FOREIGN DIRECT INVESTMENT AND EXPORT DIVERSIFICATION IN DEVELOPING COUNTRIES

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Abstract

This study examines the individual and interactive impact of foreign direct investment (FDI), domestic production structure, infrastructure, natural resource endowment, and fiscal incentives on export diversification. The econometric estimation is based on a dynamic systems general method of moments (sGMM) analysis using panel data from 44 Sub-Sahara African (SSA) countries. The study finds a positive export-diversifying effect of FDI in SSA suggesting that FDI has an influence on the composition of export baskets in host economies. Furthermore, diversifying production sectors, credible institutions, and macroeconomic stability are essential for promoting export diversification, while landlockedness and natural resource endowments contribute to export concentration. The study finds that the FDI's impact on export diversification is reinforced by better access to infrastructure and fiscal incentives to foreign investors in special economic zones (SEZs). The latter results compare with findings by Farole and Moberg (2017), while the importance of infrastructure in export diversification is emphasised by Fosu (2021). The findings from this study are particularly important to SSA economies that other than having highly concentrated export baskets have in recent years faced declines in FDI albeit limited domestic capital and government resources needed to propel export diversification. SSA economies must focus on efforts to attract more FDI possibly through regulatory reforms that grant foreign investors fiscal incentives for investing in targeted sectors and operating in SEZs.

Keywords: Foreign Direct Investment, Export Diversification, Export Concentration, Natural Resource Rents, Special Economic Zones, Trade Openness.

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1. INTRODUCTION

In the last two decades, most developing countries have achieved impressive economic growth patterns, mainly attributed to export-led growth (ELG) strategies adopted in most of these countries. A strand in the development literature posits that a surge in foreign direct investment (FDI) inflows to these countries in recent years has been associated with economic growth through the export channel

(Eryiğit, 2012). However, the sustainability of the ELG strategies in these countries is a challenge for policymakers in many developing countries due to heavy dependence on primary commodity exports which exposes these countries to external commodity price shocks. This is the case for exports from Africa; they lack product and geographic diversification; they are largely concentrated in primary products and raw materials, and have few destinations mainly in developed countries. In addition, export growth in African countries in the last decade has to a greater extent been driven by an increase in value and volumes of pre-existing exports and less by new export products. Furthermore, there have been low survival rates or poor export sustenance for new exports, which lowers the intensive margin in subsequent years after the launch of the new export product. This makes the region's export basket remain concentrated in a few export flows. Thus, lack of diversification in sectors generating economic activity and revenues and consequently products that a country is exporting remains a challenge faced by policymakers in Sub-Saharan Africa (SSA).

Export diversification is vital in African countries for several reasons. Firstly, diversified exports help to insulate the economy from boom-bust cycles emanating from fluctuations in world prices of commodities and help to stabilise the economy (Herzer, Nowak-Lehmann, & Siliverstovs, 2006). Secondly, export diversification in terms of the degree of product sophistication may induce structural change and support economic development (Hausmann, Hwang, & Rodrik, 2007). Thirdly, diversified exports help to lower terms of trade, stabilise export earnings and reduce macroeconomic volatility (Bleaney & Greenaway, 2001). Lastly, diversification is gaining more relevance in SSA as countries seek to minimise the impact of climate change by moving towards low emissions and more climate-resilient products (United Nations [UN], 2018). Ironically, developing countries in SSA tend to be caught up in cycles of dependence on windfall natural resource revenues with very little incentive to invest in other sectors.

The above outlined potential benefits of export diversification have resulted in policymakers in developing countries focusing on determining diversification drivers and strategies. The empirical literature has confirmed that economic development and FDI inflows are critical drivers for export diversification (Osakwe & Kilolo, 2018; Mau, 2016; Fonchamnyo, 2015; Cadot, Carrère, & Strauss-Kahn, 2011). This, together with well-documented evidence that countries receiving high FDI inflows have witnessed accelerated growth rates through the export channel, has resulted in renewed efforts by developing countries to attract and maintain FDI in a bid to diversify their production bases.

Consequently, most developing countries have passed legislative instruments that are accommodative of foreign investment and encouraging export-oriented FDI. This has seen SSA economies receiving high FDI inflows. For instance, FDI flows to SSA rose to US$32 billion in 2018, an increase of 32% after the successive contraction in the previous two years (United Nations Conference on Trade and Development [UNCTAD], 2019). In addition, the African Continental Free Trade Area (AfCFTA) agreement is predicted to bolster regional cooperation, further increasing prospects for growth and inward FDI flows to SSA, in particular. Furthermore, the notable surge in a number of special economic zones (SEZs) in SSA is predicted to be a source of attraction for further FDI inflows to the region (UNCTAD, 2019; African Development Bank Group [AFDB], 2018). In fact, attracting FDI and export promotion are key goals of most SEZs.

Given the positive influence of export diversification on economic growth and the potential for structural change, FDI's effect on export diversification is an important policy question for SSA. Consequently, several research questions arise such as:

RQ1: How does FDI affect export expansion (pre-existing exports to new markets)?

RQ2: How does FDI contribute to "export entrepreneurship" through investments in new export lines?

RQ3: To what extent can FDI inflows in export sectors promote the sustenance of new export lines?

The aim of this study is to provide empirical answers to these pertinent questions.

Theoretically, FDI is expected to promote export diversification as it enhances developing countries' domestic productive capacities through technological diffusion and spillovers, arising from innovation, and skills and knowledge transfers. Additionally, FDI facilitates access to foreign markets through the provision of relevant information needed to gain access to foreign markets as well as linking domestic markets to wider export distribution networks. As a result, geographic product diversification is enhanced. Most importantly, is central to the diversification efforts of developing countries where domestic capital and government resources needed to propel the diversification of productive sectors are limited.

Although several studies have examined the drivers of export diversification and the benefits of FDI in developing economies, empirical research on the influence of FDI on export diversification is scant. In the case of Africa, Fonchamnyo (2015) examined the export-diversifying effects of FDI in the Central African Economic and Monetary Community (CEMAC) region but did not explore the possible conduits through which FDI can affect export diversification. This study seeks to empirically ascertain the channels through which FDI affects export diversification, in a sample of 44 SSA countries using systems generalised method of moments (sGMM) methodology for panel data.

A key contribution of the current study is that it incorporates simultaneously the roles of measures of fiscal incentives to foreign investors, infrastructure, institutions, and domestic production structure in export diversification. The incorporation of fiscal incentives to foreign investors captures recent evidence of the effectiveness of fiscal incentives in attracting export-led manufacturing FDI in SSA. Countries such as Costa Rica, Chile, the Dominican Republic, and Mauritius have attributed their export diversification success to increased FDI inflows in establishments operating in SEZs or free trade areas (FTAs)[1]. Notably, SEZs have

[1] These countries have managed to attract and protect FDI through legislations that grant foreign and local investors fiscal incentives such as tax breaks for investing in targeted sectors in the country.

been central in the structural transformation of industries in developing economies. For instance, China used SEZs to promote export-oriented industrialisation whereas SEZs in Egypt and Morocco were influential in promoting diversification (Farole & Moberg, 2017). The incorporation of measures of infrastructure and institutions captures the well-documented evidence that good infrastructure and institutional frameworks attract foreign investors. Lastly, the inclusion of the domestic production sector is justified because strong domestic structures foster development and export diversification in developing countries. As such, the emergence of FDI in the manufacturing sector in Africa in recent years should thus be reflected in surges in manufacturing exports and domestic value-added in manufacturing amongst others.

