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The Role of Exports, FDI and Imports in Development: New Evidence from Sub-Saharan African Countries

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The Role of Exports, FDI and Imports in Development: New Evidence from Sub-Saharan African Countries

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Abstract

The disappointing economic performance of Sub-Saharan African (SSA) economies in the late 1980s prompted economic-wide policy reforms in the early 1990s. The primary objectives of these institutional and structural changes were to promote trade and export activities, enhance foreign direct investment (FDI) inflows, and ease foreign access to SSA markets particularly for large multinational enterprises associated with more advanced technologies and better managerial and organizational practice. This study focuses on the effect of exports, FDI and imports on economic growth in SSA, using the new autoregressive distributed lag (ARDL) approach and Pedroni estimation procedure which also allows for heterogeneity across individual countries. It is found that exports and FDI have significant impact on economic growth. Granger-type causality tests show the interrelatedness of exports, FDI, imports and income variables. The results also provide some evidence of existence of a two-stage causal chain of exports, imports and income. The paper calls for more market-oriented policy changes in SSA countries to create a liberal environment for foreign trade and FDI.

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1. Introduction

For most African countries, a disappointing history of poor economic performance started in the late 1970s. From the late 1960s to the mid 1970s, the moderate growth of SSA (Sub-Saharan African) economies was mainly inspired by booms in commodity prices, increased foreign aid and a higher growth rate in agricultural production. A combination of factors, including adverse external development, distorted trade policies, serious policy errors and structural and institutional bottlenecks, contributed to deterioration in economic performance in the late 1970s and early 1980s (UNCTAD, 2001).[1] These bottlenecks and poorly designed macroeconomic policies discouraged trade and impeded foreign direct investment (FDI) flows into the region (Rodrik, 1998). The protectionist trade policies and poor governance-conditioned stagnation in turn fuelled a downward spiral. Eventually, the persistent slowdown in economic growth and a failure to achieve significant improvement in the standard of living triggered policy changes in many African countries from the mid 1980s. By the late 1980s, major policy reforms and market-friendly incentives were initiated in many African countries so as to encourage the accumulation of capital and more efficient allocation of resources. As part of the structural adjustment program, financial systems (markets) were restructured in most of the countries, with a major emphasis on trade liberalization and reduction or removal of barriers to trade.[2] In addition, there has been a significant change in the stance of development policy with import-substitution being replaced by an outward-oriented strategy and export-led growth.

The impacts of these reform measures have so far been limited for the region as a whole (Ahmed, 2005; Nissanke and Aryeetey, 1998) and more efforts towards commitment to reforms in SSA economies is required. The savings rates in these countries have remained low and GDP growth rates have shown little improvement. There has been even development across countries in terms of trade liberalization and adoption of an export led growth strategy. In order to attain long-term sustained economic growth, these economic reforms should include policy measures that attract more domestic and international capital.

In this regard two major outward looking strategies are necessary. The first string of strategies is to increase Africa's participation in world markets and enhance its international competitiveness by further advocating international trade, which allows African exporters to capitalize on opportunities in foreign markets (Yeats et al., 1997). Elaborating on this point, Yeats et al. (1997) notes that since the 1950s, trade in SSA countries has grown at relatively low rates so that the region's share of world trade now only stands at about one per cent compared to three in the mid 1950s. This fundamental structural problem of the marginalization of Africa's trade growth is largely explained by government-imposed trade barriers that have generally been higher in the continent compared to any other region (Rodrik, 1998). However, in the late 1980s and early 1990s, a number of SSA countries have managed to reverse the economic decline by carrying out more fundamental economic and trade policy

[1] Economic growth averaged 4.5% in 1965-1969, declining to 4.2% in 1970-1979, before facing serious decline and stagnation to an average of 2.5% in 1980-1989.

[2] Specifically, these policy reform measures included the abolition of artificial quotas, privatization of state monopolies and capital market liberalization, aimed to reduce trade barriers and encourage inward foreign investment in SSA economies.

reforms.[3] Uganda, Ghana and Tanzania are leading examples in this respect while others such as Mali and Gambia have boosted their trade volumes, although are yet to achieve sustained long-term growth (Rodrik, 1998).[4]

The second string of strategies seeks to increase domestic capital investment and improve productivity by attracting more foreign investment, which will act as a vehicle for international technology transfers and spillovers, and for the diffusion of managerial skills and global market access in African economies. Although there is not yet a concensus, an increase in foreign capital investment tends to impact positively on export growth and domestic savings (Dupasquier and Osakwe, 2005; Borenzstein et al., 1995). In recent years, numerous studies have examined the role played by FDI in stimulating innovation and leading to increased trade (Ghirmay et al., 2001; Bayoumi and Lipworth, 1997; Balasubramanyam et al., 1996). Their results indicate a stronger impact of FDI by trade orientation (export oriented FDI and import-substituting FDI).[5] In this regards, even though total FDI flows to the African continent represent only a small share of total flows to developing countries, FDI flows have increased in value terms during the last few years.[6] UNCTAD (1999a) observes that the rate of return on FDI in Africa has remarkably improved to above 10 per cent between 1983 and 1997, and averaged 29 per cent since 1990, as a result of the change in foreign investment policy and capital liberalization.[7]

The main objective of this paper is to examine whether FDI and exports have contributed positively to SSA's economic growth. In the paper, an empirical assessment of the relationship between FDI, exports and economic growth in the five SSA countries is conducted against a backdrop of the economic and trade liberation of the last two decades in African countries. Importantly, in this examination of the short-run and long-run causality, we examine the multiplicity of the relationship between income, inward FDI and exports.

This paper also addresses the policy issues surrounding the factors which have been responsible for attracting FDI. While examining the impact of policy reforms in the 1990s, we distinguish between the policies that should have been undertaken, and those that were actually undertaken by most of African countries. We also discuss the policy mix for trade and investment liberalization, such as reduction and removal of tariffs and other barriers to trade and foreign investment, and their relationship with commensurate reforms in fiscal and financial policies, and the sequencing of reforms. Following Sachs and Warner (1997), we divide African economies into three main groups: (a) those countries that have been affected by wars, political instability and major natural and/or man made disasters, such as Sudan, Somalia, Zimbabwe, etc. where frequent cases of policy reversal are likely; (b) those countries that have, to some extent, implemented protectionist policies and hence have higher trade barriers, but a relatively stable political and economic environment such as Burundi, Zaire,

[3] These reforms included, but were not limited to, the removal of export restrictions, lowering of import tariffs and relaxation of quantitative restrictions on imports.

[4] In addition to other economic adjustment domestically, two-thirds of SSA countries initiated trade liberalization, average applied tariffs remain high, non-tariff barriers to trade still exist and most of the countries also have a variety of quantitative restrictions and exchange controls (Sachs and Warner, 1997).

[5] There are also empirical works indicaticating a stronger relation between FDI and economic efficiency (Harrison, 1996; Ghirmay et al., 2001).

[6] FDI has increased from about US$2.2 billion in 1980s to around US$20 billion in 2004 (UN, 2005).

[7] Other studies have also noted that Japanese investments in Africa were more profitable (after tax) in 1995 relative to the early 1990s and were higher compared to many other regions (Bende-Nabende, 2002).

Central African Republic, Niger, Serra Leone, etc.; and (c) those countries that have adopted more liberalized trade and foreign investment policies such as Gambia, Ghana, Mauritius, Uganda, Kenya, Nigeria, South Africa, Zambia, etc. and qualify as open or classified as reformers by independent observers. While selecting a sample of five countries from this group, in this particular assessment we are interested in ascertaining whether exports and FDI are pro-growth in group (c) countries.

The remainder of this paper is organized as follows. In the next section, we present a brief review of related literature. Section 3 provides a historical overview of FDI and trade trends in SSA countries. Section 4 presents the theoretical framework and empirical methodologies, followed by a discussion of the empirical results in Section 5. Summaries, conclusions and policy implications of the study are given in Section 6.

2. Brief Literature Review

In the 1960s and 1970s, many economists believed that participation in international trade and improvement in export performance could provide the much needed impetus for economic growth in the developing economies. Thus the work of prominent economists such as Bhagwati and Srinivasan (1978), Krueger (1978) and Bhagwati (1978) have projected export promotion (outward-looking strategy) as a superior development strategy. This has generated a considerable debate in the development and growth literature on the role of exports in stimulating economic growth.

There are numerous arguments in favour of the pursuit of this export-led development strategy: first, trade expansion will bring about enhanced productivity through increased economies of scale in the export sector, positive externalities on non-exports and through increased capacity utilization. Second, exports may affect productivity through encouraging better allocation of resources driven by specialization and increased in effeiciency, which in turn generate dynamic comparative advantage via reduction in costs for a country that facilitates exports (Mahadevan, 2007). Third, through encounters with international markets, trade will facilitate more difussion of knowledge (especially in the process of interaction with foreign buyers and learning by doing gains) and more efficient management techniques which will have a net positive effect on the rest of economy and enhance overall economic productivity. Fourth, export growth also promotes capital accumulation and accumulation of foreign exchange and thus enables the importation of capital and intermediate inputs necessary in the production of goods exports. Through this link export growth has been analzed as the engine of economic growth (Bhagwati and Srinivasan, 1978; Krueger,1978; Kavoussi, 1984).

These factors notwithstanding, the empirical evidence on export-led growth strategy (ELG) remain inconclusive at best. Empirical evidence that has found strong support for ELG include Krueger (1978), Bhagwati (1978), Tyler (1981), Kavoussi (1984), and Balassa (1978; 1985), and more recent studies such as Afxentiou and Serletis (1992), Serletis (1992), Bahmani-Oskooee and Asle (1993), Durraisami (1996), Henriques and Sadorsky(1996), Liu et al. (1997), Ghatak et al. (1997) and Al-Yousif (1999). Others, notably Jung and Marshal (1985), Chow (1987), Ahmad and Kwan (1991), Afxentiou and Serletis (1991), Bahmani-Oskoee et al. (1991), Dodaro (1993), and Greenaway and Seaford (1994) have failed to provide unambiguous support for ELG while using recent advances in time series econometrics and longer time periods.

