aid enables the recipient country to finance outflows (as a result of improved balance of payment) of profit repatriation from FDI (Anyanwu, 2012).

This study is significant for a few reasons. First, to the extent that the relationship between foreign aid and FDI has been examined only in a few studies and provides ambiguous results, the examination of this nexus will contribute to the scarce literature. Second, the existing literature focuses on developing countries in Asia and Latin America[41], thus, this study re-visits the nexus and provides a focused analysis of the FDI-foreign aid nexus for SSA countries. This permits recommendations tailored to these countries to be made. Third, with the consideration of different aid modalities; productive, socio-economic, energy and transport infrastructure aid, the study adds to the literature on the impor-

tance of disaggregated aid in examining the effectiveness of foreign aid. Fourth, the argument is made that FDI to SSA is predominantly resource seeking and therefore the motive of FDI needs to be considered in the aid-FDI nexus. Thus the study extends the literature by testing the hypothesis that the impact of foreign aid on FDI will differ between resource (oil) endowed SSA countries and non-resource (non-oil) endowed SSA countries.

The rest of the study is structured as follows. The nature of foreign direct investment and foreign aid to Sub Saharan Africa is discussed in section 2. A brief review of previous studies on the FDI-foreign aid nexus for Africa as a whole and SSA as a region is provided in section 3. Methodology and data is explained in section 4. Section 5 provides a discussion of the estimation results and section 6 concludes the study.

2 Overview of foreign direct investment and foreign aid to SSA

2.1 Foreign direct investment to SSA countries

The vast resources on the continent have been the largest driver of FDI inflows to many African countries. A significant amount of FDI to SSA has been purposed for resource rich countries. For example, in 2013, FDI to resource-rich SSA countries accounted for 95 percent of the increase in FDI to Africa in that year. Countries like Nigeria, South Africa, Angola and Mozambique, who combined account for almost three quarters of Africa's commodities export received almost three quarters of the inflows to Africa between 2001 and 2007 (UNCTAD World Investment Directory, 2008; African Economic Outlook, 2014).

In recent years, other non-traditional resource countries like Ethiopia, Ghana, Kenya, Uganda and Mauritania have also experienced an increase in FDI due not only to the increase in exploration FDI in natural resources but also due to an expanding middle class and changes in consumer behaviour propelled by higher purchasing power (African Economic Outlook, 2014) especially since the 2000s. The share of FDI inflows in the GDP of non-resource rich SSA countries was 4.5 percent in 2013, which was twice the level in 2000 (IMF, 2013b).

Despite the gains, SSA's share of global FDI inflow remains lower than other regions (see figure 1), due in part to four factors, (i) structural obstacles in the Africa's manufacturing sector which resulted in a decline in manufacturing flows (ii) high production costs in the value chain process in production of diamonds in Botswana, South Africa and Namibia (iii) high labour costs in the textile and apparel industries in countries like South Africa, causing an inability to meet competition from cheaper countries like China and (iv) Investors preference to countries that enhanced labour productivity and skill of workers in the manufacturing sector (UNCTAD World Investment Directory, 2008).

Regional observation of FDI inflows reveals that as a share of total world FDI, West Africa is the highest recipient of FDI, followed by Southern Africa, North Africa and East Africa respectively (see figure 2). West Africa's FDI

inflow is mainly in the mining and oil sectors with Nigeria accounting for over 34 percent of the FDI inflows into the region. Chinese interest in the agriculture sectors of some West African countries has also contributed to boosting the region's FDI inflows. Between 1981 and 2008, Chinese investment in the region's agriculture sector had increased from 0.1 percent to 27.5 percent (Nehad, 2012). Higher FDI flows are attracted by the region's growing population, abundance of natural resources and rising economic growth which combine to offer opportunities for businesses and states. FDI to the region increased from 9 billion dollars in 2000 to 62 billion dollars by 2012 (Nehad, 2012). According to Anyanwu (2011) civil conflict as well as governance challenges have been the two main factors that have contributed to East Africa's limited ability to attract higher FDI inflows.

2.2 Foreign Aid to Africa and SubSaharan Africa

In the last three decades, SSA has accounted for a large proportion of the ODA disbursed to developing countries, as the region has consistently received more than 30 percent of the total ODA disbursed. From table 1, on average, of the total ODA disbursements to the developing world, SSA accounted for over 28 percent between the periods 1980 and 2013. As a proportion of total ODA disbursed to the African continent, SSA received above of 77 percent between 1980 and 2013.

Observation of OECD-DAC total foreign aid disbursement to developing regions between 1995 and 2012 shows that the foreign aid/GNI ratio is highest for Africa compared to other regions. From figure 3, between 1995 and 2012 Africa's ODA/GNI ratio peaked at 4.5 percent compared to a high of 1 percent in Europe and the America's and 0.6 percent in Asia.

The distribution of foreign aid between 1980 and 2013 indicates that the largest amount of foreign aid has been disbursed to West Africa (33 billion US Dollars) followed by East Africa (29.8 billion US Dollars) and Southern Africa (26.2 billion US Dollars) (see figure 4). In terms of the sectoral distribution of foreign aid disbursements, amongst African countries, the largest sectors in terms of disbursement of ODA over the last five years have on average been the social, economic and the services sectors respectively (see figure 5).

3 Literature review

3.1 The determinants of foreign direct investment in Africa and SSA

The eclectic paradigm theory of FDI developed by Dunning (1977, 1979, and 1993) combined the internalization and trade theories and is perhaps the most encompassing explanation of the determinants of FDI as it incorporates the locational, ownership and internalization (OLI) advantages of MNE's investing in a foreign country. According to Dunning, a firm's decision to invest in a host

nation depends on the firm's ability to acquire specific assets not available to the host country firms. The OLI framework provides the base for numerous empirical FDI models, in which many authors test the ownership, locational and internalization factors of FDI determinants.