The rest of the paper is organised as follows. Section 2 gives an overview of relevant literature, while Section 3 presents stylised facts. Section 4 presents the theoretical and empirical models; Section 5 provides a discussion of the results, while the conclusion and policy recommendations are presented in Section 6.

2. LITERATURE REVIEW

2.1. Theoretical literature review

Export diversification relates to the broadening of the variety of products that a country is exporting, that is, the export of new product varieties to existing and new markets, or the export of existing product varieties to new destination markets. In fact, export diversification has two dimensions: intensive margin and extensive margin of trade. Extensive margin captures diversification in a country's export basket to existing or new geographical markets, while intensive margin accounts for the increase in the volume of existing exports to current markets.

The literature on export diversification stems from the arguments of the 18th century classical trade approaches which emphasised the benefits of free trade premised on comparative advantage, division of labour, and specialisation. However, other divergent views stated that with specialisation developing countries are forced to heavily rely on a limited set of output from the primary sector of the economy, i.e., primary commodity exports (less diversification), while importing industrial and manufactured goods. Subsequent work by other scholars confirms an inverse relationship between dependency on raw materials and agricultural exports and subsequent economic growth, referred to as the natural-resource curse (Sachs & Warner, 1999). Consequently, there has been a considerable shift of focus in development strategies towards export promotion and outward orientation since the 1980s, to reduce dependency on primary commodity exports, and therefore expand export revenues to achieve sustainable economic growth (Lederman & Maloney, 2003; Grossman & Helpman, 1991).

The correlation between foreign investment and an increase in the wealth of a nation through the export channel has received considerable attention. While the individual contributions of both FDI and export diversification in economic growth are clear, determining the link between FDI and export diversification is key to understand the degree to which FDI determines export diversification and hence sustainable economic growth. Vernon (1992) introduced the product life cycle model in international investment and trade. The model explains the shift in international trade and investment patterns, with factors such as the timing of innovation, scale economies, and uncertainties playing important roles in decisions about trade and investment.

The product life cycle model posits that when a product is invented, it is highly unstandardized. In this early stage, the focus is on the extent to which producers can vary inputs among other things; hence the inputs such as product parts and labour are sourced from the inventor's locality. As the product enters the next stage of growth, a new set of standards emerge opening up technical possibilities for economies of scale, and at this point, both product parts and labour may be outsourced from abroad. In addition, with an increase in local demand and the introduction of foreign demand germinates the idea of FDI as producers start thinking about setting up foreign subsidiaries to serve the growing demand in other countries. At this point, they weigh two options; either export or FDI, which highly depends on considerations on production costs such as transport, labour as well as tariff and non-tariff barriers. In the maturity stage of the product life cycle, the international market for the product advances and competitors enter which may give rise to the need to source product parts and labour from outside sources. An increase in requirements for production as well as increased demand from foreign markets often leads to the original producer of the product establishing a production unit in a foreign country to serve the foreign markets and compete with the entrants. The model predicts that developed countries with cutting-edge technology would import standardised products while exporting newer, high-tech products.

FDI plays an important role in transferring technology from foreign to domestic firms, through technological spillovers. New ideas and technologies used by foreign firms are diffused to domestic firms through either vertical or horizontal spillovers. These spillovers may entail the production and export of new products, which can drive economic and export diversification (Görg & Greenaway, 2003). In addition, domestic firms tend to gain more market access as they become more knowledgeable about opportunities that exist in new markets through their association with foreign firms (Banga, 2006). Resultantly, domestic firms become better placed to export to broader markets, hence promoting the export diversification base of the home economy. Furthermore, FDI stimulates research, development, and innovation in domestic economies hence facilitating technology transfer which enhances labour productivity hence efficient production of new products, and growth of tradable sectors (Grossman & Helpman, 1991).

Merlitz (2003) proposed a model of export diversification in which the more productive firms, induced by exposure to trade, produce more for the export markets relative to the less productive firms. The model assumes heterogeneous firms which pay fixed costs to supply to the domestic market and entry costs in international markets.

They also incur variable costs such as transport and insurance costs on each export item. This implies that the most productive firms are the ones that will be able to export. A firm, which learns a new way of making a product or a new management practice, increases the productivity of the firm, enabling it to produce for export. In addition, a decline in fixed costs of entering export markets or acquisition of new international networks, distribution networks, and the creation of transport infrastructure enhances prospects for developing new products, thereby diversifying export products. All these possibilities can be brought about by FDI, which targets export sectors. This model highlights the contribution of FDI in enhancing export diversification through its effects on trading costs and productivity.

2.2. Empirical literature review

Empirical studies on the role of FDI in driving economic diversification still lack consensus. Banga (2006) reported that while FDI from the United States of America contributed towards the diversification of exports from India, FDI from Japan had no influence on the structure of India's exports. Using data for 29 countries from 1990 to 2006 on instrumental variable techniques, Jayaweera (2009) found a direct link between foreign investments and export diversification. However, the study focuses on the extensive margin and excludes the effect of FDI on diversification at the intensive margin. To this end, Hummels and Klenow (2005) find evidence that larger economies' export baskets have varied products (extensive margin) compared to huge volumes of each product (intensive margin).

Tadesse and Shukralla (2013) investigate the effects of FDI on diversification in 131 countries using a number of export lines as a proxy for export diversification. The results indicate that depending on the existing FDI levels, FDI positively influences horizontal export diversification. Using a generalized linear model (GLM) to study the export-diversifying effects of FDI on the CEMAC[2], Fonchamnyo (2015) found that FDI as well as manufacturing sector value-added and trade openness drive export diversification, while natural resource rents and real exchange rate have a negative effect. Similarly, Osakwe, Santos-Paulino, and Dogan (2018) report that trade openness, good institutions, and human capital contribute to export diversification in African countries. Using data from SSA countries, Masunda (2020) found that Aid-for-Trade (AfT) enhances export diversification. Furthermore, the study reports that poor infrastructure limits the capacity of countries to diversify export products. In a recent study, Fosu (2021) finds that the impact of FDI on export diversification is higher in African countries with good infrastructure.

Agosin, Alvarez, and Bravo-Ortega (2011) investigated export diversification determinants for the period from 1962 to 2000 and report a positive relationship between export diversification and human capital while real exchange rate volatility negatively impacts export diversification. In an empirical analysis of the determinants of export diversification in 16 Southern African Development Community (SADC) countries, Espoir (2020) found a positive effect of FDI and trade openness on export diversification. Phiri (2022) employs a non-linear autoregressive distributed lag (ARDL) model on data from 17 African countries and found that public investment in sectors such as agriculture, education, and transport promotes export diversification in the long run. Similarly, Hounsou and Ayivodji (2020) also report a significant positive impact of public investment and trade openness on export diversification in 14 countries of the franc zone. Using the dynamic panel method, Iwamoto and Nabeshima (2012) found evidence that FDI has a direct effect on export diversification. The study also found that other important drivers of export diversification include lagged effects of FDI inflows, the size of the domestic economy, and trade openness.

In contrast, Kamuganga (2012) employs the conditional logit technique and bilateral trade flow data and found an indirect effect of FDI on economic diversification. This could signify that foreign investments in Africa may not directly translate to the production of new goods for export markets. On the other hand, Görg and Greenaway (2003) showed that, while technology spillovers could be positive, they could also be negative, especially to domestic firms. They argued that the positive and negative spillover effects may in fact cancel each other and make the overall effects of FDI on exports less visible. They concluded that the extent to which FDI impacts export diversification might be depended upon several factors such as contagion and a nation's domestic absorptive capacity.