A number of other variables have also impacted on the relationship between exports and economic growth, such as imports, real effective exchange rate and capital expenditure. The failure to address the role of these macroeconomic variables will result in specification bias or spurious regression (Al-Yousif, 1999; Shan and Sun, 1998; Riezman et al.,1996). Thus more recent empirical studies (such as Asafu-Adjaye and Chakraborty,1999) have carried out ELG hypothesis test beyond the traditional two-variable relationship by taking into account other important macroeconomic variable in their investigation.

Despite there being many factors that can influence export-growth link, both neoclassical and new growth theories emphasized the following: (a) the considerable importance of export in promoting economic growth and highlight the importance of exports to improving efficiency in the allocation of productive resources and inducing investment in a country (Ghirmay et al., 2001; Balasubramanyam et al., 1996; Harrison, 1996);[8] and (b) trade policy regimes (whether geared towards export promotion or import substation) also condition the gains from FDI to a host country (Bhagwati, 1978; 1985). While FDI is growth-enhancing due to promoting export or through transfer of technology, Balasubramanyam et al. (1996) suggest that the growth-enhancing effect of FDI would be significant and strong in countries with open trade policies compared to a policy regime geared towards import substitution. By taking into account the role of these factors, we consider FDI and other variables in the model of the causality.

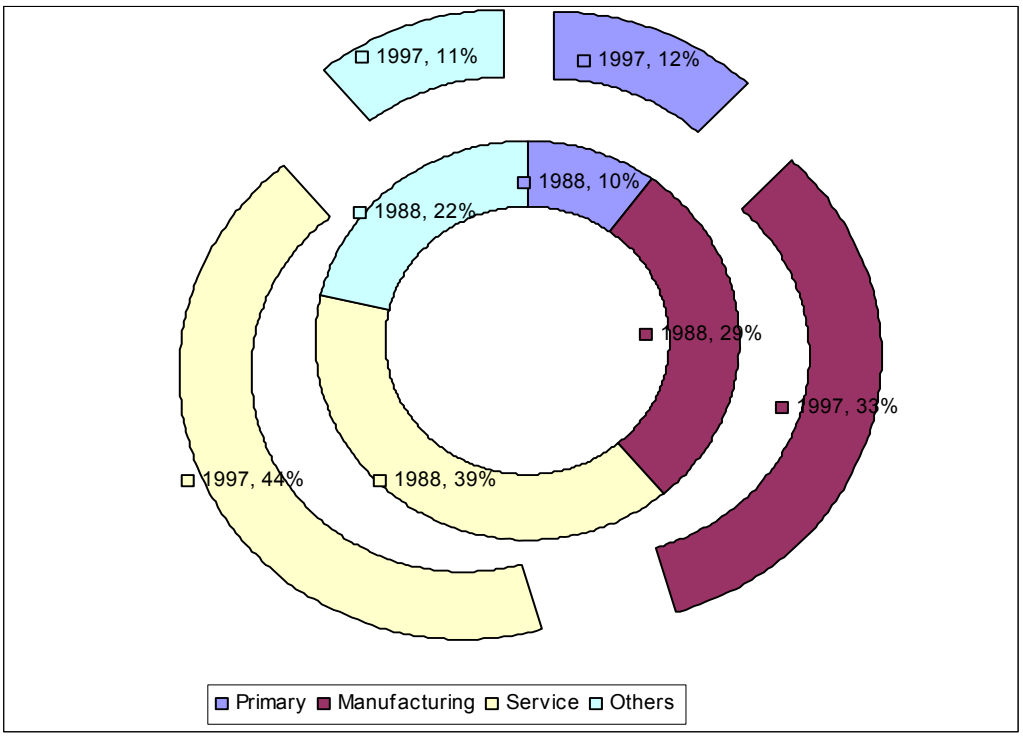
3. FDI Inflows and Trade in Africa

Foreign direct investment (FDI) contributes to economic growth in a number of ways. Generally, FDI can impact on productivity and serve as a catalyst for economic development through productivity enhancement, employment creation (poverty alleviation) and trade growth (Hale and Long, 2006; UNIDO, 2006; Pacheco-López, 2005; OECD, 2002; Balasubramanyam et al. 1996; De Gregorio, 1992; Findley, 1978). In addition to this range of prospective benefits suggested by the literature, FDI has two other crucial roles for economic development. First, as FDI inflow brings new capital investment adding to a country's capital stock (Ram and Zhang, 2002; De Gregorio, 1992; Blomstrom et al. 1992), it promotes both forward and backward linkages within the domestic economy, thereby stimulating future economic growth (World Bank, 1998).[9] Second, the greatest contribution of FDI may also come through technology transfer which can stimulate export growth, improve total factor productivity and help a country integrate into global economic networks (Schneider, 2005; Sun and Parikh, 2001; Grossman and Helpman, 1995). While most studies conclude that the contribution of direct foreign investment depends on the ability of the host economy to enable foreign technology diffusion (OECD, 2002; Keller, 1996), it is generally stressed that FDI can promote growth through the key role of creating a better economic environment (UNCTAD, 2002; Ramirez, 2000; Balasubramanyam et al., 1999; Kokko, 1994) and encouraging exports. Multinational firms operating in foreign markets can observe comparative advantage opportunities in certain countries and upon investigating economic conditions may decide to open a subsidiary or embark on a joint venture in a host country. This will lead to a flow of equipment,

[8] Export may increase the level of investment through providing investment opportunities and henece attracting more FDI inflows.
[9] See Ikiara (2003) for a detail discussion on this.

machinery and management expertise, which in turn will enhance the process and speed with which a country integrates into the global economy. It is due to these critical roles played by FDI that SSA and other countries have attempted to design policy measures to facilitate the access to and attraction of new foreign capital. However, there are other claims that the growth-enhancing effect of FDI is not obvious; may vary from country to country (Borensztein et al. 1995); and for some cases it may even adversely affect the growth process (Xu, 2000; Aitken and Harrison,1999; De Mello, 1999; Borensztein et al.,1998).

Figure 1: Sectoral distribution of FDI in Africa (% total inflows), 1988 and 1997



Source: UNCTAD, *Investment Policy Review of Ghana*, 2003.

Since the 1970s, Africa's share of global FDI has plummeted. It fell from 5 per cent in the 1970s to about 1.8 per cent in the 1990s, and further dropped to 0.8 per cent in 1999-2000 (Dupasquier, 2005). Africa's FDI position relative to other developing countries has followed a similar pattern. The region's share of total FDI inflow to developing countries dropped from about 20 per cent in the 1970s to about 5 per cent in 2002 (Ikiara, 2003), even though inflows into the developing regions increased from about $20 billion in 1981 to an average figure of $75 billion between 1991 and 1995. It is also observed that the share of Africa in FDI flows lagged heavily behind those of the Asia and the Pacific, and Latin America and the Caribbean countries.

Within the African economies, the destination of FDI inflows has traditionally concentrated in a few resource-rich countries.[10] However, more recently, a new up-coming group of African economies, such as Tunisia, Tanzania, Uganda and Ghana, have attracted rapidly increasing FDI inflows. Similar to the country distribution, the sectorial composition of foreign direct investment in Africa has also traditionally concentrated in a few economic sectors. Reflecting their comparative advantage and

[10] For details see for example, Bende-Nabende (2002).

factor endowment, primary sectors such as mining and oil accounted for a substantial share of FDI. Figure 1 shows that although the primary sector still remains important, both manufacturing and services are transforming to be key sectors for FDI.[11] The evidence shows that FDI in Africa is increasingly diversifying, though full data on the sectoral location of FDI in Africa is not readily available. Taking the case of Ghana as an example, we observe that in the period 1994-2002, 20% of FDI stock was in the manufacturing sector, 53% in services, and 12% in agriculture and export trade combined (UNCTAD, 2003). This shows how Ghana has bridged the savings-investment gap to sustain its industries and maintain economic growth. Considering another case, UNCTAD (1999b) report that there has been improvement in FDI inflows to Nigeria in the most important sectors where manufacturing received 50% and other sectors such as primary industries and services attracted 30% and 20% respectively in 1992.

There has been keen competition for FDI among developed and less developed countries. On the assumption that FDI is welcome in most less developed economies/countries (LDCs), a critical factor is how do potential foreign investors decide where to invest, an issue important for SSA economies who are trying to attract more foreign investment. From the perspective of a foreign agency, foreign investment represents a more serious and long-term commitment compared with trade. The considerations for foreign investment can be categorized into the following two broad areas: factor endowment of a specific economy and policies for attracting foreign investment. Factor endowment includes domestic market size and potentials, labour quality and costs, natural resources, infrastructure and market access; and the policies include the legal and regulatory environment for foreign investment, fiscal and taxation incentives, and accountability and transparency of the governments.

An important question is whether the decline in foreign investment in SSA has been caused by government policies and trade barriers, by a decline in overall GDP and domestic savings, and/or a lack of investment opportunities. Although the latter is an important contributor, Dean et al. (1994) suggests the former is the main cause since most African countries have made little or only moderate progress towards liberalizing their trade regimes. Although trade liberalization may not bring in FDI when considered in isolation, trade reforms that create correct incentives for firms to develop and improve productivity, encourage competition with imports and enhance availability of imported inputs will have positive effect on FDI (Evguenia et al., 2003; Lawrence and Weinstein, 1999; Edwards, 1998; Sachs and Warner, 1995). Therefore changes in trade and investment policies may have a powerful impact on foreign capital investment and result in rapid growth.