Factors that are examined within the OLI framework include the level of economic development of the host country, the degree of openness of the host nation, the level of infrastructure development, macroeconomic stability, the market size, governance and institutional quality and in the case of SSA countries and resource consideration. The determinants of FDI have been assessed for regions as a whole as well as for individual countries. Onyeiwu and Shrestha (2004) for 29 African countries, Krugell (2005) for 17 African countries, Sichei and Kinyondo (2012) for 45 African countries for the period 1980-200; Anyanwu (2011) for the period 1980-2007, all examine the drivers of FDI for Africa as a whole. Their findings reveal the significance of market size, trade openness, macro-economic stability, infrastructure development and political stability as drivers of FDI inflows.

Examinations of the determinants of FDI inflows to SSA as a region also provide similar findings on the drivers of FDI inflows. Asiedu (2002) and Zeng et. al. (2001) make the argument that the determinants of FDI inflows in SSA countries differ fundamentally from other regions and those policies that have proven successful in other regions may not be as successful in SSA. The study finds that indeed the drivers of FDI differ between SSA and other regions. Specifically, while infrastructure development and higher capital return drive FDI in non-SSA countries, these factors have no significant impact on FDI in SSA. In addition, Asiedu (2004) finds market size, infrastructure, quality of education of the labour force, macroeconomic and political stability to all influence FDI inflows to the region. Suliman and Mollick (2009) for 29 SSA countries find that literacy rate, political and civil rights and the incidence of war are fundamental in FDI decisions of firms. Bhattacharya, Montiel and Sharma (1997) also found that for 15 SSA countries in the period 1980-1995, market size, trade openness and the variability of the real exchange rate were significant in attracting FDI inflows.

Resource endowment as a motive for FDI has also been assessed in a number of studies; however, the results are ambiguous. For example, Asiedu (2002; Onyeiwu and Shrestha (2004) find that natural resource endowed SSA countries receive more extractive FDI, however Asiedu (2013) contradicts this finding and suggests that natural resource curse in oil-rich SSA countries magnifies political instability and corruption and thus dissuades increased FDI inflows.

Observations of individual country analysis of the drivers of FDI also highlight many of the same drivers as SSA and Africa large studies. Mahembe and Odhiambo (2013) examine the drivers of FDI in 5 Southern Africa Development Committee (SADC) countries and point out political instability, policy uncertainty, poor infrastructure and difficulty in doing business as constraints to FDI inflows. In oil rich Nigeria, Wafure and Nurudeen (2010), Nurudeen, Wafure and Anta (2012) find that market size (proxied by GDP), deregulation, exchange rate, political regime, infrastructure development and trade openness

were significant in the determination of firms FDI. For the other major resource rich economy in the regio; South-Africa, Fedderke and Romm (2006) indicate the importance of market size, openness and political stability in enhancing FDI inflows, while high corporate tax crowds out FDI inflows to the country.

Single country analysis on the determinants of FDI in non-resource rich SSA countries also unearths similar drivers as with the regional studies. For example, Nyamwange (2009) and Abala (2014) find that FDI into Kenya is attracted by market size, trade openness, macro-economic stability, good infrastructure and political stability. Malefane (2007) shows that for Lesotho, whose economy is highly dependent on its neighbour, South-Africa's economy, real exchange rate, macro-economic stability, political stability and south-Afric's market size determined FDI inflows into the country.

3.2 The nexus between FDI and foreign aid

The transmission channels between foreign aid and FDI include the vanguard effect, buffer effect, and infrastructure and rent seeking effect. According to Kimura and Todo (2010) foreign aid promotes FDI inflows from the same aid donors to the recipient nation because the provision of foreign aid send signals on the recipient's business environment to the donor country firms thus making it easy for donor firms to invest. Additionally, if aid is provided on a governmental level, this sends the signal of reduced risk to donor country investors/firms. The buffer effect (response of aid to volatile FDI inflows) is investigated by Carro and Larru (2010) and they find that foreign aid acts a buffer against volatile FDI in Brazil, implying that the allocation of foreign aid by donors is driven in part by considerations of periods of low FDI inflows into the country. The infrastructure and rent seeking effect of foreign aid on FDI is isolated by Harms and Lutz (2006), who suggest that the infrastructure effect is positive through improved recipient country infrastructure which all tie in to raising the marginal productivity of capital and encouraging FDI inflows. The rent seeking effect is negative due to the actions of private firms in competing for aid rents may result in a decline in the marginal product of capital of the recipient, causing a decline in FDI inflows.

Bhavan et al. (2011) argue that foreign aid for human capital and infrastructure development enables improvements in not only physical infrastructure but also enables increased knowledge, allows for improved production methods and output and in turn encourages investors in the improved markets. They found foreign aid for human capital and infrastructure development to be complementary to FDI inflows, while there was no evidence of a crowding out effect of foreign aid for physical capital on FDI inflows. Karakaplan et al. (2005) examined the nexus in a panel of 97 countries between 1960 and 2004 and found that foreign aid increases FDI inflows when good governance and a high level of financial development exist in the recipient nation. In their examination of the nexus in 99 developing countries between 1970 and 2001, Selaya and Sunesen (2012) concluded that foreign aid invested in physical capital accumulation crowds out FDI and foreign aid invested in complementary inputs (human cap-

ital infrastructure aid) complements FDI.

The OLI framework for FDI enabled the empirical testing of numerous factors of the determinants of FDI and has yielded findings of the above factors and more as determinants of FDI inflows. In the consideration of the determinants of FDI however, very few have considered the impact of foreign aid on FDI inflows. This study, thus aims to examine the nexus between foreign aid and FDI within the OLI framework.