It is therefore clear that there is no consensus on the link between FDI and export diversification with different studies using different variables to measure export diversification, as well as different econometric models across different economies. This study uses a comprehensive measure of export diversification which captures both the intensive and extensive margins. In addition, this study incorporates simultaneously the roles of measures of fiscal incentives to foreign investors, infrastructure, institutions, and domestic production structure in export diversification which have been identified as key determinants of export diversification in recent years. These determinants have however not been assessed simultaneously in previous studies.

3. RECENT PATTERNS IN FDI AND EXPORT DIVERSIFICATION IN SSA

3.1. FDI dynamics in SSA

Over the last three decades, FDI stock increased from approximately US$36 billion in 1990 to US$610 billion in 2018. Similarly, the share of FDI in gross domestic product (GDP) increased threefold from 10% in 1990 to about 36% in 2018 (Table 1).

[2] CEMAC countries include Chad, Congo, Gabon, Cameroon, Central Africa Republic, and Equatorial Guinea.

Table 1. Inward FDI in SSA (1990–2018)

	1990	*2000*	*2005*	*2010*	*2015*	*2018*
FDI stock: Share of total world	1.6	1.5	1.7	2	1.9	1.9
FDI stock: % GDP (gross domestic product)	10.0	27.6	27.5	30.8	32	36
FDI stock: US$ billion	36	107	197.8	402.5	500.4	610
FDI flow: % GFCF (gross fixed capital formation)	1.9	8	11	11	13	11
FDI flow: Share in total trade	2.5	7	9	9	16	10

Source: Authors' calculation based on UNCTAD (n.d.).

The share of FDI inflows in gross fixed capital formation (GFCF) recorded an upward trend from 2% in 1990 to 13% in 2015 (Table 1). There was however a notable decline in this ratio from 19% in 2007 to 11% in 2010. This may have been a result of declines in global investment flows into SSA following the 2007–2008 financial crisis. On the contrary, the share of FDI inflows in total trade recorded an upward trend between 1990 and 2015 and has remained stable at about 10% in recent years. The huge improvement in the FDI-total trade ratio between 2005 and 2015 may indicate a decline in export growth as trade partners in the developed world were affected by the global financial crises. The FDI to total trade ratio declined between 2015 and 2018, signifying an improvement in trade growth in recent years relative to FDI inflows. For instance, SSA economies registered an annual average export growth rate of 6% in 2018 up from a decline in the export growth rate of 30% in 2015.

3.2. SSA's economic and export structure

Economic and export diversification is critical for the sustainable growth of SSA countries whose economies depend on one or two sectors and too few export commodities. Other than exposing these countries to commodity price shocks, the extractive sectors are generally capital intensive and have weak links to other industries in the economies. Resultantly, an increase in investments in the extractive sectors has over the years contributed to an increased concentration of GDP in the mining sector in African economies.

3.3. Output structure

SSA economies are heavily reliant on the agriculture and mining sectors. The contribution of these two sectors to GDP averaged 30% over the 1995–2018 period with agriculture contributing a greater part (Figure A.1 in Appendix)[3]. This is not the case with other developing countries (excluding China) where the mining and agricultural sectors in these economies contributed about 10% of total GDP each during the same period. While on average agriculture contributes about 18% of GDP in SSA, there is a wide variation in the agriculture sector's share in GDP across different countries ranging from below 3% in Botswana and South Africa to more than 50% in Chad. On the other hand, there was a significant contribution by the mining sector, including utilities (gas, water, and electricity), averaging 12% over the 1995–2018 period. The high contribution of the agricultural and mining sectors to GDP underlines the concentration of output in agriculture and primary product exports.

The contribution of manufacturing to GDP has been on a downward trend from as far back as the 1980s. Figure 1 indicates that the share of manufacturing to GDP declined from about 17% in 1995 to about 11% in 2018, reflecting the slow structural transformation of SSA economies. This compares with an average of 18% for other developing countries (excluding China) exhibiting more diversified economies over the same period. On the other hand, Figure 1 highlights a sizeable increase in the region's services sector over the years. Trade services have contributed an increasing share to GDP as well as trade and employment in many SSA countries. In fact, the contribution of trade and transport services taken together demonstrates that the services sectors constituted the second largest segment in SSA economies between 1995 and 2018[4].

The upward trend in the rate of the services sector's contribution to GDP has been attributed to growth in the tourism sectors, financial services, telecommunication services, amid rapid urbanization, and the information and communication technologies (ICT) revolution in most African economies. The recent growth in services sectors especially in telecommunications, transport, and energy could significantly enhance economic diversification in African economies.

3.4. Export structure

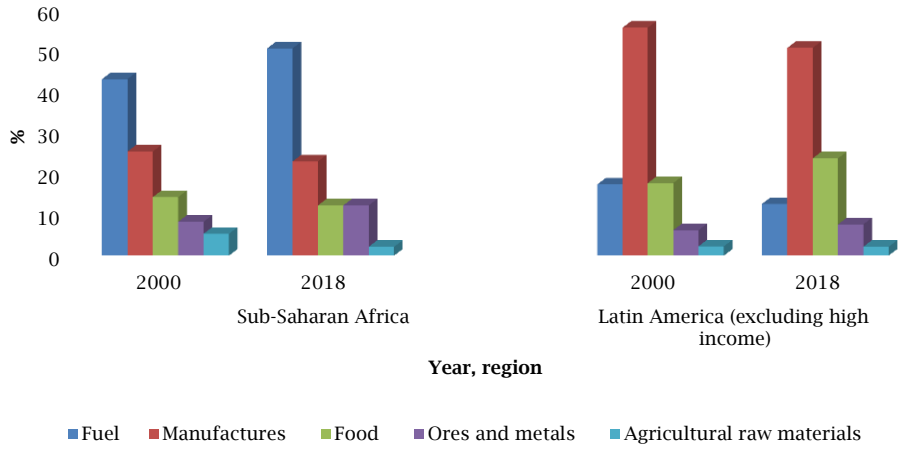
Over the past three decades, Africa as a whole has experienced very little progress in diversifying its export base. SSA's exports have remained concentrated on mainly unprocessed primary products, with commodity exports accounting for about 80% of total merchandise exports annually[5]. As illustrated in Figure 1, SSA's share of manufacturers averaged 25% in 2000 and 2018. On the contrary, Latin American countries recorded significantly high levels of manufacturing of 55% and 51% of total merchandise exports in 2000 and 2018, respectively.

[3] Agriculture provides employment to more than 55% of the labour force in the region.

[4] There has been a 6.4% growth in services in SSA over the 2000–2018 period compared to the world average of 3%. This mirrored the trend in developing economies, where trade and transport services sectors together contributed the largest share to developing economies GDP over the 1990–2018 period.

[5] In fact, commodity exports earn 90% or more of merchandise export earnings in almost half of SSA's economies.

Figure 1. Structure of merchandise exports (% total)



Notes: Categories of merchandise exports are defined and derived from UNCTAD International Merchandise Trade Data as follows: food — Standard International Trade Classification (SITC) 0, 1, 4, and 22; agricultural raw materials —SITC 2, less 22, 27 and 28; fuels — SITC 3; ores and metals — SITC 27, 28 and 68; manufactures — SITC 5, 6, 7 and 8 excluding division 68.
Source: Authors' compilations using UNCTAD (n.d.).

With respect to primary products, SSA records very high shares of primary products exports in GDP. For instance, the Republic of Congo and Equatorial Guinea recorded primary product exports as high as 72% and 67%, respectively (Gamariel & Hove, 2019). Regarding export earnings, most commodity-exporting countries rely mainly on income from either fuel or primary commodities exports. For instance, Botswana, Guinea, the Democratic Republic of Congo, and Zambia reported export earnings of at least 70% from minerals and metals between 1995 and 2018, while 50% of total export earnings for Mauritania, Sierra Leone, the Central African Republic, and Chile were also from minerals and metals during the same period (Gamariel & Hove, 2019).