After ranking SSA countries based on FDI attractions, structural reforms and policy implementations, we focus on the business climate and economic details of five economies here as in Table 1. Note that Mali and Zimbabwe are outsiders to our main sample (used in the next section) to facilitate comparisons (replacing Kenya and Zambia). The close relationship between FDI and GDP growth for the five African countries is detailed. In this table, cost of regulation refers to the economic cost of government over regulation on foreign investment and trade, an important policy indicator which measures the barriers to foreign investment and trade. The economic environment for FDI is represented in the table by hard and soft infrastructure, macroeconomic stability, political risk and corruption indexes, and rule of law and order. Table 1 indicates that there is a positive relationship between FDI and GDP for

[11] Bende-Nabende (2002) notes that this is the case, even in oil-exporting countries.

the five African countries, though in the case of South Africa, the relatively low GDP growth rate relates to the obviously higher base of GDP and international sanctions during the apartheid era. More importantly, the negative correlation between the cost of regulation and FDI growth rate is self-evident, considering the economic environment for trade and investment in the five countries. The higher FDI growth rate in South Africa, Mali and Ghana were related to their relatively lower costs caused by over regulation. Note that Mali, albeit with higher costs of regulation, has high FDI growth rate compared to Ghana. We believe this is due to specific locational advantages and natural resources the country poses as observed by Basu and Srinivasan (2002) for some African countries. The close relationship between government policies, FDI and trade for the five African countries are measured quantitatively in Section 4 of this paper.[12]

Table 1: Economic Environment, FDI and GDP Growth in the Five SSA Economies (1991-2001)

Items	Ghana (22)[1]	Mali (23)[1]	Nigeria (4)[1]	S. Africa (1)[1]	Zimbabwe (39)[1]
FDI annual growth (1991-2001)[2]	14.6	18.3	4.1	35.1	2.8
FDI per capita US$ (1991-2001)[3]	6.1	3.5	11.3	34.8	7.2
GDP annual growth (1991-2001)[2]	4.3	4.8	2.8	2.1	0.8
GDP per capita (constant at 2000 prices US$) (1991-01)[3]	233	195	388	2986	620
Total FDI (1991-2001) (million US$)[3]	1235	418	13217	16258	965
Macroeconomic stability	Good	Average	Average	Very good	Poor
Hard and soft infrastructure	Very good	Average	Average	Excellent	Poor
Political risk index in 1995-98[4]	3.5	4.2	4.8	2.3	3.3
Corruption index in 1995-98[4]	5.4	5.9	7.1	2.5	5.0
Rule of law index in 1995-98[4]	5.0	5.0	5.0	4.1	4.1
Inst. inv. risk index in 1995-98[4]	7.0	8.3	8.4	5.4	6.8
Cost of regulation in 1995-98[5]	14.90%	51.84%	99.30%	36.70%	58.50%

Notes: 1. The numbers in bracket are our country's ranking of the FDI inflows in Africa (2000-2003). 2. Annual compound rate of growth. 3. The data is based on average 1991-2001. 4. The indices rank from 1-10, the risk increases from 1 to 10. 5. Cost of regulation is the cost in % of 1997 GDP.
Sources: Authors' calculations; International Country Risk Guide; Pigato (1999); UNCTAD FDI Database; Djankov et al. (2000); and World Bank, *World Development Report*, various years.

An important aspect of market liberalization, which many African countries adopted in the late 1990s, is its ability to promote international trade while attracting foreign capital investment. Sharma (2000) argues that 'the success stories of East and South East Asian countries suggest that FDI is a powerful tool of export promotion', through tapping export opportunities and taking advantage of a country's comparative advantage. Flexner (2000) also suggests that 'discretionary trade or tax regimes may inhibit the ability of FDI to act as a positive means of advancing technology transfer'. Others have argued that trade liberalization benefits FDI as it reduces the cost of imported inputs thereby enhancing cost-effectiveness of domestic production (Jenkins and Thomas, 2005).

Despite the decline in the FDI share of the continent and the modest ability of the region to attract foreign capital, FDI as a percentage of GDP remained high compared to other developing countries, thanks to a low level of gross capital investment in the region. Foreign capital inflows account for about 10 per cent of

[12] Detailed policy analyses regarding FDI and trade for these countries are available upon request.

SSA's gross fixed capital formation (Ikiara, 2003). Moreover, the allocation of FDI in the African countries has been biased towards certain economies. For example, FDI as a ratio of gross domestic investment increased from 0.9 per cent in 1988 to almost 17 per cent in 1999 in the case of Ghana and from below 0.1 per cent in 1988 to 16.3 per cent in 2000 in the case of Kenya.[13] FDI inflows accounted for 10.4 per cent and 5.2 per cent of GDP in 1999 in Ghana and Zambia respectively. Overall, all five SSA countries in our sample reveal a pattern of increasing inflows of FDI as a percentage of GDP since the structural reform period of the 1990s. This large proportion of external capital inflows as a share of total investment shows the considerable gap between domestic savings and investment, and the important role FDI attraction can play in promoting economic growth.

Table 2: Trade Openness, as percentage of GDP

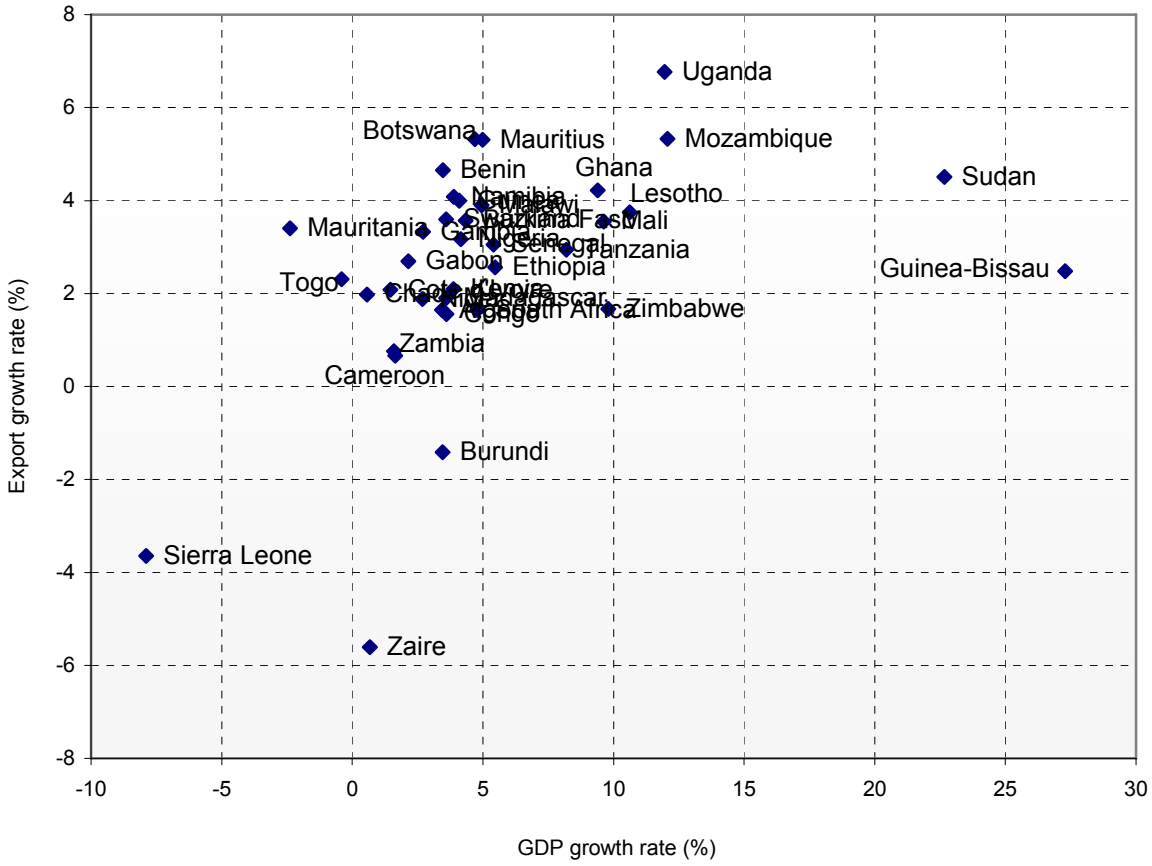
Country	1980-84	1985-89	1990-94	1995-99	2000-04
Argentina	14	17	16	22	33
Brazil	19	16	18	18	28
Ghana	*13*	*38*	*50*	*76*	*99*
Kenya	*38*	*36*	*44*	*52*	*57*
Nigeria	*39*	*44*	*81*	*79*	*87*
South Africa	*54*	*51*	*41*	*48*	*58*
Zambia	*78*	*71*	*54*	*63*	*62*
Malaysia	108	116	159	197	216
Thailand	50	59	79	95	127
Highly indebted poor countries	47	41	46	55	59
Middle income countries	42	41	49	52	64

Note: Openness is defined as sum of export and import of goods and services/GDP.
Source: Calculated from data in World Bank, *World Development Indicators*, various years.

The nature of the relation between export and economic growth has been the subject of discussion for many decades and controversy still persists regarding role of export performance in GDP growth (see, for example, Bhagwati, 1978; Krueger, 1978; Balassa, 1978; Kohli and Singh, 1989; Fosu, 1990; Sengupta 1991).[14] While many studies have highlighted a positive relationship between trade openness and FDI, an outward-oriented trade strategy has been suggested as having a large influence on economic growth (famously known as the export-led growth hypothesis in the literature). Table 2 provides comparison statistics of trade openness in the five selected SSA countries in comparison with average middle income economies and some Asian newly industrialized economies (NIEs). Although it is clear that Malaysia and Thailand are the most open economies, reflecting their export-push development strategies, almost all SSA countries have similar trade ratios to average middle-income economies. Importantly, all the SSA countries in the sample have ratios substantially higher than Argentina and Brazil (see Table 2). In this context, whereas most of the empirical literature treats openness as the principal channel by which liberalization enhances output, an outward orientation in Africa should facilitate a better environment for FDI and enable further integration with the global economy. Thus Yao and Zhang (2003) find that in general more open NIEs have had higher absorption of foreign capital.

[13] In support of this, Ikiara (2003) observes that some countries such as Lesotho and Angola recorded inflows/domestic investment of 53.1% and 44.1% respectively in 1996-1998, pointing out that these ratios could be very high in some SSA countries.
[14] A comprehensive review of the literature from both sides is given by Madina-Smith (2001).

Figure 2: GDP and export growth in SSA countries, 1990-2000



Source: World Bank, *World Development Indicators*, various years.