4 Methodology

4.1 The Empirical Model

The model is specified in the general form as follows:

$$fdi_{it} = \beta_0 + \beta_1 prod - aid_{it} + \beta_2 sec - aid_{it} + \beta_3 inf l_{it} + \beta_4 pop_{it} + \beta_5 tel_{it} + \beta_6 trade_{it} + \beta_7 gi_{it} + \beta_8 oil_{it} + \varepsilon_{it} \quad (1)$$

Where FDI_{it} = net FDI inflows into recipient country as a proportion of GDP

$PROD$ = Total productive infrastructure aid

SEC = Total socio-economic infrastructure aid

$INFL_{it}$ = Inflation rate

POP_{it} = Total population

TEL_{it} = Mobile and fixed line subscribers per 100 people

$TRADE_{it}$ = The sum of exports and imports as a percentage of GDP

GI_{it} = governance index

OIL_{it} = oil endowment

The literature on the determinants of FDI informs the variables included in the model. FDI inflows is the dependent variable, socio-economic infrastructure (SEC) aid (education and health aid, energy, transport and communication) and productive sector infrastructure (PROD) aid (agriculture and forestry, industry, mining and construction and tourism) are included as the two proxies of foreign aid.

Macroeconomic stability is one of the criteria's of foreign investment, thus inflation rate (INFL) is included as proxy. High inflation increases acts as a disinvestment to FDI. The expectation is that the coefficient will be negative.

Telephone per 100 people (TEL) is used as a proxy for the level of infrastructure development. The role of a good infrastructure network is emphasized in the FDI literature as one of the factors that incentivize investors. A good transport network helps reduce transport costs thus lowering production costs. According to Campos and Kinoshita (2003), regardless of the type of FDI, good infrastructure is necessary for investors to operate efficaciously. There coefficient of infrastructure is expected to be positive.

Total population is included to proxy the recipient country size. According to the literature, one of the biggest incentives for FDI in developing countries is the abundant and cheap labor. Non-market seeking FDI especially is attracted by

abundant labor which is utilized for building subsidiary production and assembly plants as well as to invest in the development of natural resources (Yasin, 2005). The expectation is that as population increases, FDI inflows increase.

In order to examine the role of governance in attracting FDI inflows, a governance index (GI) created by averaging the six governance indicators obtained from the World Bank, is included. The governance indicator[42] (WGI) variable is expected to have a positive impact on FDI inflows.

Significant FDI inflows to SSA countries is namely in oil, gas and minerals. Increased demand for oil by Western and Asian countries has in part driven MNC activities in the region. According to Anyanwu (2012) the inclusion of natural resource endowment in FDI examinations is unique to African countries. In the consideration of resource endowment, this study focuses on oil resource endowment[43] which is proxied by oil reserves, oil production and an oil dummy (where 1= oil endowed country; 0= non-oil endowed country).

Lastly, TRADE which is a measure of trade openness is included. An open economy allows for easier movement of goods and resources which is attractive to foreign investors. The assumption is made that the more open an economy the higher the FDI it can attract. The degree of openness is important given the motive of the investment.

4.2 Data

This study employs data on 31 SSA countries[44] for the period 1995-2012 (T=18, N=31). The data on productive and socio-economic infrastructure aid[45] is obtained from the Credit Reporting System (CRS) of the Organization of Economic Cooperation and Development (OECD/DAC) online database[46]. OECD-CRS reports annual commitment and disbursement figures (in USD millions at constant and current prices) from 1995 and 2002 respectively. The limited period is due to the restricted coverage of these activities by the donors. The short time series implies that in order to be able to assess long term impact of sectoral aid, the best option is to use commitment figures. This raises its own challenges because commitment figures in most cases tend to overestimate the aid flows to recipients. Dreher et al. (2008) make the argument that the measurement issue of foreign aid cannot be resolved, but conclude however that provided the correlation between disbursements and commitments is high, one can use commitment data instead. Data on the other independent variables are obtained from World Bank's World Development Indicators (WDI) online database. Data on oil reserves and oil production are obtained from the British petroleum (BP) statistical Review of World energy (2014) workbook.

4.3 Estimation Technique

Panel data analysis allows for the control of variables that are unobservable or immeasurable. A series of initial diagnostic tests are performed on the data series in order to inform the model specifications.

The assumption that countries are homogenous results in the omitted variable bias and the potential differences between countries introduces the issue of heterogeneity which needs to be addressed in the estimation technique using the fixed and random effects models. The fixed effects model assumes that the unobservable factors or country specific factors captured in the error term are correlated with the regressors, while the random effects model assumes that the unobservable variables are not correlated with the regressors. The Hausman test for the validity of fixed or random effects is carried out. The results indicate heterogeneity of the panels, given by the test statistics ($\text{Pr} > \chi^2 = 0.000$), signifying that the fixed effects model is the more appropriate model.

Macroeconomic variables tend to include elements of persistence and FDI is no exception. Investors generally invest in countries in which they have a history of investments. Thus the lagged FDI is included to capture persistence in FDI flows. In addition there is potential endogeneity of the aid variable which arises if aid donors provide more aid to countries that receive less foreign investment (Harms and Lutz, 2006). According to Hansen and Tarp (2001) the effect of endogeneity of aid flows can cause estimates from aid regressions to be biased. Fixed and random effects models address the heterogeneity of panels, however they ignore the potential for endogeneity. The endogeneity problem is thus addressed with the use of dynamic panel estimation technique suggested by Arrelano and Bond (1991). The difference GMM estimator suggested by Arellano and Bond (1991) uses lagged levels of first differences as instruments which according to Arellano and Bover (1995) are for the most part poor instruments. The system GMM estimation technique is suggested as a better estimation technique by Arellano and Bover (1995) and again by Arellano and Bond (1998) since it is more efficient in estimating a dynamic panel model, provides consistent estimates and, efficiently deals with the issue of endogeneity.