3.5. Export diversification across regional blocks

Export diversification has been measured differently in literature, for instance, some studies use the number of exported products while others use concentration indices such as Gini, Herfindahl, or Theil index.

The concentration index[6] for different world regions for the 1995–2018 period is presented in Figure A.2 in Appendix. From Figure A.2, it is clear that SSA has the most concentrated (less diversified) export base. The concentration index for SSA has been on an upward trend (moving closer to 1) from 1995 reaching a peak of 0.46 in 2008 reflecting a high concentration of exports on a few products in the region. SSA exports became more diversified from 2008 to 2018 as signified by the concentration index moving close to zero. This improvement possibly signifies policies adopted after the 2008 global crisis which promoted South-South trade, intra-regional trade as well as intensified exports to low- and middle-income countries which all gave the region better opportunities for product and market diversification. On the contrary, other developing countries reported significantly low concentration indices between 1995 and 2008, recording an average of 0.25. In addition, Figure A.2 further confirms that developed economies reported low export concentration indices, recording an average concentration index of 0.05 throughout the 1995–2018 period, signifying diversified export structures.

3.6. Export diversification in SSA countries

Despite a high average export concentration index at the regional level, experiences are more varied at the country level within the SSA region. For instance, Table 2 indicates that South Africa was the most diversified economy in SSA in 1995 and maintained the top ranking in 2018. Countries such as Uganda, Mauritius, and Togo recorded remarkable export diversification between 1995 and 2018. Uganda recorded the highest decline in concentration from 0.70 to 0.27 in 1995 and 2018, respectively.

[6] The product concentration index indicates the extent to which a country's exports and imports are concentrated on a few products (UNCTAD, n.d.).

Table 2. Top ten most diversified SSA economies in 2018: Merchandise exports

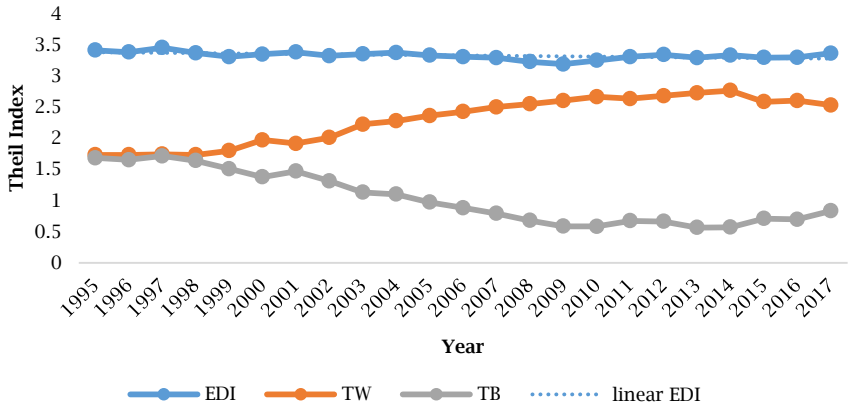
Rank (2018)	*Country*	*Concentration index: 2018*	*Concentration index:1995*	*Number of products exported: 1995*	*Number of products exported: 2018*
1	South Africa	0.13	0.11	255	254
2	Tanzania	0.21	0.26	81	204
3	Madagascar	0.21	0.23	75	171
4	Mauritius	0.22	0.36	109	159
5	Sierra Leone	0.23	0.28	42	135
6	Kenya	0.23	0.23	208	231
7	Senegal	0.24	0.22	131	198
8	Togo	0.24	0.36	99	156
9	Uganda	0.27	0.70	66	179
10	Namibia	0.28	0.34	185	190

Source: UNCTAD (n.d.).

Regarding export lines, Table 2 indicates that South Africa and Kenya have consistently exported the highest number of product lines in 1995 as well as in 2018. There was a significant increase in the number of export lines in Tanzania, from 81 in 1995 up to 204 in 2018. In terms of export concentration, South Africa, Madagascar and Tanzania recorded the least concentrated export structures in the region in 2018. Other countries fared poorly, for instance, Liberia, Gabon, Nigeria, and Angola were the least diversified economies with concentration indices above 0.8 in 1995. However, there has been a marked improvement in export diversification among these countries with Liberia and Gabon recording indices of 0.4 and 0.55 respectively in 2018. However, it is worth noting that countries such as Guinea-Bissau (0.88), Botswana (0.88), and Angola (0.93) remain at the bottom tail of the concentration index, indicating that exports from these economies were highly concentrated on a few product lines in 2018.

An alternative export diversification index used in literature is the Theil index. We compute the Theil index for 44 countries from the SSA region using Standard International Trade Classification (SITC) Revision 3 trade data from the UNCTAD statistics database for the period 1995 to 2017, to illustrate the export diversification trends in SSA. Figure 2 illustrates our computed main Theil index as well as the decomposed export variation, i.e., intensive (share of export volumes across existing products — TW) and extensive (concentration in the number of export lines by country — TB) export margins. The higher (lower) the value of an index, the less (more) diversified an economy is.

Figure 2. The Theil index for export diversification in SSA (averages 1995–2017)



Notes: EDI: export diversification index; TW: share of export volumes across existing products; TB: concentration in the number of export lines by country.
Source: Authors' computation using UNCTAD (n.d.).

Figure 2 shows that there was a general decline in the overall export diversification index (EDI) in SSA from 1995 to 2017 indicating an improvement in export diversification in the SSA region. Despite these improvements, there were notable increases in EDI during 1996–1997, 1999–2005, as well as 2009–2017 periods indicating a decline in export diversification. It is also clear that existing exports in the region lost market share over time, i.e., there was a decline in SSA's share of exports in total world exports. This is signified by the upward trend in the TW index, indicating a decrease in diversification on the intensive margin for SSA exports. On the other hand, SSA exports have become more diversified on an extensive margin as indicated by the decrease in the TB index from 1.7 in 1995 to 0.83 in 2018. This suggests that SSA's export base has broadened, with new exports being introduced over time.

4. METHODOLOGY

The theoretical literature review above informs the theoretical framework of this study. It is clear that theoretically, FDI has an influence on export diversification through its role in enhancing technological transfers from multinational corporations to the domestic economy. FDI brings in the capital, technology, and expertise along with better access to international markets. Thus, the export diversifying effect of FDI arises from the higher tendency of foreign firms to be export-

oriented and through spillover effects to domestic firms. Export activities of foreign firms tend to reduce the export costs of their domestic counterparts and consequently expansion in active export lines hence contributing towards intensive diversification. Therefore, FDI augments export diversification. Other potential drivers of economic diversification include macroeconomic environment, productivity, institutional structures, trade openness, and fiscal incentives in form of special economic zones, resource endowments, and physical infrastructure amongst others. This study tests the hypothesis that FDI has a positive direct and indirect effect on export diversification in SSA countries. The following is a theoretical model that will be tested empirically in this study.

$$EDI = f(FDI, prod, macro, sez, infra, nrr, prodstr, open, fsd, llock, inst) \quad (1)$$

where, *EDI* is the export diversification index, *FDI* is foreign direct investment, *prod* is productivity, *infra* is the number of fixed telephone lines a proxy for infrastructure, *macro* is real gross domestic product (GDP) per capita, and *sez* is fiscal incentives through the special economic zones, *open* is trade openness, *fsd* is financial sector development, *nrr* is natural resource endowments, *inst* is a measure of institutional quality, *llock* is a dummy variable that indicates if a country is landlocked or not, and *prodstr* measures how diversified the domestic production structure of a country is.