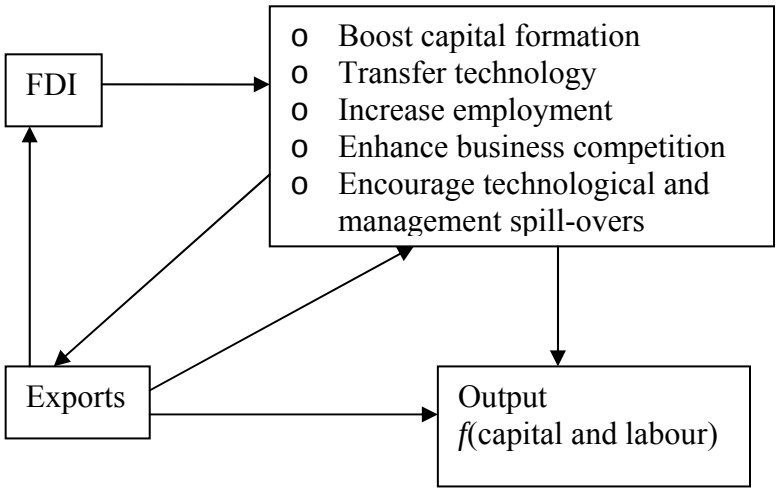
From a different point of view, Figure 2 depicts GDP and the export growth relationship among 37 African countries. While the mapping shows some evidence of a positive relationship between GDP and exports, Uganda achieved the highest growth in exports and GDP over the period 1990-2000. Considering this background, we will empirically investigate the links between FDI and trade (exports), and any causal relationship among exports, FDI and economic performance using the five selected SSA countries in the next section.

4 Theoretical Framework and Methodology

With the above discussion in mind, this section aims to elaborate on the appropriate methodology to explore the export-FDI-growth relationship. Despite various country-focused case studies, different econometric approaches and numerous uses of large cross-country data sets, the relationship between these variables remains inconclusive. Economists also differ on the subject, particularly for the developing countries (Medina-Smith, 2001; Cuadros et al., 2004; Edwards, 1993). So far the empirical results on the relationship between FDI and growth (especially in the case of developing countries) have produced mixed results. As discussed earlier, the interactive mechanisms may mean either multinational foreign investment is expanding the existing export channel in the host country or it is channelling FDI

linked with new exports (Alguacil et al., 2002; Borensztein et al., 1998; Chen et al., 1995).

Figure 3: Possible links in FDI, exports and income



The relationship between exports and economic growth has been a research interest in both the theoretical and empirical literature for some time now. The literature on the export-led growth hypothesis postulates trade as the main engine of growth and therefore claims that outward-oriented policies and exports in particular, improve productivity growth through the following means: (a) enabling the adoption of foreign technologies; (b) resulting in greater capital utilization and utilization of advantage of economies of scale and comparative advantage; and (c) helping create a conducive and stable macroeconomic environment through increasing employment, labour productivity and enhancement of the country's external earning power (Edward, 1998; World Bank, 1993; Serletis, 1992; Shan and Sun, 1998; Balassa, 1985).[15] Thus the issue of which variable is driving the other and the nature of any link between FDI, exports and economic growth is not clear-cut. Figure 3 illustrates some of the possible transmission mechanisms whereby these three variables influence each other. However, given the criticisms of the export-led growth hypothesis (ELGH) and failure of a number of individual country-specific investigations to exhibit evidence for ELGH in recent studies (see for example Cuadros et al., 2004; Medina-Smith, 2001; Henriques and Sadorsky, 1996; Greenaway and Sapsford, 1994), this examination will focus on the causal relationship between these variables.

Since it is not obvious that any of the links between FDI, exports and growth can be ruled out, our investigation will use a Granger type test of a bi-directional causal link. Further, we will also examine the association and nature of any causal relationship using the Granger Representation Theorem in a multivariate framework and including an error correction term. Examining the causality issue using country-specific case studies has been the topic of many recent studies and the technique of Granger causality, with cointegration and error-correction has been used frequently (Medina-Smith, 2001; Cuadros et al., 2004; Pacheco-López, 2005). Recently, studies

[15] In addition to this, other studies have also indicated that there is a bi-directional relation where export enhances growth and output growth promotes further expansion in exports (Ekanayake, 1999; Dutt and Ghosh, 1994).

have resorted to a country case framework due to the fact that widely applied cross-country analysis fails to capture unique country specific information (Zhang, 2001; Catão, 1998; Al-Yousif 1997; Henriques and Sadorsky, 1996; Serletis, 1992). Because of this deficiency, it is now recognized that 'tests of the export-led model, must intrinsically involve country case studies' (Medina-Smith, 2001).

For the above reasons, our estimation method will start with a Granger-causality test in a bivariate vector auto-regression (VAR) framework and then undertake a multivariate temporal Granger causality test adding an error correction term (to incorporate long-run relationships) upon establishing the existence of cointegration.[16]

When time series are stationary, the hypothesis of x_t Granger causing y_t can be tested using a framework where past changes in one variable explains the actual changes in another (such as unrestricted VAR in levels).[17] However, if the series are non-stationary, such a causality test will not be valid unless a common trend exists among the variables (Engle and Granger, 1987). In recent years, Pasaran and Shin (1995) have developed a new approach, the autoregressive distributed lag (ARDL), where causality and long-run relationships can be tested regardless of the order of integration of the variables.[18] It is now standard practice that once the times series properties of the variables are resolved, a vector error correction system is used where both short-run and long-run dynamics are captured. These ARDL-type models were applied by Pesaran et al. (2001), Pacheco-López (2005) and Zachariadis (2006). Given this modelling, some studies (Oh and Lee, 2004; Zachariadis, 2006) have pointed out that the Granger-type test of causality can be carried out in three different approaches: (a) through examining the significance of the lagged differences of the variables (joint Wald test); (b) through investigating long-term causality by checking the significance of the error correction term; and (c) possibly through examining the joint significance of all the lagged variables and of the error term equation above.

However, Pesaran (1997) and Pesaran et al. (2001) emphasize the use of ARDL in analysing the long-run relationship between variables. Thus assuming an appropriate order of ARDL and an error correction model in the spirit of Pesaran et al. (2001), an appropriate equation to test the relationship among variables can be represented in the following form:

$$\Delta y_t = \alpha_0 + \sum_{i=1}^{m} \beta_i \Delta y_{t-i} + \sum_{i=0}^{n} \theta_i \Delta x_{t-i} + \phi EC_{t-1} + \xi_t \qquad (1)$$

Here m and n represent the number of lags chosen; EC is the error-correction term, β_i and θ_i are expected to capture short-run dynamics, ϕ captures adjustment towards long-run equilibrium, while ξ_t is the random disturbance term. In this case, if $\theta_i's$ are jointly significant using a standard Wald test, then the null hypothesis of 'x does not Granger cause y' is rejected.

[16] Later, we utilize Pedroni's (1999) panel estimation approach to check the robustness of our findings.
[17] This is refered to us the standard Granger causality (see, Engel and Granger (1987)).
[18] VAR and ARDL models are now standard technique in econometric analyses and thus we limit our discussion on this. For an excellent discussion see Pesaran (1997) and Zachariadis (2006).

5 Empirical Results and Data

The empirical investigations of this study use annual data for the five selected Sub-Saharan African countries from secondary data sources of *International Financial Statistics* (IMF) and *World Development Indicators* (World Bank).[19] The sample countries are Ghana, Kenya, Nigeria, South Africa and Zambia. The variables under study are real export (*Expo*), inward foreign direct investment (*FDI*), real domestic income (y), foreign income (y^{us}), real imports (*imp*) and an index capturing openness and regime liberalization (*lib*). The later index is added to examine the role of trade in conditioning regimes policy towards generating a favourable environment for FDI inflow. The *lib* index is constructed from two main reform indicators of domestic and external liberalization which represent a significant move towards a stronger liberal economic environment.[20] For a sound economic analysis, it is important to convert values from current prices into constant prices. For consistency with the previous literature, US GDP is used as an indicator of foreign income. Foreign income is included to capture potential external shocks as recommended by the literature (Cuadros et al., 2004; De Gregorio, 1992).[21] With the exception of the index, all of the other series are expressed in log form to compress the measurement scale and reduce estimation problems such as heteroscedasticity.

Many previous studies, including those with strong empirical support for ELG (Bahmani-Oskooee and Asle, 1993; Ukpolo,1994; Durraisami, 1996; Liu et al., 1997; Ghatak et al., 1997) and mixed/weak support (Dodado, 1993; Greenway and Sapsford, 1994) did not consider the role of imports in their analyses. However, from the recent literature, studies have shown that the imports variable is important in the casual relationship between export and growth, while ommiting it from the analysis may overstate the effect of export and/or FDI on growth (Riezman et al. 1996; Afxentiou and Serletis, 1992). Importantly, including imports as a variable will allow testing of the import compression hypothesis (that is, by allowing capital and intermediate inputs to be imported, export growth relieves the foreign exchange constraint) (Asafu-Adjaye and Chakraborty, 1999; Esfahani, 1991). Pacheco-López (2005) also observes that firstly, imports may stimulates FDI where a rise in imports justifies investment and production by foreign firms signalling FDI inflow. Secondly, FDI inflow in a host country increases the demand for imports as multinational firms will require specific supplies, not locally available, to maintain their internally required standards. Thus there is the possibility of a bidirectional links between these two variable. For these reasons, the traditional two-variable relationship (where imports are not considered) can: (a) result in both 'type I' and 'type II' errors of spurious rejection as well as spurious detection of a causality (Riezman et al. 1996); and (b) the omission of import growth can mask the causality between exports and output growth. We will take imports into account explicitly.

Before undertaking the Granger-type causality test specified under equation (1), we conduct a formal test to confirm the time series properties. We employ the augmented Dickey-Fuller (ADF) unit root procedure to test the level of integration for

[19] Appendix 1 gives full definitions and sources of all variables we have used.

[20] It is also included to capture the deregulation and transformation of the economic systems of these countries. To compute a single index that will be used in the regression analysis, we use the principal weighted average method.

[21] We recognize that some studies have used quarterly data in this aspect, however due to unavailability and quality of such quarterly data in developing countries, annual data is preferred, even though having a medium-size sample is taken to be an unavoidable shortcoming.

the variables concerned. The null hypothesis of the series being non-stationary is not rejected in levels (with the exception of one case, FDI in Kenya) but the null is rejected at the five per cent level when first differences of the variables are taken.[22] These ADF test results indicate that all the variables are integrated of order one for all countries. Having determined the order of integration of the series, we proceed to conduct the multivariate cointegration test applying the Johansen and Juselius (1990) maximum likelihood estimation procedure. As the selection of the correct order of ARDL is important in this type of examination, and given the medium size of our samples, lag order selection by either the Akaike information criteria (AIC), or by the Schwartz bayesian criteria (SC) is recommended (Pesaran, 1997).