The system GMM addresses the issue of endogeneity, however, widely acknowledged in panel data literature is the substantial cross sectional dependence (CSD) in the errors exhibited in panel models. Cross sectional dependence can arise from increased economic and financial integration of countries. It is important therefore to test for cross sectional dependence in the panel especially in short panel data models in which $T < N$. If the unobserved factors that cause the cross sectional dependence are correlated with the regressors, the Fixed effect (FE) and Random effect (RE) estimators will be biased and inconsistent and therefore other estimation techniques such as instrumental variables (IV) and GMM can be used. However, in short panel-data models, if there is cross sectional dependence in the disturbances, then estimates from IV and GMM become inconsistent. The size and dimensions of the panel determines the test to be used. In cases where $T < N$, the Breusch- Pagan Lagrange multiplier (LM) test for CSD will produce significant distortions; instead, three suggested tests, Pesaran (2004) CD test, Friedman's (1937) test and Frees (1995) tests are used to test for cross sectional dependence (De Hoyos and Sarafidis, 2006). The test for cross-sectional independence is carried out using the Pesaran CD test¹ and

¹ According to the literature, the Pesaran CD test is the most appropriate test when $N > T$,

the test statistic of 1.175 evidences no cross sectional dependence between the panels.

5 Econometric Analysis and Discussion of Results

The analysis begins with a summary of the descriptive statistics of the variables used in the estimation. The results are displayed in table 2 The correlation matrix in table 3 shows that FDI is positively and significantly correlated with trade openness (TRADE) and negatively and significantly correlated with the infrastructure variable (TEL). The correlation between FDI and productive and socioeconomic sector aid and inflation is positive but insignificant and the correlation between FDI and the governance and population variables is negative but not significant. There are also significant correlations between the explanatory variables. Productive sector aid is positively correlated with socio-economic aid and population and negatively correlated with telephone infrastructure, population, governance and trade openness. A significant negative correlation is observed between socio-economic aid and four of the explanatory variables.

Table 4 provides the results from the estimation of equation three (1) using the fixed effect (FE), random effect (RE), the systems-GMM techniques. The systems-GMM result in column 5 of table 4 is explained in detail here as it addresses the issue of endogeneity. Additionally, the model includes the square aid term in order to capture the non-linearity of foreign aid (Selaya and Sunesen, 2012; Bhavan et al. 2011).

The coefficients of the control variables are significant with the exception of socio-economic aid and the square aid term. The general finding from the estimation is the importance of trade openness, population, governance, telephone infrastructure and inflation as drivers of FDI to the 31 SSA countries. Poor infrastructure development and inflation hinder FDI inflows, while trade openness and population size enhance FDI inflows. The positive and significant impact of lagged FDI on FDI inflows highlights the existence of an agglomeration effect of FDI inflows. Barrell and Pain (1997); Agionmirgiannakis et al. (2006) find similar results in the importance of prior FDI experiences in attracting increased FDI. Turning to the variables of interest productive sector aid is positively and significantly related to FDI inflows and socio-economic sector aid has no significant impact on FDI inflows Similar findings regarding the latter effect is observed by Bhavan et al. (2011) who find a positive impact of physical capital aid on FDI. The results suggest that productive infrastructure aid is complementary to FDI inflows. There is no evidence of a crowding out effect of foreign aid on FDI as found in Selaya and Sunesen (2012)[47].

The non-linearity of foreign aid arises according to the Solow growth model because aid as a complementary factor shifts the production function and thus raises the steady state levels of income and domestic savings (Acemoglu, 2008).

thus only the Pesaran statistic is reported here.

The sign of the coefficient of the squared aid term is contrary to expectation and is insignificant

5.1 Motive of FDI: Resource Endowment

Most studies have either looked at the impact of oil endowments on aid received or the impact of oil endowment on FDI. For the most part, the former studies report a positive but insignificant impact (Lee, 2012) and the findings on the later are ambiguous (Anyanwu, 2012; Asiedu 2013). To understand the interaction of foreign aid and FDI when resource motive is factored in, two interaction variables, interacting the oil endowment variable with both productive infrastructure aid and socio-economic infrastructure aid are created. The results are provided in table 5 From table 5, oil producing SSA countries that receive both productive and socio-economic infrastructure aid receive less FDI than non-oil producing SSA countries[48] The result of the effect of aid on FDI in resource endowed versus non-resource endowed countries is interesting due to the fact that while FDI to the top 10 recipients has been in natural resources, there is no evidence that aid to oil endowed countries boosts FDI inflows. A potential explanation of the result is that oil discoveries project the idea that the nation is richer and thus by extension diminishes the need for increased resources such as FDI regardless of the aid inflows. In addition, given the fact that a significant proportion of FDI inflows goes to oil producing SSA countries[49], it is worth noting that the oil producing SSA countries and indeed the countries in the region are characterized by poor institutional quality and high levels of corruption. In fact Asiedu (2013) showed that the average corruption index for the 8 oil exporting SSA countries between 2000 and 2009 was higher than the average for non-oil exporting SSA countries. The implication is that oil exporting SSA countries appear to suffer from a natural resource curse when it comes to attracting FDI and the level of corruption is deterring enough to investors in the non-extractive sectors of these economies.