4.1. Empirical model

The empirical model is presented below:

$$D_{it} = aD_{it-1} + \beta' X_{it} + \eta_i + \varepsilon_{it},\ i = 1, \dots N; t = 1, \dots T \quad (2)$$

where, D_{it} is the export diversification index, X_{it} is a set of determinants of export diversification including FDI, η_i represents country-specific effects, while the error term is denoted by ε_{it}. Lastly, t and i are time (in years) and country subscripts respectively.

Estimating equation (2) using ordinary least squares has several challenges and is likely to yield biased and inconsistent estimators. First, the model does not cater to endogeneity bias, potentially from some of the explanatory variables such as production structure. In this case, there could be a possibility of reverse causation between export diversification and production structure. Second, the model may fail to account for unobserved heterogeneity which may be caused by omitted variables. Such omission may likely result in serial correlations between the error term and some independent variables. Third, the lagged export diversification variable D_{it-1} possess further challenges as it is correlated with country-specific effects η_i.

In order to address these potential problems, we make use of the sGMM methodology. This methodology was proposed by Arellano and Bond (1991) and Blundell and Bond (1998) and was employed by Gamariel and Hove (2019). The methodology allows for the identification of country-specific effects control for the endogenous bias caused by some independent variables. In addition, in order to get rid of panel effects, the model makes use of instruments after taking the first differences of equation (2)[7]. Furthermore, making use of instruments takes care of the omitted variable problem.

Blundell and Bond (1998) combine the equation in first differences with the one in levels using relevant moment conditions resulting in a systems estimator that yields consistent and efficient parameter estimates[8]. This study, therefore, employs the sGMM as it addresses the issue of endogeneity arising from, for instance, exporting more products (diversification) may enhance industrialisation resulting in an expanded share of manufacturing value-added in GDP (*pdnstruc*). Similarly, while FDI can affect economic diversification, the diversification of the economy can also help to attract FDI.

To test whether the instruments are valid and that there is no serial correlation in the error term, we employ the Sargan test of over-identifying restrictions. In addition, we employ a test suggested by Blundell and Bond (1998), Arellano and Bover (1995), and Arellano and Bond (1991) which tests for second-order serial correlation in the first-differenced residuals. To test the robustness of the sGMM method, this study considers two-stage least squares (2SLS) estimation that also deals with the potential endogeneity problem. These models are estimated using Stata 16.

4.2. Data and variables

The dependent variable is export diversification (*ED*). We compute an export diversification index (*EDI*) for a database of 44 countries from the SSA region over the 1995–2017 period using SITC 3-digit level (255 product lines) trade data to compute EDI[9]. The countries in our sample are presented in Table A.1 in Appendix. Trade data is obtained from the UNCTAD database. *EDI* of a country is a Theil index calculated following Cadot et al. (2011) and IMF (2014a). We follow IMF (2014a) by first categorising exports into three groups: traditional, new, or non-traded[10]. The overall Theil index is then calculated as follows:

$$T = \frac{1}{n}\sum_{k=1}^{n} \frac{X_k}{\mu} ln\left(\frac{X_k}{\mu}\right) \quad (3)$$

$$\mu = \frac{1}{n}\sum_{k=1}^{n} X_k \quad (4)$$

where, *X* represents export value, *k* represents each of the groups: new, non-traded and traditional (IMF, 2014a). This index is decomposed into intensive and extensive components. The extensive component for each country/year is given by:

$$TB = \sum_{k=1}^{n} \frac{N_k}{N}\left(\frac{\mu_k}{\mu}\right) ln\left(\frac{\mu_k}{\mu}\right) \quad (5)$$

and the intensive Theil index is calculated as:

[7] For a detailed discussion of the GMM methodology with balanced and unbalanced panel data, see Mau (2016) and Moral-Benito, Allison, and Williams (2019), respectively.

[8] See Gamariel and Hove (2019) for a discussion on the moment conditions.

[9] The International Monetary Fund (IMF, 2014b) has similar data for SSA countries, but only up to 2014. Our data compares favourably with the IMF data for same countries and years.

[10] See IMF (2014a) for definition of the categories: traditional, non-traded and new goods.

$$TW = \sum_{k=1}^{n} \frac{N_k}{N} \left(\frac{\mu_k}{\mu}\right) \frac{1}{N_k} \sum_{k=1}^{n} \frac{X_i}{\mu} ln\left(\frac{X_i}{\mu_k}\right) \quad (6)$$

where, N_k the sum of products that each group exports and μ_k/μ are the relative means of each group's exports. Higher values of the Theil index denote higher degrees of concentration. The indices we construct compare very well with the IMF diversification indices. The Theil index is used extensively in export diversification literature.

This study also uses other variables as an alternative measure of export diversification; the number of goods exported by a country per annum. Data on this count variable is obtained from UNCTAD (n.d.).

Foreign direct investment (FDI) is "an investment made by a resident enterprise in one economy (direct investor or parent enterprise) with the objective of establishing a lasting interest in an enterprise that is resident in another economy (direct investment enterprise or foreign affiliate" (UNCTAD, n.d.). We use a share of FDI flows in GDP.

4.3. Other explanatory variables

The share of natural resource rents in GDP (*nrr*) is expected to be negatively correlated with economic diversification as resource-rich countries are likely to have less diversified export structures. Infrastructure (*infra*) controls the effect of infrastructure in production and trade costs on economic diversification. Fiscal incentives (*sez*) have helped many developing countries to attract and retain FDI while expanding output on exports. Manufacturing value added in GDP (*pdnstruc*) captures the degree to which the domestic production sector of a country is diversified. We postulate that a strong domestic structure fosters development and reduces a country's export concentration. The effect of geographic characteristics is captured by a dummy variable for land-locked (*llock*) countries. We also include variables to control for productivity (*prod*) which has an effect on diversification through the production of new products and enhancement of efficiency in the economy. Similarly, we control for the effects of the degree of openness (*open*) and financial sector development (*fsd*), proxied by the ratio of private sector credit in GDP. Lastly, we control for the macroeconomic environment (*GDPpc*) and institutional quality (*inst*). A summary of these variables, data sources, and expected relationship with the dependent variable is given in Table A.2 in Appendix.

5. RESULTS ANALYSIS

5.1. Baseline model

We regress the export diversification index on FDI and control for other explanatory variables in a sGMM framework. The estimation results are presented in Table 3 below. The diagnostic tests show evidence of correct model specification and that instruments used to take care of endogeneity are valid. The model is therefore appropriate for dynamic sGMM estimation. The dependent variable measures export concentration, as such estimated coefficients with a positive (negative) sign, are interpreted as having negative (positive) effects on export diversification.

The results presented in Table 3 indicate the high persistence of export diversification. The coefficient on lagged *EDI* is below 1 in all the specifications, indicating that export diversification is dynamically stable. There is evidence of a positive export-diversifying effect of *FDI* in the SSA region, with the *FDI* coefficient consistently negative and significant in all specifications, albeit at a 5% level. These empirical results seem to suggest that export activities from foreign investments within host countries have some influence on the composition of the export basket of the host economy, possibly from spillover effects on host economies. This result is consistent with findings from Iwamoto and Nabeshima (2012) who report that efficiency-seeking investments directed towards non-traditional sectors potentially diversify the export structure of the host country. Similarly, Osakwe et al. (2018) and Fonchamnyo (2015) report that high *FDI* inflows encourage export diversification in developing countries and the CEMAC region respectively.