The results from the cointegration analysis (see Table 3) show that when three to four lags are used, the null hypothesis of no cointegration (r = 0) between variables (*Expo-y*), (*Expo-FDI*), (*y-FDI*) and (*y-imp*) is rejected at 5 per cent or 10 per cent using either the trace test or maximum eigenvalue test in all the five cases.[23] This provides evidence on the existence of at least one cointegrating vector in the model and therefore we conclude that the variables exhibit a long-run association between them. Having established this, we next estimate an error-correction model based on equation (1) to investigate bi-directional causality between FDI and exports, FDI and income, exports and income, and imports and income for all five SSA countries.

Table 4 provides the results of the causal relationships between variables.[24] The estimated results show that bi-directional Granger causality exists between FDI and exports in Ghana and Kenya based on the F-statistics for the joint significance of the autoregressive terms, and Nigeria based on the statistical significance of the error correction term.[25] For the other two countries, the Granger causality runs from FDI to exports in South Africa and from exports to FDI in Zambia. This observation supports previous findings by Frimpong and Oteng-Abayie (2006), Hansen and Rand (2005), and Karikari (1992) for the case of African economies, and Ram and Zhang (2002), Alguacil et al. (2002), Blomstrom et al. (1992) and De Gregorio (1992) for the case of other economies. Similarly, the null hypothesis 'FDI does not Granger cause growth' is rejected in all countries except Nigeria, where the feedback effect runs from income to FDI. The results shows that the null hypothesis 'Granger no-causality from imports to output' can be rejected at the 5 percent level of significance for Ghana, and the 10 percent level of significance for Kenya and Zambia. For Nigeria and South Africa, the same hypothesis is rejected at the 10 percent level of significance based on the statistical significance of the error correction term. Further, the results presented indicate a feedback effect between imports and output only in South Africa. Our findings in this examination are somewhat similar to those of Riezman et al. (1996) who point to the existence of causality from import to output in the case of Ghana and South Africa.

[22] To conserve space we do not provide the unit root test results here, but they are available on request.
[23] We have not included foreign income (y^{us}) as we assume it to be exogenous. We limit our examination to this number of relations even though *FDI-imp* could be considered.
[24] The lags used here were identified using the Akaike information criterion (AIC).
[25] To examine the consistency of our findings, we have converted FDI, y, and Expo variables into per capita and re-conducted unit root and causality tests. The results generally remain the same and are available upon request.

Table 3: Johansen's Test of Cointegration

GHANA Variables list : Expo-y					KENYA Variables list : Expo-y				
Test: **Trace**					Test: **Trace**				
(A)	(B)	*VAR=1*	*VAR=3*	*VAR=4*	(A)	(B)	*VAR=1*	*VAR=3*	*VAR=4*
r= 0[a]	r ≥ 1	13.49	23.13	28.06	r= 0[a]	r ≥ 1	16.46	25.02	44.91
r ≤ 1[b]	r ≥ 2	4.55	10.29	8.70	r≤ 1[b]	r ≥ 2	4.69	6.53	11.70
Maximum eigenvalue					**Maximum eigenvalue**				
r= 0[a]	r ≥ 1	8.95	12.84	19.36	r= 0[a]	r ≥ 1	11.77	18.48	33.20
r ≤ 1[b]	r ≥ 2	4.55	10.29	8.70	r≤ 1[b]	r ≥ 2	4.69	6.53	11.70
Variables list: Expo-FDI					Variables list: Expo-FDI				
Trace		*VAR=1*	*VAR=3*	*VAR=4*	**Trace**		*VAR=1*	*VAR=3*	*VAR=4*
r= 0[a]	r ≥ 1	13.45	22.24	25.62	r= 0[a]	r ≥ 1	23.07	12.99	7.85
r ≤ 1	r ≥ 2	1.99	3.40	5.54	r≤ 1	r ≥ 2	4.52	3.17	1.90
Maximum eigenvalue					**Maximum eigenvalue**				
r= 0[a]	r ≥ 1	11.46	18.84	20.07	r= 0[b]	r ≥ 1	18.56	9.81	5.95
r ≤ 1	r ≥ 2	1.99	3.40	5.54	r≤ 1	r ≥ 2	4.52	3.17	1.90
Variables list: y-FDI					Variable list: y-FDI				
Trace		*VAR=1*	*VAR=3*	*VAR=4*	**Trace**		*VAR=1*	*VAR=3*	*VAR=4*
r= 0[a]	r ≥ 1	17.66	23.31	28.92	r= 0[a]	r ≥ 1	26.27	27.72	34.66
r ≤ 1	r ≥ 2	5.66	3.19	3.34	r≤ 1[b]	r ≥ 2	8.31	9.99	6.27
Maximum eigenvalue					**Maximum eigenvalue**				
r= 0[a]	r ≥ 1	12.00	20.11	25.58	r= 0[a]	r ≥ 1	17.96	17.73	28.39
r ≤ 1	r ≥ 2	5.66	3.19	3.34	r≤ 1[b]	r ≥ 2	8.31	9.99	6.27
Variables list: y-Imp					Variable list: y-Imp				
Trace		*VAR=1*	*VAR=3*	*VAR=4*	**Trace**		*VAR=1*	*VAR=3*	*VAR=4*
r= 0[a]	r ≥ 1	18.28	21.83	29.42	r= 0[a]	r ≥ 1	15.58	21.63	43.15
r ≤ 1	r ≥ 2	2.84	5.04	3.76	r≤ 1[b]	r ≥ 2	5.19	2.85	10.20
Maximum eigenvalue					**Maximum eigenvalue**				
r= 0[a]	r ≥ 1	15.44	16.79	25.66	r= 0[a]	r ≥ 1	10.39	18.78	32.94
r ≤ 1	r ≥ 2	2.84	5.09	3.76	r≤ 1[b]	r ≥ 2	5.19	2.85	10.21

NIGERIA Variables list : Expo-y					SOUTH AFRICA Variables list : Expo-y				
Test: **Trace**					Test: **Trace**				
(A)	(B)	*VAR=1*	*VAR=3*	*VAR=4*	(A)	(B)	*VAR=1*	*VAR=3*	*VAR=4*
r= 0	r ≥ 1	17.98	17.99	10.47	r= 0[a]	r ≥ 1	39.44	17.30	23.33
r ≤ 1	r ≥ 2	7.19	1.97	4.62	r≤ 1	r ≥ 2	7.35	3.49	2.59
Maximum eigenvalue					**Maximum eigenvalue**				
r= 0[b]	r ≥ 1	10.79	16.01	5.86	r= 0[a]	r ≥ 1	32.10	13.81	20.74
r ≤ 1	r ≥ 2	7.19	1.97	4.62	r≤ 1	r ≥ 2	7.35	3.49	2.59
Variables list: Expo-FDI					Variables list: Expo-FDI				
Trace		*VAR=1*	*VAR=3*	*VAR=4*	**Trace**		*VAR=1*	*VAR=3*	*VAR=4*
r= 0[a]	r ≥ 1	11.24	18.68	30.48	r= 0[a]	r ≥ 1	13.82	18.97	20.31
r ≤ 1	r ≥ 2	2.32	1.06	1.02	r≤ 1	r ≥ 2	0.80	1.39	5.81
Maximum eigenvalue					**Maximum eigenvalue**				
r= 0[a]	r ≥ 1	8.92	17.62	29.46	r= 0[b]	r ≥ 1	13.02	17.58	14.51
r ≤ 1	r ≥ 2	2.32	1.06	1.02	r≤ 1	r ≥ 2	0.80	1.39	5.81

Table 3 Continued…

Variables list: y-FDI					Variables list: y-FDI				
Trace		*VAR=1*	*VAR=3*	*VAR=4*	**Trace**		*VAR=1*	*VAR=3*	*VAR=4*
r= 0	r ≥ 1	14.20	17.15	13.37	r= 0[a]	r ≥ 1	30.06	34.07	20.30
r ≤ 1	r ≥ 2	1.35	0.60	2.37	r≤ 1[b]	r ≥ 2	10.74	5.16	0.81
Maximum eigenvalue					**Maximum eigenvalue**				
r= 0[b]	r ≥ 1	12.85	16.55	11.00	r= 0[a]	r ≥ 1	19.32	28.92	19.49
r ≤ 1	r ≥ 2	1.35	0.60	2.37	r≤ 1[b]	r ≥ 2	10.74	5.16	0.81
Variables list: y-Imp					Variables list: y-Imp				
Trace		*VAR=1*	*VAR=3*	*VAR=4*	**Trace**		*VAR=1*	*VAR=3*	*VAR=4*
r= 0[b]	r ≥ 1	16.38	6.62	18.83	r= 0[a]	r ≥ 1	8.13	7.80	17.11
r ≤ 1	r ≥ 2	1.48	2.93	3.45	r≤ 1[b]	r ≥ 2	1.03	1.57	4.59
Maximum eigenvalue					**Maximum eigenvalue**				
r= 0[b]	r ≥ 1	14.90	3.68	15.37	r= 0[a]	r ≥ 1	8.10	7.23	15.51
r ≤ 1	r ≥ 2	1.49	2.93	3.45	r≤ 1[b]	r ≥ 2	1.03	1.57	4.59

ZAMBIA Variables list : Expo-y				
Test: **Trace**				
(A)	(B)	*VAR=1*	*VAR=3*	*VAR=4*
r= 0[a]	r ≥ 1	11.22	9.38	26.21
r ≤ 1	r ≥ 2	3.60	3.26	8.90
Maximum eigenvalue				
r= 0[b]	r ≥ 1	7.62	6.13	17.31
r ≤ 1	r ≥ 2	3.60	3.26	8.90
Variables list: Expo-FDI				
Trace		*VAR=1*	*VAR=3*	*VAR=4*
r= 0[a]	r ≥ 1	14.46	24.23	26.70
r ≤ 1	r ≥ 2	4.45	4.91	6.54
Maximum eigenvalue				
r= 0[a]	r ≥ 1	10.01	19.32	20.16
r ≤ 1	r ≥ 2	4.45	4.91	6.54
Variables list: y-FDI				
Trace		*VAR=1*	*VAR=3*	*VAR=4*
r= 0[a]	r ≥ 1	14.48	27.32	27.76
r ≤ 1	r ≥ 2	6.04	7.73	5.51
Maximum eigenvalue				
r= 0[a]	r ≥ 1	8.44	19.59	22.25
r ≤ 1	r ≥ 2	6.04	7.73	5.51
Variables list: y-Imp				
Trace		*VAR=1*	*VAR=3*	*VAR=4*
r= 0[a]	r ≥ 1	7.57	8.87	17.27
r ≤ 1	r ≥ 2	1.23	1.72	3.05
Maximum eigenvalue				
r= 0[a]	r ≥ 1	7.33	7.15	14.21
r ≤ 1	r ≥ 2	1.23	1.72	3.05

Note: (A) and (B) indicate the null hypothesis and alternative hypothesis respectively under the test.
a and *b* indicate significance at 5 percent and 10 percent levels respectively.