5.2 Disaggregated Economic Aid

A number of authors have argued that the use of total foreign aid figures in aid effectiveness studies does not provide a comprehensive picture of the impact of the aid. They suggest that the aid modality must be factored into such examinations. The lack of robust findings on the socio-economic aid variable suggests there is a need for further detailed examination of the impact of socio-economic aid on FDI inflows. Given that economic infrastructure aid has potentially the most direct impact on FDI, the impact of economic infrastructure in the form of transport infrastructure and energy infrastructure aid on FDI inflows is examined[50]. The regression result for transport and energy aid is presented in tables 6 and 7[51]

The regression results from disaggregating economic aid into transport and energy infrastructure aid indicates the significance of energy aid in increasing FDI inflows to SSA countries, while the impact of transport infrastructure aid

is insignificant. Foreign aid targeted at improving SSA's energy infrastructure is complementary to FDI flows. Similar findings overall have been reported by Harms and Lutz (2006), who suggest that the overall infrastructure effect of foreign aid on FDI is positive [52] and the effect is through improved recipient country infrastructure in the form of better roads, improved energy infrastructure amongst other factors, which all tie in to raising the marginal productivity of capital and encouraging FDI inflows.

6 Summary and Conclusions

This study examined the nexus between foreign aid and foreign direct investment (FDI) in a panel of 31 SSA countries between 1995 and 2012. Using panel data estimation techniques and disaggregating foreign aid into productive and socio-economic infrastructure aid, the study finds evidence of the enhancing impact of productive infrastructure aid on FDI inflows in the 31 countries. Additionally, socio-economic infrastructure aid has no significant impact on FDI inflows. The result points to the importance of the consideration of aid modality in foreign aid effectiveness studies. The results from the empirical analysis have important policy implications for SSA countries. To the extent that many SSA countries still experience financial or resource constraints, foreign aid can enhance the inflows of FDI. This is important if the benefits of FDI as well as the fact that it is a less risky and more stable source of much needed funds are considered. Secondly, the finding of the significance of productive sector aid suggests that foreign aid directed at productive activities such as agriculture, fishing, mining and construction represents an injection of funds into avenues of the economy of many SSA countries that are in themselves the growth inducing sectors of their economies. Therefore channeling aid into these sectors should enable or foster the conditions necessary to attract FDI.

The importance of disaggregating aid along the modality lines is further highlighted by the results obtained from estimating the impact of transport and energy infrastructure aid on FDI inflows. Although total socio-economic infrastructure aid has no impact on FDI inflows, examination of its components sheds a different light. Energy infrastructure aid enhances FDI to the region while transport infrastructure aid has no impact on FDI inflows. This suggests that the significance of economic aid should to be considered by policy makers, especially energy infrastructure aid given that over two thirds of SSA countries are affected by power crisis and about 40.8 billion USD per annum is needed in Africa's power sector to close the gap between infrastructure needs and available financial resources (Muzenda, 2009). Foreign aid can help reduce the capacity and skills constraints inherent in the energy sector and thus attract increased FDI.

Lastly, given that significant FDI inflows to SSA countries is to the natural resource sectors, namely in oil, gas and minerals, therefore the study goes a step further than previous studies on foreign aid and FDI and asks whether the complementarity or substitutive impact of aid on FDI differs between countries that

are resource (oil) endowed and non-resource endowed (non-oil endowed). The findings suggest that oil endowed SSA countries receive less FDI when both productive and socio-economic infrastructure aid is provided to them. Furthermore, it implies that oil rich SSA countries must look at diversifying their economies away from the single dominant extractive industry in order to promote FDI beyond the extractive sectors and thus enhance the amount of FDI inflows they receive.

The debate in the aid literature that aggregate analysis of the impact of aid may be misleading is magnified by the findings in this and other similar studies (Selaya and Sunesen, 2012; Bhavan et al. 2011) in which on a disaggregated level foreign aid has the potential to enhance growth through its interactions with other forms of assistance such as FDI. Clearly, the type of aid matters and the impact of the aid differs based on the recipient. Further, it is important to note that the over dependence of some SSA countries on foreign aid is not a sustainable means to achieving long term growth, therefore, the beneficial links between the foreign aid that is provided and FDI must be explored and exploited by policy makers in SSA countries.

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- [42] Other proxies of governance provided by the freedom house only consider two aspects of governance (civil liberty and political stability) and therefore might exclude other factors that affect governance in SSA which is covered by the WGI. The WGI comprises of 6 broad dimensions of governance namely corruption, rule of law, regulatory quality, government effectiveness, political stability and voice and accountability. The governance scores range from -2.5 to 2.5 representing weak and good governance respectively.
- [43] The focus on oil endowment is informed by the fact that oil endowed countries account for a significant proportion of FDI to the region. In 2014 for example, over 40 percent of FDI to SSA was to the extractive sectors in oil rich nations.
- [44] The countries included in the study are Angola, Benin, Botswana, Burkina Faso, Cameroon, chad, DRC, ivory Coast, Ethiopia, Gabon, Ghana, Guinea, Kenya, Lesotho, Madagascar, Malawi, Mali, Mauritius, Mozambique, Namibia, Niger, Nigeria, Rwanda, Senegal, Sierra Leone, South Africa, Swaziland, Tanzania, Togo, Uganda and Zambia.