Table 3. FDI and export diversification in SSA: sGMM estimation results

Regressand: EDI					
Variables	***(1)***	***(2)***	***(3)***	***(4)***	***(5)***
EDI_1	0.60*** (0.098)	0.58*** (0.096)	0.56*** (0.098)	0.56*** (0.10)	0.53***
FDI	-0.03 (0.021)	-0.06* (0.002)	-0.05** (0.002)	-0.02* (0.002)	-0.03** (0.001)
pdnstruc	-0.03* (0.180)	-0.03** (0.017)	-0.03* (0.018)	-0.03* (0.018)	-0.02** (0.014)
nrr	0.06 (0.046)	0.05 (0.005)	0.05* (0.004)	0.01** (0.004)	0.08** (0.005)
infra	-0.08* (0.050)	-0.12* (0.044)	-0.11* (0.068)	-0.06* (0.043)	-0.02* (0.071)
inst		-0.01*** (0.006)	-0.02*** (0.003)	-0.02*** (0.005)	-0.02**** (0.005)
llock			0.67* (0.03)	0.71** (0.028)	0.69** (0.235)
fsd				-0.01*** (0.005)	-0.01** (0.004)
macro					-0.001** (0.004)
Constant	1.22***	1.48***	1.90***	1.518***	2.1987**
[1] Wald chi[2]	847***	1192***	1051***	941***	1172***
AR (1)	-3.096***	-3.172***	-3.1233***	-3.0969***	3.3791***
AR (2)	0.414	0.619	0.479	0.450	0,038

*Notes: Robust standard errors in parentheses;*** p < 0.01, ** p < 0.05, * p < 0.1.*
[1] Wald statistic: the null hypothesis (H_0): All coefficients are zero.
AR (1) and AR (2) tests for 1st and 2nd order autocorrelation. H_0: No autocorrelation of residuals.

Pdnstruc, the variable capturing the degree to which the domestic production sector is diversified has the expected sign though significant at 5% in most specifications. This confirms that large industrial bases reduce export concentration thereby promoting export diversification in a country. These results are similar to those of Osakwe et al. (2018) and Fonchamnyo (2015). As expected, our results suggest that a stable macroeconomic structure (*macro*), well-established institutions (*inst*), as well a well-developed financial sector (*fsd*) could help countries reduce export concentration as confirmed by the negative and significant coefficients on these variables. The results also confirm that the availability of good infrastructure (*infra*) reduces export concentration, though the effect is weak. Elhiraika and Mbate (2014) report that infrastructure has a positive and significant effect on export diversification confirming that better infrastructure reduces investment risk thereby enhancing export diversification. Fosu and Abass (2019) posit that domestic credit and governance (good institutions) enhance export diversification in Africa. Similarly, Fonchamnyo (2015) and Elhiraika and Mbate (2014) find an inverse relationship between per capita GDP and export concentration confirming the positive influence of macroeconomic development on export diversification.

On the contrary, *nrr* has a positive sign as expected but significant at a 10% level in only two of the specifications. This result suggests that rents from natural resources increase export concentration in resource-rich nations. Osakwe and Kilolo (2018) find strong evidence that high reliance on natural resources impedes export diversification while Lederman and Maloney (2007) argue that resource-rich economies tend to have high export concentrations. Furthermore, Lejárraga and Ragoussis (2018) confirm a high concentration of FDI in natural resource sectors in the Middle East and North Africa. Similar to findings by Fosu and Abass (2019) and Fosu (2021), the coefficient on *llock* is positive and significant, confirming that landlocked nations are likely to have less diversified export structures since they have greater trade costs compared to countries located near coastal ports.

5.2. Analysis of channels

We interacted with FDI with several variables to analyse the possible channels through which FDI could affect export diversification in the SSA region. The results are presented in Table 4.

Table 4. Interaction effects: sGMM estimation results

Regressand: EDI				
Variables	***(1)***	***(2)***	***(3)***	***(4)***
EDI_1	0.53*** (0.069)	0.47*** (0.087)	0.57*** (0.062)	0.52***
FDI	0.01* (0.002)	0.01** (0.007)	-0.003 (0.002)	0.004* (0.01)
pdnstruc	-0.02* (0.014)	-0.01* (0.01)	-0.03* (0.014)	-0.03* (0.014)
nrr	0.07* (0.005)	0.01** (0.006)	0.01* (0.005)	0.007 (0.004)
infra	-0.21* (0.07)	-0.005 (0.070)	-0.05 (0.070)	-0.03* (0.071)
inst	0.02*** (0.005)	0.06** (0.004)	0.013*** (0.005)	0.08*** (0.005)
llock	-0.69*** (0.23)	-0.245** (0.025)	-0.17*** (0.065)	-0.27*** (0.224)
fsd	-0.01** (0.004)	-0.01** (0.003)	-0.01* (0.005)	-0.08* (0.005)
macro	0.001** (0.004)	-0.002*** (0001)	0.008** (0.004)	-0.001)** (0.004)
FDI_infra	-0.006*** (0.003)			
sez		-0.007 (0.007)		
FDI_sez		-0.262** (0.014)		
prod			-0.001 (0.002)	
FDI_prod			-0.002 (0.009)	
open				-0.002 (0.002)
FDI_open				-0.004*** (0.0001)
Constant	2.23*	2.16*	2.34**	2.22**
[1] Wald Chi[2]	771***	646***	809***	889***
AR (1)	-3.74***	-3.36***	-3.57***	-3.6***
AR (2)	0.031	0.192	0.299	0.224

*Notes: Robust standard errors in parentheses; *** p < 0.01, ** p < 0.05, * p < 0.1.*
[1]Wald statistic: the null hypothesis H_0: All coefficients are zero.
AR (1) and AR (2) tests for 1st and 2nd order autocorrelation. H_0: No autocorrelation of residuals.

Firstly, we interact with FDI and infrastructure variables. The interaction term, *FDI_infra*, has a negative and highly significant coefficient which seems to ascertain the notion that good infrastructure by reducing investment risk, attracts foreign investors and in turn fosters economic

development and export diversification in host countries. These results complement those of Wekesa, Wawire, and Kosimbei (2016) who find that the better the infrastructure a country has the more likely such a country will attract more FDI as better quality infrastructure would allow multinational cooperates (MNCs) to operate at their optimal efficiency levels. The consequent spillover effects from MNCs would foster the production of no-traditional products hence diversifying the export basket.

The negative and significant coefficient of FDI interacted with the presence of a special economic zone suggests that fiscal incentives in SSA reinforce FDI in reducing concentrated export baskets in host nations. This concurs with the observation that increased incentives and setting up of SEZ in recent years in SSA was going to be one of the major sources of attraction of further FDI inflows to the region. Furthermore, Lejárraga and Ragoussis (2018) posit that the extent to which FDI benefits host countries in different sectors depends on the host economy's framework conditions and policies, among others. In fact, countries such as Mauritius have managed to attract and protect FDI through legislation that grants foreign investors fiscal incentives such as tax breaks for investing in targeted sectors in the country, resulting in more diversified export products. Similarly, Mosley (2018) posits that duty exemptions on manufacturing firms in export processing zones were a critical driver in diversifying the export structure in Mauritius.

Zeng (2015) reports that SEZ projects implemented by China in some SSA countries provide evidence of attracting investments and positively contributing to productive capacities and diversified export products in these economies. Similarly, Scheepers (2013) identified a direct correlation between SEZs and FDI in South Africa. On the other hand, Lejárraga and Ragoussis (2018) confirm that MNCs make significant contributions to outcomes such as productivity, skills transfer, export orientation, and diversification of host nations. Taken together, these findings seem to suggest that government incentives targeted towards MNCs potentially boost export sectors in host economies.