Table 4: Granger Causality Based on Error-Correction Model[a]

Ghana	**Regression type**	**Lags taken**	**Wald test**	**EC term**	**Causation**
1a	ΔFDI on ΔExpo	(2,2)	10.62**	-0.884*	FDI ↔ Expo
1b	Δexpo on ΔFDI	(2,2)	11.53**	-0.518	
2a	ΔFDI on Δy	(2,4)	7.90**	0.213	FDI ↔ y
2b	Δy on ΔFDI	(2,2)	12.90**	-0.544*	
3a	ΔExpo on Δy	(1,3)	22.95**	-0.107**	Expo ↔ y
3b	Δy on ΔExpo	(2,3)	7.68*	-0.863*	
4a	Δimp on Δy	(2,2)	14.47**	-0.905**	Imp→ y
4b	Δy on Δimp	(2,3)	2.49	-0.772	
Kenya					
1a	ΔFDI on ΔExpo	(2,2)	5.28*	-0.241	FDI ↔ Expo
1b	Δexpo on ΔFDI	(2,1)	5.94**	-1.065**	
2a	ΔFDI on Δy	(2,4)	8.84**	-0.135	FDI → y
2b	Δy on ΔFDI	(2,2)	1.30	-0.937**	
3a	ΔExpo on Δy	(3,0)	2.74*	-0.972**	Expo ↔ y
3b	Δy on ΔExpo	(2,4)	13.18**	-0.124	
4a	Δimp on Δy	(2,2)	4.70*	-1.045*	Imp→ y
4b	Δy on Δimp	(1,3)	1.25	-0.755	
Nigeria					
1a	ΔFDI on ΔExpo	(2,2)	3.39	-0.612**	FDI ⇔ Expo
1b	Δexpo on ΔFDI	(2,2)	1.94	-0.118*	
2a	ΔFDI on Δy	(1,2)	1.61	-0.676	FDI⇦y
2b	Δy on ΔFDI	(2,1)	2.41	-0.432*	
3a	ΔExpo on Δy	(3,0)	17.55**	-0.474*	Expo ↔ y
3b	Δy on ΔExpo	(1,2)	25.32**	-0.947**	
4a	Δimp on Δy	(4,2)	1.54	-0.835*	Imp⇨y
4b	Δy on Δimp	(1,3)	3.28	-0.212	
South Africa					
1a	ΔFDI on ΔExpo	(2,1)	6.41*	-0.045	FDI → Expo
1b	Δexpo on ΔFDI	(1,2)	1.71	-0.768**	
2a	ΔFDI on Δy	(2,2)	14.34**	-0.050**	FDI → y
2b	Δy on ΔFDI	(2,2)	1.97	-1.320**	
3a	ΔExpo on Δy	(2,3)	1.94	-0.102**	Expo ⇔ y
3b	Δy on ΔExpo	(2,2)	7.31*	-1.071*	
4a	Δimp on Δy	(1,3)	2.54	-0.134*	Imp⇨y
4b	Δy on Δimp	(2,3)	1.70	-0.291*	
Zambia					
1a	ΔFDI on ΔExpo	(2,2)	2.82	-0.881	FDI⇦Expo
1b	Δexpo on ΔFDI	(2,2)	2.21	0.618**	
2a	ΔFDI on Δy	(1,4)	8.01*	0.991	FDI→ y
2b	Δy on ΔFDI	(2,2)	1.76	-0.830**	
3a	ΔExpo on Δy	(2,2)	5.23**	-0.050**	Expo ↔ y
3b	Δy on ΔExpo	(2,2)	12.05**	-0.246	
4a	Δimp on Δy	(4,2)	7.89*	-0.810*	Imp→ y
4b	Δy on Δimp	(1,3)	1.77	-0.958	

Note: [a] Liberalization index (which enter in first-difference) was included in all the ARDL models. ** and * denote the statistical significance at the 5 and 10 per cent levels respectively. Arrows ↔ and ⇔ indicate causality based on standard Wald F-test (joint significance of restriction) and long term causality through significance of error term.

Finally, the statistical significance of F-statistics for the joint significance of autoregressive terms and/or the error term implies a strong bi-directional causality between export and GDP growth but mainly unidirectional causality from imports to GDP growth in all five Sub-Saharan African countries. These observed results are consistent with previous evidence of a bi-directional causality relationship between exports and growth in a two-variable framework and a dataset from African countries (Ahmad and Kwan, 1991; Bahmani-Oskoee et al., 1991; Lussier, 1993; Fosu, 1990).

Although we have adopted a bivariate VAR in the above analysis, multivariate causality is preferred and at times is more reliable (Lutkehpol, 1982). Importantly, one serious drawback of a bivariate causality framework is that it could be biased as it omits other relevant variables. Moreover relationships could be more complex than a two-way causation where consideration of other variables could amplify realized effects. While separating the long-term relationship and short-term forecast and taking into account the aforementioned issues, we specify a VAR model to examine a Granger type test of causality with an error correction representation:

$$\Delta Expo_t = A_{10} + \sum_{i=1}^{m-1} \Delta\beta_{11} Expo_{t-i} + \sum_{i=0}^{m} \beta_{12} \Delta y_{t-i} + \sum_{i=0}^{m} \beta_{13} \Delta fdi_{t-i} + \sum_{i=0}^{m} \beta_{14} \Delta imp_{t-i} + \sum_{i=0}^{m} \beta_{15} \Delta y^{us}_{t-i} + \mu_1 lib_t + a\rho_{t-1} + e_t \quad (2)$$

$$\Delta y_t = B_{20} + \sum_{i=1}^{m-1} \Delta\beta_{21} y_{t-i} + \sum_{i=0}^{m} \beta_{22} \Delta Expo_{t-i} + \sum_{i=0}^{m} \beta_{23} \Delta fdi_{t-i} + \sum_{i=0}^{m} \beta_{24} \Delta imp_{t-i} + \sum_{i=0}^{m} \beta_{25} \Delta y^{us}_{t-i} + \mu_2 lib_t + b\pi_{t-1} + \zeta_t \quad (3)$$

$$\Delta fdi_t = C_{30} + \sum_{i=1}^{m-1} \beta_{31} \Delta fdi_{t-i} + \sum_{i=0}^{m} \beta_{32} \Delta Expo_{t-i} + \sum_{i=0}^{m} \beta_{33} \Delta y_{t-i} + \sum_{i=0}^{m} \beta_{34} \Delta imp_{t-i} + \sum_{i=0}^{m} \beta_{35} \Delta y^{us}_{t-i} + \mu_3 lib_t + c\delta_{t-1} + \xi_t \quad (4)$$

$$\Delta imp_t = D_{40} + \sum_{i=1}^{m-1} \beta_{41} \Delta imp_{t-i} + \sum_{i=0}^{m} \beta_{42} \Delta Expo_{t-i} + \sum_{i=0}^{m} \beta_{43} \Delta y_{t-i} + \sum_{i=0}^{m} \beta_{44} \Delta fdi_{t-i} + \sum_{i=0}^{m} \beta_{45} \Delta y^{us}_{t-i} + \mu_4 lib_t + c\tau_{t-1} + \psi_t \quad (5)$$

The results of the temporal Granger causality test for each equation (equations (2) to (5)) are reported in Table 5. [26] [27] As we have indicated previously, the findings in Table 5 provide evidence on the causal relationship between FDI, exports, imports and income. While the Wald test of joint significance of lags is significant in various equations, significance of either joint autoregressive restriction terms or lagged error correction (*t-test*) will imply Granger causality (Cuadros et al., 2004). The statistical significance of the error correction terms in the exports, imports, FDI and income equations (with the exception of a few cases) represent a long-run impact of variables

[26] Although not reported due to space constraint, a test of cointegration between variables indicated that there exist at least a unique cointegarting vector and therefore the existence of a long-run relationship among the variables involved.

[27] In a different specification, we have included terms of trade and the results are avaible upon request. To generate enough degrees of freedom for estimation this variable has not been included here.

over the others. Furthermore, a positive causal relation from exports and FDI to income is observed for all five SSA countries as indicated by the estimated cointegrating vectors (only in the case of Kenya do we observe a negative impact of FDI). A FDI-growth linkage is not automatic. It has been shown that a country's ability to take advantage of the positive effects of FDI depends on absorptive capacity and local conditions such as the development of the local financial markets, or the educational level of the country (Alfaro et al., 2006). This result is in line with Alfaro et al., (2006) and Rothgeb (1984) who finds that FDI was negatively linked to growth for the set of 18 developing countries where FDI concentrated in the primary sector as opposed to investment in manufacturing. Ikiara (2003) also observe that foreign investment has generally not been transferring up-to-date technology in Kenya. The results also demonstrate the importance of imports in the causal link, where in the case of Ghana, Kenya, South Africa and Zambia exports do induce imports. Imports also cause output in the same countries. From the long-run results, the coefficient on imports is negative in the case of Kenya and South Africa. Depending on the composition of imports, the effect of imports on economic performance may be positive or negative (Asafu-Adjaye and Chakraborty,1999). Overall, the results presented provide evidence of the existence of a positive causal link and of a long-run impact of exports, imports and FDI on income.