- [45] Productive sector aid is composed of aid directed to agriculture, forestry, fishing, industry mining, construction, trade, banking and tourism. Socio-economic infrastructure aid consists of aid directed at social infrastructure such as education, health, water supply and economic infrastructure such as energy, transportation and communication.
- [46] Commitment figures are reported from 1995 to 2012, while disbursement figures are reported from 2002 to 2010.
- [47] Robustness checks results for the energy and transport regressions are available in appendix 2(a) and 2(b).
- [48] Similar estimation results are found when oil reserves and oil dummy is used as proxy for oil resource. The coefficients are negative although insignificant.
- [49] According to Asiedu (2012) in 2009 for example, 43 percent of FDI inflows to SSA countries went to the top 4 oil exporters in the region, while 49 percent went to the remaining 43 SSA countries.
- [50] Exchange rate is included as proxy for macro-economic stability and per capita GDP is included to proxy market size.
- [51] Due to data availability, 23 and 25 countries were included in the energy and transport regression respectively.
- [52] The results obtained here though contrary to Harms and Lutz (2006) who find energy aid to be negatively related to FDI and transport aid to positively impact FDI inflows, still meet with their overall findings of a positive impact of infrastructure aid on FDI inflows.

Table 1: Percentage of total ODA flows to Developing Nations. 1980-2013

Years	Region						Africa and SSA		
	Europe	Africa	America	Asia	Oceania	Unspecified	Africa% of total ODA	SSA% of total ODA	SSA% of ODA to Africa
1980-1989	1.80	36.71	8.99	36.90	3.40	12.18	36.71	28.58	77.84
1990-1999	4.36	38.96	10.27	30.60	3.11	12.70	38.96	30.06	77.15
2000-2013	5.29	36.54	7.73	30.57	1.47	18.41	36.54	32.04	87.68

Source: OECD-CRS Online database

Table 2: Descriptive statistics

Variable	Mean	STD. Dev	Min	Max
FDI-GDP	3.70	5.15	-8.58	46.49
PROD	77.13	56.40	0.035	647.05
SEC	516.92	539.88	4.26	3637.26
TRADE	74.72	35.13	25.04	209.87
INFL	23.35	187.70	-9.61	4145.10
TEL	2.43	5.03	0	31.50
POP	2.11e+07	2.74e+07	984506	1.69e+08
GI	-0.535	0.583	-2.22	0866

Table 3: Correlation Matrix

	FDI	PROD_AI D	SEC_AID	INFL	TRADE	TEL	POP	GI
FDI	1							
PROD	0.002	1						
SEC	0.015	0.736***	1					
TRADE	0.315***	-0.365***	-0.394***	1				
INFL	0.009	-0.046	-0.009	0.075*	1			
TEL	-0.095**	-0.235***	-0.303***	0.487***	-0.009**	1		
POP	-0.036	0.547***	-0.516***	-0.516***	0.046	-0.495***	1	
GI	-0.035	-0.02	-0.150***	0.248***	-0.153***	0.735***	-0.433***	1

* ** *** indicates significance at 10%, 5%, and 1% level of significance

Table 4: Panel estimation regression results

Variable	FE	RE	SYS-GMM(1)	SYS-GMM(2)
PROD-Aid	0.515**	0.31	0.30***	0.29***
SEC-Aid	-0.22	0.16	0.002	-0.41
AID-SQUARED	-	-	-	0.35
TRADE	8.96***	7.72***	6.25***	5.49***
INFLATION	-0.01*	-0.001***	-0.046***	-1.42***
TELEPHONE	-2.89***	-1.84***	-1.37***	-1.02***
POPULATION	4.48**	0.24	-1.64***	-1.42***
GOVERNANCE	-1.15	1.43*	0.13	-2.14***
FDI _{t-1}	-	-	0.57***	0.55***
F-Test	Pr>F=0.000	-	-	-
Wald Test	-		Pr> χ^2 =(0.000)	Pr> χ^2 =(0.000)
		Pr> χ^2 =(0.000)		
Arrellano-Bond Test	-	-	Pr> Z=(0.23)	Pr> Z=(0.25)
Sargan Test	-	-	Pr> χ^2 =(1.000)	Pr> χ^2 =(1.000)
Number of observations	526	526	495	495

The asterix * ** *** indicates 10%, 5% and 1% level of significance

Table 5: Interaction of foreign aid and resource endowment

Variable	FE		SYS-GMM	
PROD-Aid	0.80***	0.73***	0.38***	0.31***
SEC-Aid	0.03	0.28	0.19	-0.12
TRADE	8.23***	7.41***	6.74***	6.67***
INFLATION	-0.001	-0.002**	-0.004***	-0.004***
TELEPHONE	-2.81***	-2.60***	-1.12***	-1.36***
POPULATION	4.47*	5.40**	-1.77***	-1.58***
GOVERNANCE	-1.65	-1.18	-0.09	0.88
PROD-AID*OIL PRODUCTION	-0.007***		-0.0008***	-
SEC-AID*OIL PRODUCTION	-	-0.001***	-	-0.0004***
FDI _{t-1}	-	-	0.52***	0.52***
F-Test	Pr>F=0.000	Pr>F=0.000		
Wald Test	-	-	Pr> χ^2 =(0.000)	Pr> χ^2 =(0.000)
Arrellano-Bond Test	-	-	Pr> Z=(0.23)	Pr> Z=(0.24)
Sargan Test	-	-	Pr> χ^2 =(1.000)	Pr> χ^2 =(1.000)
Number of observations	526	526	495	495

The asterix * ** *** indicates 10%, 5% and 1% level of significance

Table 6: Transport aid regressions

Variable	FE	RE	SYS-GMM(1)	SYS-GMM(2)
TRANSPORT Aid	-0.096	-0.096	-0.022	-0.047
TRADE	12.39***	8.933***	11.93***	10.57***
EXCHANGE RATE	0.039	0.025	-2.17***	-2.66***
TELEPHONE	-1.15*	-1.205**	-2.00*	-2.871**
GDPC	-8.40***	-1.398**	-4.14**	-4.304*
GOVERNANCE	2.915*	1.659*	7.68***	11.36***
FDI _{t-1}			0.391***	0.443***
Aid ²				-0.002
F-Test	Pr>F=0.000			
Wald Test		Pr> χ^2 =(0.000)	Pr> χ^2 =(0.000)	Pr> χ^2 =(0.000)
Arrellano-Bond Test			Pr> Z=(0.26)	Pr> Z=(0.34)
Sargan Test			Pr> χ^2 =(1.000)	Pr> χ^2 =(1.000)
Number of observations	424	424	399	399