To test the openness channel, we interact with FDI and the trade openness variable. The coefficient on the interacted term is negative and significant suggesting that FDI has a positive influence on export diversification in open economies compared to closed economies. This result echoes the findings by Onyeiwu and Shrestha (2004) that more open economies are likely to attract FDI more than closed economies.

Lastly, we interact FDI and the productivity variable to test the complementarity effect of FDI on productivity in enhancing export diversification. As expected, the coefficient on the interacted variable is negative, however, the effect is statistically insignificant.

5.3. Robustness tests

We subject our baseline results to some robustness tests. First, we use a different model specification, 2SLS as well as an alternative measure for export diversification.

5.3.1. Alternative model specifications

The 2SLS model accounts for possible endogeneity between the regressand and some independent variables[11]. There is a possibility of simultaneity bias between export diversification and domestic production structure. For instance, while diversifying the production structure is essential for export diversification, an increase in a wide variety of exports may in turn foster domestic production capacities and hence inflate the share of manufacturing value-added in GDP. In this alternative specification, we instrument *pdnstruc* with its first lag. The Hansen's J test statistics are reported for the estimations in Table A.3 in Appendix. The results obtained from this model and presented in Table A.3 validate our baseline results. For instance, more FDI inflows in a country enhance the country's export diversification. Similarly, a positive coefficient on production structure supports our hypothesis that large industrial bases enhance a country's export diversification. The results on natural resource rents, institutions, and financial sector development are also significant and consistent with our results from the sGMM model presented in Table 3.

5.3.2. Alternative diversification measure

This study considers alternative export diversification measures to test the robustness of the baseline model. We consider the annual number of export lines for a country. For this variable, more export lines signify a diversified export structure. The results presented in Table A.4 column 1 in Appendix, indicate that indeed FDI positively impacts export diversification. Furthermore, the results indicate that providing better access to infrastructure; financial sector development, good institutions, and economic development promote export diversification. Their effect on domestic production structure is positive, though not significant. On the contrary, the coefficient on the natural resource rents is negative but insignificant while the dummy variable for landlocked countries is negative and significant.

Regarding interaction effects, Table A.4 columns 2 to 5 confirm that infrastructure, special economic zones, productivity, and trade openness are key channels that which the impact of FDI is translated into diversifying export sectors. However, the effect of the interactive term on trade openness, *FDI_open*, is weakly significant while the interactive term on productivity *FDI_prod* is statistically insignificant. Overall, these results confirm our earlier results, presented in Table 3, obtained by using a different export diversification measure, the Theil index.

6. CONCLUSION

This study empirically investigated the determinants of export diversification in a panel of 44 SSA countries paying particular attention to the individual and interactive impact of foreign direct investment, domestic production structure, infrastructure availability, natural resource endowment, and fiscal incentives availed through SEZ.

The study uses two measures of export diversification the number of goods exported by

[11] In our baseline estimations, the sGMM model is adopted to control for any possible endogeneity of explanatory variables (Mau, 2016).

each country per annum (number of export lines), and the export diversification variable which is a Theil index computed over the 1995–2017 period using SITC Revision 3 (255 product lines) trade data. The trade data is from UNCTAD database. The econometric estimations were done using the sGMM methodology adopted from Arellano and Bond (1991) and Blundell and Bond (1998).

Our results suggest high persistence of the export diversification variable, though stable as confirmed by the positive coefficient on lagged export diversification index. Our results suggest that FDI has a positive impact on export diversification, confirming our theoretical assertion that FDI promotes export diversification as it enhances developing countries' domestic productive capacities through technological diffusion and spillovers; through MNCs facilitating access to foreign markets, and augmenting domestic capital and government resources needed to propel diversification of productive sectors. Furthermore, large industrial bases reduce export concentration thereby promoting export diversification in a country. As expected, our results suggest that good macroeconomic and governance structures, availability of infrastructure, as well as well-developed financial sectors, could help countries reduce export concentration. On the contrary, our results suggest that countries that are landlocked and those with abundant natural resource endowments have less diversified export structures. Regarding the analysis of channels, our results suggest that infrastructure, fiscal incentives from SEZ, and trade openness reinforce FDI in reducing concentrated export baskets in host nations. This study finds no evidence of the complementarity effect of FDI on productivity in enhancing export diversification.

Our results have some key policy implications. First, in order to reduce the current concentrated export baskets, SSA countries must focus on efforts to attract more foreign direct investment given its significant individual and interactive effect on export diversification. Second, regulatory reform efforts that grant foreign investors fiscal incentives, such as tax breaks for investing in targeted sectors and operating in SEZ, will attract and protect FDI as well as help diversify the productive capacities of domestic industries and export bases. Lastly, there is a need for SSA governments to develop better infrastructure, institutions and financial sectors as these are key drivers for attracting FDI and export diversification.

The results from this study have provided critical evidence that resource-rich countries seem to have low levels of export diversification. It is important that future research focuses on how resource-rich countries can leverage natural resources to foster savings and investment that could be used to fund the development of other sectors. Future empirical investigations may also focus on the extent to which savings from natural resource rents, such as sovereign wealth funds, influence the export structure of developing nations especially those reliant on primary commodity exports.

Despite establishing that the presence of SEZ in host countries reinforces FDI in diversifying countries' export bases, one limitation of this study is that it does not examine the specific fiscal incentives offered to industries that operate in these economic zones. While this was beyond the scope of this study, future research may consider examining these specific incentives. Results from such studies will assist policymakers to identify conduits through which FDI impacts export diversification.

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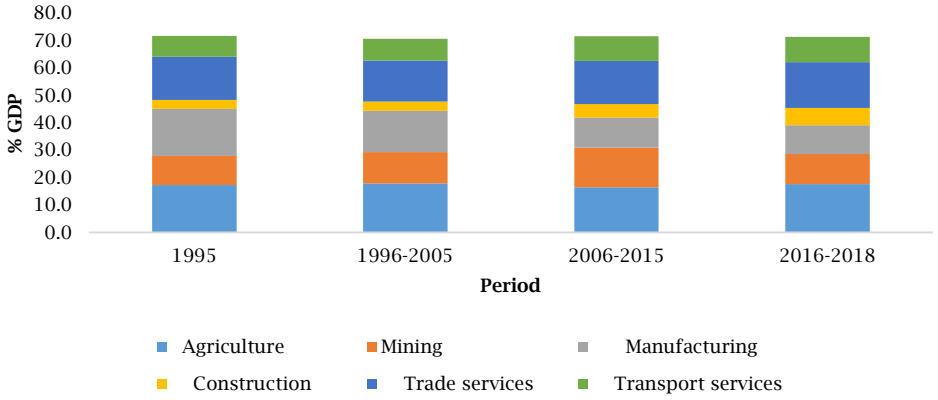
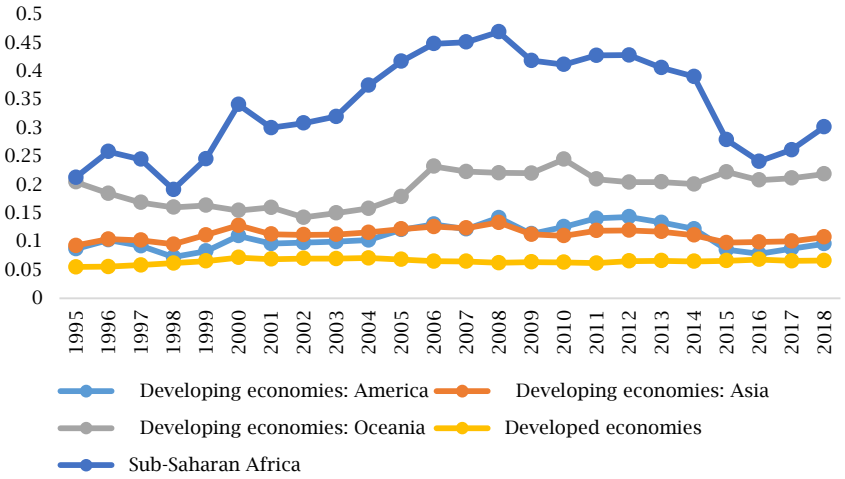
APPENDIX

Figure A.1. Sectorial shares of GDP in SSA



Source: Authors' calculation based on UNCTAD (n.d.).