Table 5: Multivariate Granger-causality Tests on Error-correction Model

Ghana

Regression	ΔExpo	ΔFDI	Δy	Δy^{us}	ΔImp	Error term
	χ^2 (2)	χ^2 (2)	χ^2 (2)	χ^2 (2)	χ^2 (2)	
ΔExpo	na	7.68**	15.08**	9.84**	2.20	-0.118**
ΔFDI	8.28**	na	1.52	1.14	5.90*	-0.764**
ΔImp	24.64**	19.94**	1.92	5.12*	na	-1.074
Δy	5.93*	1.15	n.a	9.56**	19.44**	-1.076**

y = 0.221*Expo* + 0.004*FDI* + 0.086Imp + 0.604 y^{us} + 0.008lib–2.332

Kenya

Regression	ΔExpo	ΔFDI	Δy	Δy^{us}	ΔImp	Error term
	χ^2 (2)	χ^2 (2)	χ^2 (2)	χ^2 (2)	χ^2 (2)	
ΔExpo	na	8.23**	1.53	1.76	5.67*	-0.917**
ΔFDI	9.30**	na	5.69*	5.06*	1.99	-1.172**
ΔImp	4.73*	1.61	1.71	9.17**	na	-0.619*
Δy	6.18**	3.66	na	6.12*	4.33*	-0.134

y = 0.214*Expo* – 0.014*FDI* -0.252Imp + 1.790 y^{us} +0.084lib–29.191

Nigeria

Regression	ΔExpo	ΔFDI	Δy	Δy^{us}	ΔImp	Error term
	χ^2 (4)	χ^2 (4)	χ^2 (4)	χ^2 (4)	χ^2 (4)	
ΔExpo	na	8.66**	9.86**	1.97	1.96	-0.982**
ΔFDI	11.86**	na	10.74**	1.33	9.02**	-0.941**
ΔImp	1.02	5.71*	6.41*	1.23	na	-0.982**
Δy	7.05**	4.97*	na	1.11	3.01	0.889

y = 0.059*Expo* + 0.080*FDI* +0.127Imp + 0.487 y^{us} +0.128lib+ 3.689

South Africa

Regression	ΔExpo	ΔFDI	Δy	Δy^{us}	ΔImp	Error term
	χ^2 (4)	χ^2 (2)	χ^2 (4)	χ^2 (2)	χ^2 (4)	
ΔExpo	na	7.44**	1.75	5.89*	2.21	-0.045**
ΔFDI	3.36	na	1.19	2.92	9.55**	-1.137**
ΔImp	5.84*	2.04	6.59**	1.49	na	0.466*
Δy	5.89*	7.36**	na	2.89	16.67*	-0.967*

y = 0.144*Expo* + 0.006*FDI* - 0.010Imp + 0.848 y^{us} +0.012lib–3.116

Zambia

Regression	ΔExpo	ΔFDI	Δy	Δy^{us}	ΔImp	Error term
	χ^2 (4)	χ^2 (4)	χ^2 (4)	χ^2 (4)	χ^2 (1)	
ΔExpo	na	1.91	8.01**	5.38*	7.63**	-0.329
ΔFDI	5.92*	na	2.23	4.22	2.27	-0.977**
ΔImp	5.41*	3.44	3.36	12.51**	na	0.879**
Δy	10.64**	5.76*	na	4.31	6.94*	0.968**

y = 0.177*Expo* + 0.002*FDI* +0.028Imp + 0.485 y^{us} –0.051lib–3.282

Note: ** and * denote the statistical significance at the 5 and 10 percent levels respectively. na means not applicable and in the parenthesis are degrees of freedom.

Further analyses

To further examine the importance of export, import and FDI in these African economies, we estimate a six-variable vector autoregressive (VAR) model. This is to check the robustness and sensitivity of our results. This approach is useful because it bypasses the need for potentially biased pre-tests for unit roots and cointegration, common to other formulations such as the vector error correction model (VECM) (Awokuse, 2005).

We will use a different output, export and import data from a single source. As argued by Riezman et al. (1996), this will provide a set of data that is comparable across-country on output. Considering this, we estimate equations of the form:

$$
\begin{aligned}
x_t &= \sum_{i=1}^{m} a_j x_{t-j} + \sum_{i=1}^{m} b_j gdp_{t-j} + \sum_{i=1}^{m} e_j m_{t-j} + \sum_{i=1}^{m} f_j fdi_{t-j} + \sum_{i=1}^{m} s_j y_{t-j}^{us} + \eta lib_t + e_t \\
gdp_t &= \sum_{i=1}^{m} c_j x_{t-j} + \sum_{i=1}^{m} d_j gdp_{t-j} + \sum_{i=1}^{m} g_j m_{t-j} + \sum_{i=1}^{m} h_j fdi_{t-j} + \sum_{i=1}^{m} p_j y_{t-j}^{us} + \mu lib_t + u_t \quad (6) \\
m_t &= \sum_{i=1}^{m} q_j x_{t-j} + \sum_{i=1}^{m} r_j gdp_{t-j} + \sum_{i=1}^{m} t_j m_{t-j} + \sum_{i=1}^{m} l_j fdi_{t-j} + \sum_{i=1}^{m} k_j y_{t-j}^{us} + \vartheta lib_t + v_t \\
fdi_t &= \sum_{i=1}^{m} n_j x_{t-j} + \sum_{i=1}^{m} o_j gdp_{t-j} + \sum_{i=1}^{m} \rho_j m_{t-j} + \sum_{i=1}^{m} \sigma_j fdi_{t-j} + \sum_{i=1}^{m} z_j y_{t-j}^{us} + \tau lib_t + w_t
\end{aligned}
$$

where *x* and *m* and *gdp* denote exports, imports, output (measured in term of GDP) and the other variables as defined before. As common with many time-series analyses, the testing formulation above requires a stationary time series. Otherwise variables should be transformed to stationarity. The null hypotheses to be tested are:

H_1: $c_j = 0$, j =1…m (exports fails to Granger cause output in this set-up)
H_2: $e_j = 0$, j =1…m (imports fails to Granger cause exports in this set-up)

and similar hypothesis hold for b_j, f_j, g_j, h_j, r_j, t_j, l_j, o_j, ρ_j, and σ_j.

The data on exports, imports and output are taken from Penn World Table (Mark 6.2) where total real GDP (current international dollars) is derived by multiplying CGDP and population series. Utilizing percentage shares of consumption (cc), investment (ci) and government spending (cg), we first compute current net foreign balance (cfnb) as 100-cc-ci-cg. Then, while using the variable OPEN, exports and imports are derived as ((OPEN + cfnb)/200) and ((OPEN - cfnb)/200) respectively.

Table 6 presents result of these Granger causality analyses. Some of the significant relationship we observe is that export growth causes imports growth, imports growth causes FDI growth and imports growth causes income growth: (a) exports growth causes income growh in Ghana, Kenya and South Africa where the null hypothesis of no causality running from *x* to *gdp* is rejected at the 10 percent critical level, providing evidence in favour of ELG hypothesis; (b) in each of the above countries and Nigeria, there is also evidence of indirect-causal chain where exports operate through imports to affect income, supporting the two-stage causal chain observed by Riezman et al. (1996). Thus through reliving foreign exchange constraints exports may promote imports which in turn lead to income growth; (c) in the case of Zambia, the 'growth-led exports' phenomenon is supported as opposed to ELG; and (d) we observe evidence of FDI-led exports in Nigeria and Zambia and a bidirectional Granger causal relationship between *FDI* and income in Ghana and South Africa. Overall, these results are consistent with the work of Riezman et al. (1996) and Asafu-Adjaye and Chakraborty (1999) and support the import compression hypothesis.[28] Asafu-Adjaye and Chakraborty (1999) observe that imports of intermediate and capital goods are necessary inputs in the production of exports in less developed countries and any serious imports compression can significantly and adversely affect export promotion and hence economic growth.

Table 6: Multivariate Granger Causality Analysis

Causality/Country	Ghana	Kenya	Nigeria	South Africa	Zambia
x→ gdp	0.0332	0.0743	0.6093	0.0158	0.6815
gdp→x	0.6832	0.0002	0.1707	0.6023	0.0011
x→m	0.0001	0.0836	0.0725	0.0481	0.8257
m→x	0.0031	0.2167	0.0854	0.2026	0.0004
gdp→m	0.8963	0.0739	0.3719	0.0037	0.9113
m→gdp	0.0778	0.0527	0.0345	0.0651	0.5621
fdi→x	0.8437	0.9247	0.0724	0.8809	0.0047
x→fdi	0.0049	0.3940	0.4207	0.7225	0.0744
fdi→gdp	0.0632	0.5412	0.8769	0.0514	0.6873
gdp→fdi	0.0002	0.5274	0.0881	0.0385	0.0004
fdi→m	0.8346	0.8894	0.0503	0.0231	0.2169
m→fdi	0.0436	0.0633	0.8786	0.0107	0.0234

Note: With the exception of *lib* (which enter in first-difference) all other variables in the system are in growth rates. Statistics given are marginal significance levels (or p-value) for null hypothesis of no Granger causality.

The results in Table 6 suggest, in Ghana, Kenya, South Africa and Zambia, that the null hypothesis of 'Granger no-causality from import growth to FDI growth' can be rejected at least at the 90 percent significance level. This results is in line with Pacheco-López (2005) who pointed out that an increase in imports of a specific

[28] See Asafu-Adjaye and Chakraborty (1999) and Esfahani (1991) for a detailed analysis on this.

commodity signals an investment opportunity and therefore attracts FDI in the host country to initiate local production of the commodity. Thus import growth results in a growth of FDI inflows.

The empirical evidence also show that a growth rate of imports leads to a growth in FDI inflows which in turn causes the growth rate of income. This further leads to the growth of imports, suggesting that there exist interlinkages (synergy) between FDI, *gdp* and *m* in South Africa.