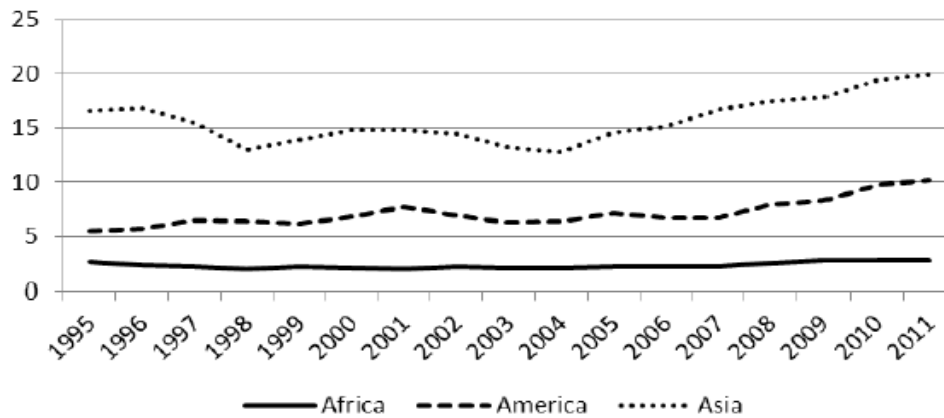
The asterix * ** *** indicates 10%, 5% and 1% level of significance

Table 7: Energy aid regressions

Variable	FE	RE	SYS-GMM(1)	SYS-GMM(2)
ENERGY Aid	0.264***	0.216**	0.092***	0.141***
TRADE	8.220***	7.05***	6.365***	4.87***
EXCHANGE RATE	-0.149	-0.210	-3.282***	-3.73***
TELEPHONE	-0.942	-0.83**	0.584	1.63
GDP	-2.786	-0.772	-4.15**	-5.02***
GOVERNANCE	-1.63	0.247	2.70	1.29
FDI _{t-1}			0.352***	0.337***
Aid ²				-0.036***
F-Test	Pr>F=0.000			
Wald Test		Pr> χ^2 =(0.000)	Pr> χ^2 =(0.000)	Pr> χ^2 =(0.000)
Arrellano-Bond Test			Pr> Z=(0.25)	Pr> Z=(0.22)
Sargan Test			Pr> χ^2 =(1.000)	Pr> χ^2 =(1.000)
Number of observations	389	389	367	367

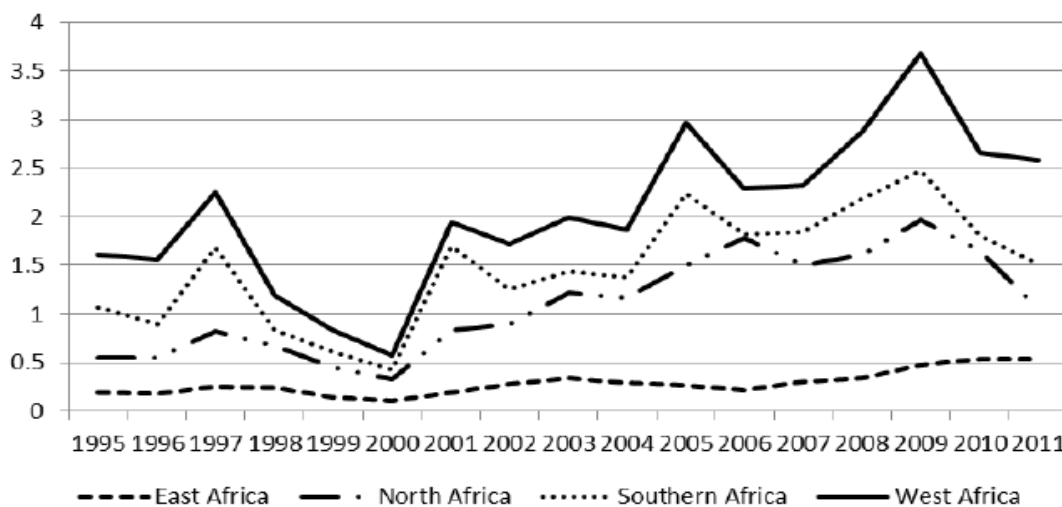
The asterix * ** *** indicates 10% 5% and 1% level of significance

Figure 1: FDI inflows to Developing countries as a proportion of total World FDI. 1995-2012