Figure A.2. Export concentration index: 1995–2018



Source: UNCTAD (n.d.).

Table A.1. Countries in sample

Code	*Country*	*Code*	*Country*	*Code*	*Country*
1	Angola	16	Gabon	31	Niger
2	Benin	17	Gambia	32	Nigeria
3	Botswana	18	Ghana	33	Rwanda
4	Burkina Faso	19	Guinea	34	Senegal
5	Burundi	20	Guinea Bissau	35	Seychelles
6	Cabo Verde	21	Kenya	36	Sierra Leone
7	Cameroon	22	Lesotho	37	South Africa
8	CAR	23	Liberia	38	Sudan
9	Chad	24	Madagascar	39	Swaziland
10	Comoros	25	Malawi	40	Tanzania
11	Congo	26	Mali	41	Togo
12	Côte d'Ivoire	27	Mauritania	42	Uganda
13	The Democratic Republic of Congo	28	Mauritius	43	Zambia
14	Equatorial Guinea	29	Mozambique	44	Zimbabwe
15	Eritrea	30	Namibia		

Table A.2. Variable definition and data sources

Variable and acronym	*Definition*	*Expected relationship*	*Source*
Export diversification index (EDI)	The EDI is constructed using trade data for a country's exports	Dependent variable	UNCTAD (n.d.)
Export lines (EL)	Number of goods a country exports each year	An alternative measure of the dependent variable	UNCTAD (n.d.)
Foreign direct investment (FDI)	FDI as a percentage of GDP	Positive	UNCTAD (n.d.)
Productivity (prod)	GDP per person employed	Positive	UNIDO (n.d.)
Openness (open)	The ratio of the sum of imports and exports to GDP	Positive	World Bank (n.d.)
Macroeconomic environment (macro)	Real GDP growth of a country	Positive	World Bank (n.d.)
Production structure (pdnstruc)	Share of manufacturing value-added in GDP	Positive	World Bank (n.d.)
Infrastructure (infra)	Fixed telephone subscriptions (per 100 people)	Positive	World Bank (n.d.)
Natural resource rents (nrr)	Share of natural resource rents in GDP	Negative	UNCTAD (n.d.)
Special economic zones (sez)	Fiscal incentives to investors	Positive	Newman and Page (2017), Akinci and Crittle (2008)
Land locked country (llock)	Dummy variable: 0 = landlocked, 1 = otherwise	Negative	
Institutional quality (inst)	Regulatory efficiency index computed using data from Heritage Foundation on three aspects: business freedom, labour freedom, and monetary freedom	Positive	The Heritage Foundation (n.d.)
Financial sector development (fsd)	The ratio of private sector credit to GDP	Positive	World Bank (n.d.)

Table A.3. FDI and export diversification in SSA: 2SLS estimation results

Regressand: EDI				
Variables	***(1)***	***(2)***	***(3)***	***(4)***
FDI	0.01* (0.002)	0.01** (0.007)	-0.003 (0.002)	0.004* (0.01)
pdnstruc	-0.02* (0.014)	-0.01* (0.01)	-0.03* (0.014)	-0.03* (0.014)
nrr	0.07* (0.005)	0.01** (0.006)	0.01* (0.005)	0.007 (0.004)
infra	-0.21* (0.07)	-0.005 (0.070)	-0.05 (0.07)	-0.03* (0.071)
inst	0.02*** (0.005)	0.06** (0.004)	0.013*** (0.005)	0.08*** (0.005)
llock	-0.69*** (0.23)	-0.245** (0.025)	-0.17*** (0.065)	-0.27*** (0.224)
fsd	-0.01** (0.004)	-0.01** (0.003)	-0.01* (0.005)	-0.08* (0.005)
macro	0.001** (0.004)	-0.002*** (0.001)	0.008** (0.004)	-0.001)** (0.004)
FDI_infra	-0.006*** (0.003)			
sez		-0.007 (0.007)		
FDI_sez		-0.262** (0.014)		
prod			-0.001 (0.002)	
FDI_prod			-0.002 (0.009)	
open				-0.002 (0.002)
FDI_open				-0.004*** (0.0001)
Constant	2.23*	2.16*	2.34**	2.22**
[1] Wald Chi[2]	771***	646***	809***	889***
Hansen p-value	-3.74***	-3.36***	-3.57***	-3.6***

*Notes: Robust standard errors in parentheses;*** p < 0.01, ** p < 0.05, * p < 0.1.*
[1] Wald statistic: the null hypothesis (H_0): All coefficients are zero.

Table A.4. Alternative diversification measure

Regressand: Export lines					
Variables	***(1)***	***(2)***	***(3)***	***(4)***	***(5)***
EL_1	0.65*** (0.049)	0.64*** (0.049)	0.68*** (0.047)	0.63*** (0.055)	0.65*** (0.047)
FDI	0.09** (0.043)	0.14** (0.065)	0.16 (0.007)	0.08* (0.04)	0.10* (0.06)
pdnstruc	0.26 (0.26)	0.038 (0.33)	0.041 (0.034)	0.15* (0.19)	-0.26* (0.02)
nrr	-0.04 (0.12)	-0.10 (0.12)	-0.10 (0.10)	-0.04 (0.012)	-0.04 (0.015)
Linfra	0.48*** (0.05)	0.21 (0.20)	0.47*** (0.070)	0.45*** (0.08)	-0.49*** (0.15)
inst	0.16*** (0.058)	0.15*** (0.06)	0.12** (0.06)	0.017*** (0.064)	0.16*** (0.058)
llock	-0.043* (0.027)	-0.043 (0.027)	-0.11 (0.025)	-0.17 (0.065)	-0.007 (0.01)
fsd	0.36*** (0.09)	0.29** (0.13)	0.35*** (0.10)	0.28** (0.11)	0.36*** (0.09)
macro	0.13* (0.08)	0.24* (0.13)	0.20** (0.09)	0.13* (0.09)	0.13* (0.04)
FDI_infra		0.001* (0.002)			
sez			-0.32 (0.06)		
FDI_sez			0.24** (0.014)		
prod				0.002 (0.002)	
FDI_prod				0.0003 (0.0004)	
open					-0.0001 (0.055)
FDI_open					0.001 (0.0001)
Constant	14.45**	12.08**	17.94*	13.41**	14.58**
[1] Wald Chi[2]	434***	325***	626***	409***	449***
AR (1)	-4.42***	-4.48***	-3.41***	-3.37***	-4.39***
AR (2)	1.59	0.985	0.139	0.263	1.633

*Notes: Robust standard errors in parentheses;*** p < 0.01, ** p < 0.05, * p < 0.1.*

[1] Wald statistic: the null hypothesis (H_0): All coefficients are zero.

AR (1) and AR (2) tests for 1st and 2nd order autocorrelation. H_0: No autocorrelation of residuals.