The analysis so far has focused on individual SSA nations. Next, we seek to exploit the benefits of panel data estimation, given the finite-sample nature of our time series. We adopt the Pedroni (1999) estimation approach to test for cointegration which also allows for heterogeneity across individual countries in the mean and time effects. Pedroni (1999) distinguishes between 'within-dimension' or 'panel' statistics and 'between-dimension' or 'group' statistics. The former are estimators that pool the autoregressive coefficient in the unit-root tests across different countries separately while the latter set of estimators average the individually estimated coefficients for each country. The 'group' estimators allow for additional heterogeneity that makes them more robust than the 'panel' estimators in small samples in the sense that they are less susceptible to size distortions. The panel set comprises of *v* (a type of non-parametric variance ratio), ρ (the panel equivalent to the Phillips-Perron ρ-statistic), *pp* (equivalent to the Phillips-Perron *t*-statistic), and *adf* which is analogous to the augmented Dickey-Fuller *t*-statistic. The three 'group' statistics are ρ, *pp* and *adf*.

More formerly, Pedroni allows for the long-run relation of the type:

$$EC_{i,t} = Y_{i,t} - (\alpha_i + \delta_i t + X_{i,t}) \tag{7}$$

where Y is the dependent variable and **X** is a vector of regressors. It follows from the above that 'fdi', 'Expo', 'Imp' and 'y' all should be considered as dependent variables in Y. The vector of explanatory variables, X, includes 'y^{us}' and 'lib'.

For panel estimation, however, we work with per capita figures prior to taking logs, with the exception of 'y^{us}' and 'lib'. The cointegration results appear in Table 7.[29] Most of the test statistics, and especially the group statistics, reject the null hypothesis of no-cointegration. The rejection is particularly strong for the *pp* and *adf* tests, as well as the 'group' statistics. In general, panel cointegration results suggest that cointegration cannot be ruled out completely, implying that a long-run relationship between the variables does exit.

[29] Prior to the cointegration examination, we also perform a panel unit root to test the presence or absence of a unit root. With the exception of a few cases where we observe FDI to show stationarity and given various weaknesses of panel unit root technique (Karlsson and Lothgren, 2000), the null hypothesis of non-stationarity cannot be rejected.

Table 7: Pedroni Panel Cointegration Tests with Heterogeneous Trends

(a) Export equation		*(b) Income equation*	
Panel *v*-statistics	-0.2693	Panel *v*-statistics	1.2763
Panel *rho*-statistics	1.3214	Panel *rho*-statistics	-0.1347
Panel *PP*-statistics	-0.2341	Panel *PP*-statistics	-3.7998**
Panel *ADF*-statistics	-2.2987**	Panel *ADF*-statistics	-2.0840**
Group *rho*-statistics	2.0756**	Group *rho*-statistics	0.2348
Group *PP*-statistics	-0.0815	Group *PP*-statistics	-4.8383**
Group *ADF*-statistics	-0.6089	Group *ADF*-statistics	-2.0717**

(a) FDI equation		*(b) Import equation*	
Panel *v*-statistics	-0.4907	Panel *v*-statistics	0.0525
Panel *rho*-statistics	-1.9454*	Panel *rho*-statistics	0.3111
Panel *PP*-statistics	-8.8906**	Panel *PP*-statistics	-3.7371**
Panel *ADF*-statistics	-5.5991**	Panel *ADF*-statistics	-1.0462
Group *rho*-statistics	-0.6778	Group *rho*-statistics	0.9751
Group *PP*-statistics	-10.209**	Group *PP*-statistics	-4.6775**
Group *ADF*-statistics	-5.1304**	Group *ADF*-statistics	-0.9739

Note: Results with Heterogeneous time effects. All tests reported here are distributed as N (0,1). * and ** denote significance at the 10% and 5% levels, respectively.

Table 8: Panel Group FMOLS Results

(a) Export equation			*(b) Income equation*		
Variable	Coefficient	t-statistic	Variable	Coefficient	t-statistic
FDI	0.001*	1.734	FDI	0.010	0.534
y	1.237**	6.807	Expo	0.176**	6.757
Imp	0.123**	2.122	Imp	0.161**	4.385
y^{us}	0.009	0.142	y^{us}	-0.003**	2.243
lib	0.050*	1.891	lib	-0.004**	-3.656

(c)FDI equation			*(d)Import equation*		
Variable	Coefficient	t-statistic	Variable	Coefficient	t-statistic
Expo	1.779*	1.861	FDI	-0.028**	-2.086
y	0.781	1.086	Expo	0.251	1.237
Imp	1.829*	1.759	y	1.382**	3.727
y^{us}	-1.639	-1.108	y^{us}	-0.069	-0.349
lib	0.736**	2.677	lib	-0.010	-0.799

Note: Estimation with common time dummies included. * and ** denote significance at the 10% and 5% levels respectively.

Finally, we also employ Pedroni's (1999) FMOLS estimation procedure to obtain estimates of the cointegrating vector in the four long-run equations. Table 8 presents the results. The evidence here indicates that FDI, local GDP and liberalization all have a positive and statistically significant impact on exports. Also, FDI, exports and imports have a positive effect on domestic income. However, it is interesting to see that exports and FDI are complements in SSA economies. While FDI has a positive and significant influence on exports, the latter also has a significant and positive effect on FDI. The results in this part are consistent with Addison and Mavrotas (2005), who elaborate that there are several ways in which FDI can play an

impotant role in the growth process. Our findings provide evidence to support the indirect aspect of an FDI-growth linakage where exports are enhanced as a result of increased capacity and competitiveness in domestic production brought about by foreign firms and investment.

As expected, liberalization in the SSA countries is found to have a positive and significant effect on FDI together with imports. This seems to indicate that the significant financial and trade related reforms have worked to enhance market efficiency, reduce price distortions and enhance SSA countries competitiveness and acess to global market; thus promoting international capital inflows and expansion of exports. There appears to be a positive correlation between foreign income (our control variable for potential external shocks) and exports, and therefore foreign economic activity positively influence SSA's export behaviour. We also observe a negative and significant coefficient on FDI in the imports equation. As FDI level in the host country increases and multinational enterprises participate in local production, one would therefore expect a decrease in foreign imports of consumption goods in the host country.

6. Conclusions and Policy Implications

This is a timely study, given the relatively poor performance of the African countries in attracting FDI and the recent changes in their investment and trade policies.

However, FDI trends observed indicate that the region's share of global FDI inflows has not significantly improved, though the position of Africa's share seems to have improved in recent years. On the other hand, looking at the sectoral composition, FDI is no longer concentrated in a few economic sectors but is diversifying into important sectors such as manufacturing, exports and services.

With many countries implementing steps to liberalize business, economic and market environments to reduce barriers to foreign entry, the amount of foreign capital they attract should increase. Moreover, FDI inflows and its related spillovers should enhance efficiency and bring in new technology and hence contribute to economic growth.

This study investigates the short-run and long-run causality relationships between exports and growth, exports and FDI, and between growth and FDI, and growth and imports in Sub-Saharan Africa, using the new autoregressive distributed lag (ARDL) approach in the examination of a Granger type test of causality with an error correction. Moreover, the findings are further examined through the Pedroni estimation procedure which also allows for heterogeneity across individual countries in the mean and time effects. The estimation results show that bi-directional Granger causality exists between FDI and exports in Ghana, Kenya and Nigeria. For the other two countries, the Granger causality runs from FDI to exports in South Africa and from exports to FDI in Zambia. Moreover, the estimation results suggest a causal linkage from FDI to growth (income). A positive causal relation from exports and FDI to income is observed for all five African countries studied, as indicated by the estimated cointegrating vectors (only in the case of Kenya do we observe a negative impact of FDI). Finally, the statistical significance of F-statistics for joint significance of autoregressive terms and/or the error term implies a strong bi-directional causality between export and GDP growth in all five Sub-Saharan African countries. Overall, the results presented provide evidence of an indirect causal chain where exports, by

relieving foreign exchange constraints, promote imports which facilitate income growth. While taking into account other relevant macroeconomic variables (e.g. imports, external shocks and liberalization reforms) we have used both VAR/VECM specifications to ensure that causality inferences drawn are robust.

While our findings support the export-led growth hypothesis for these SSA countries, the observed causal positive links between FDI-exports and FDI-income suggest that FDI has contributed to a higher rate of economic growth directly and indirectly (through its effects on exports). Furthermore, given the limited data available, the recent policy reforms and trade and investment liberalization in some African countries may have helped to create a more open trade environment and hence generate positive net FDI benefits. Our findings support the view that FDI influences growth through technology transfer (diffusion), thereby speeding up development of new intermediate product varieties (to enhance the export base) and raising prospects of economic growth.

Consequently and based on this evidence, African countries should not only encourage FDI from overseas but also create a conducive environment and adopt more liberal policy frameworks to attract new FDI and maximize net benefits. To overcome the challenge of the 'partial reform syndrome', it is recommended that African countries carefully design and implement their reforms and take a more pragmatic and gradual approach in the process of integrating with the global economy, promoting exports and attracting FDI.

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Appendix 1: Definations and Sources of Variables Used in Regression Analysis

Variable	Defination	Source
FDI	Foreign direct investment and portfolio inflows. It is the realized FDI (US dollar). Detailed definitions and sources of terms relating to FDI is given in http://www.unctad.org/Templates/Page.asp?intItemID=3144&lang=1	UNCTAD, FDI Database.
y	Gross domestic product (current US dollars). Norminal figures for domestic and foreign GDP were deflated by GDP deflator (2000=100) for respective countries to express them in real terms. Another measure of GDP (*GDP*) is total real GDP in current international dollar derived from multiplying CGDP and population	World Development Indicators Penn World Table (Mark 6.2)
Expo/ Imp	Total exports/imports in million of US real dollars. The total nominal exports/imports in current US$ were deflated by GDP deflators for exports and imports.	World Development Indicators
x	Real exports computed as ((OPEN + current net foreign balance)/200) (see discussion under section 5).	Penn World Table (Mark 6.2)
m	Real imports computed as ((OPEN - current net foreign balance)/200) (see discussion under section 5).	Penn World Table (Mark 6.2)
Lib	Liberalization index constituting two main reforms indicators of domestic and external liberalization. Further, to inspect the consistency of the data for some countries, respective Central Banks were referred to.	Gelbard and Leite (1999), Reinhart and Tokatlidis (2003), various Central Bank Bulletins and IFS.