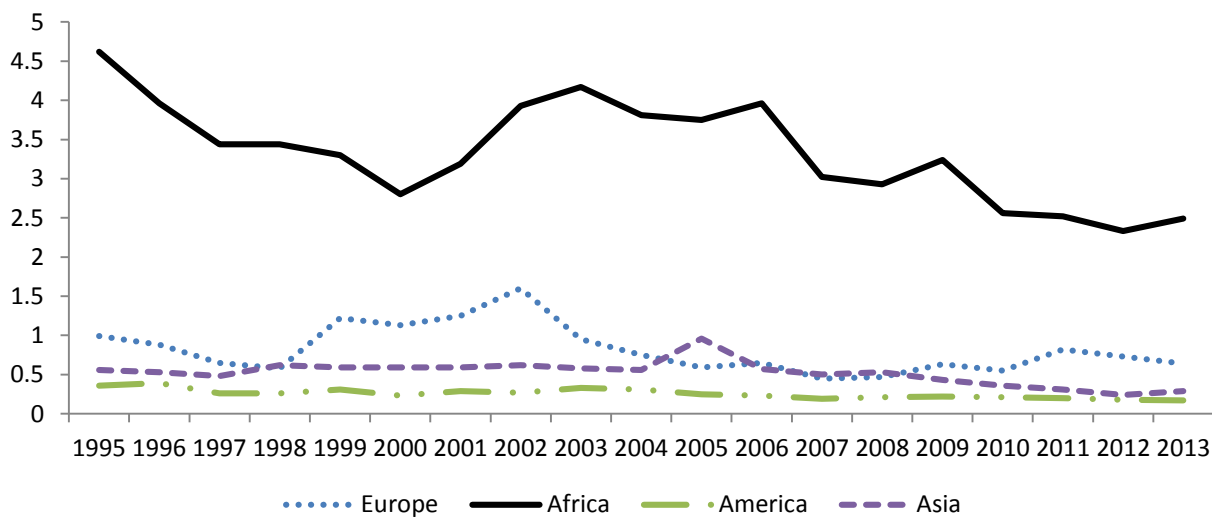
Source: UNCTAD World Investment Report (2013).

Figure 2: Regional comparison of FDI inflows to Africa as a percentage of World FDI. 1995-2012



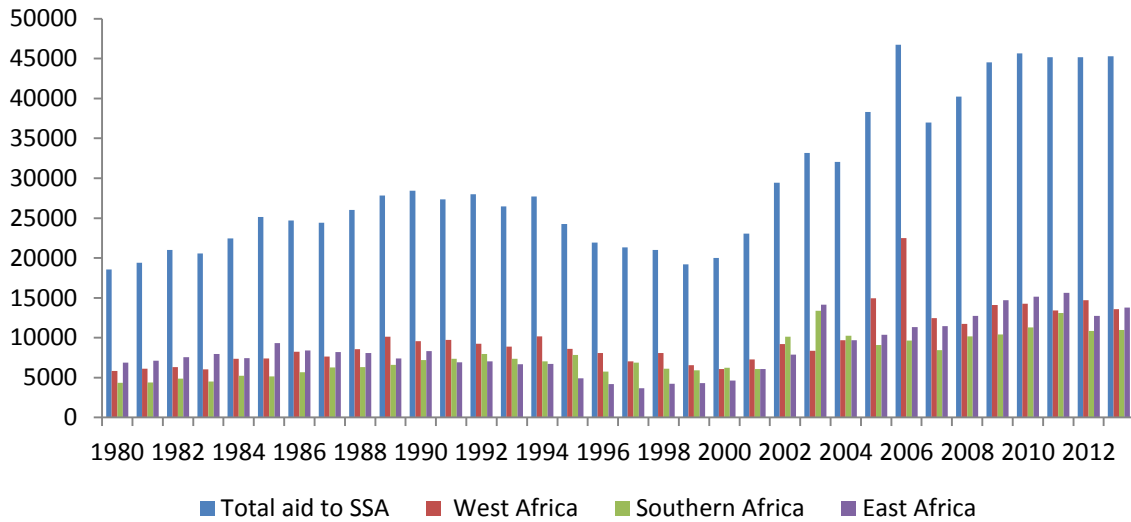
Source: UNCTAD World Investment Report (2013).

Figure 3: ODA as a percentage of recipients GNI, 1995-2013



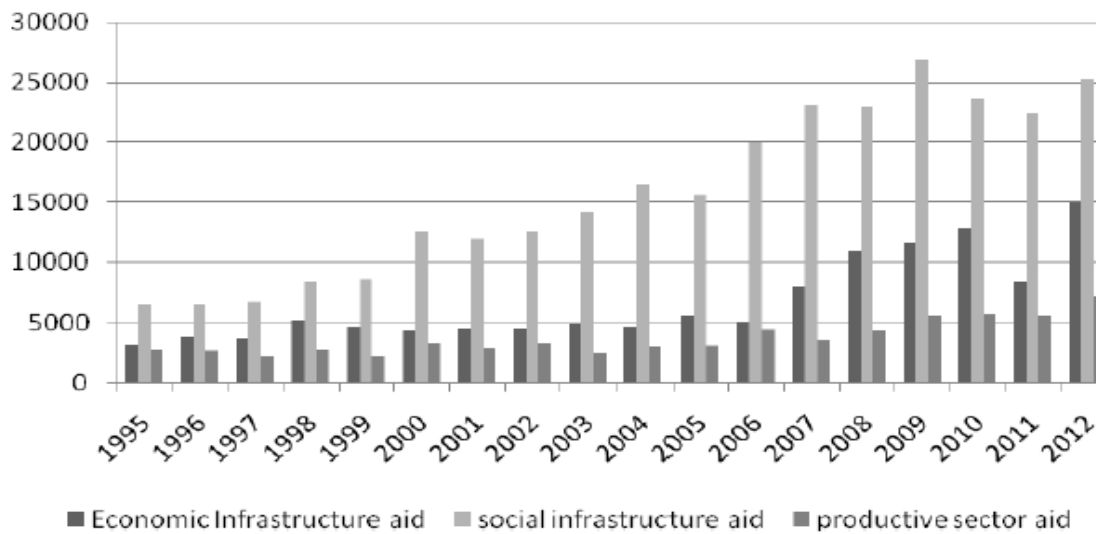
Source: OECD-CRS, Online database.

Figure 4: Geographical distribution of ODA in SSA. Million US dollars, 1980-2013



Source: Author's calculations from OECD-CRS online database

Figure 5: Sectoral allocation of foreign aid to Africa, (millions of US dollars), 1995-2012



Source: Author's calculation from OECD-CRS online database