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Research Article

Export Diversification Effects of Aid for Trade in sub-Saharan Africa

Stein Masunda*

Department of Agriculture Economics and Development, Midlands State University, P. Bag 9055, Senga Road, Gweru, Zimbabwe

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ABSTRACT

This paper uses panel data of 42 sub-Saharan Africa countries from 2005 to 2015 to examine the effect of aid for trade (AfT) on export diversification. The average Hirschman-Herfindahl index measure of 0.77 indicates that the export basket of sub-Saharan African countries is very narrow. This is further supported by the low number of active products lines, about 100 products on average measured at the Standard International Trade Classification (SITC) 3-digit level. Empirical results indicate that export diversification in sub-Saharan Africa is enhanced by particularly AfT that is directed toward improving productive capacity.

1. INTRODUCTION

Africa has rated poorly in terms of its export structure, and has been grappling with a number of challenges that have compromised its participation in international trade. Among the challenges facing developing countries, particularly in sub-Saharan Africa (SSA), are the supply-side constraints, which include poor export facilitation infrastructure (e.g., inefficient ports, inadequate roads, unreliable electricity, and poor communications), and a lack of necessary technology and knowledge to meet product standards (e.g., sanitary measures, technical barriers, and certification) prevailing in high-value markets (Stiglitz and Charlton, 2006). These problems have limited the capacity of African countries to increase the volume and added value of their exports, diversify export products and export markets, as well as attract foreign direct investment to contribute toward their diversification efforts (Stiglitz and Charlton, 2006).

Export diversification, which can either be by product or market, is a critical element in the growth of an economy. In whatever form, diversification helps countries to withstand negative external demand shocks and generate stable income flows (Tsivadze, 2011). SSA countries have heavily depended on exporting primary and natural resource products while importing manufactured goods to foster economic development. Through diversification, however, SSA can boost growth-enhancing exports (Brenton and Newfarmer, 2007).

In light of the challenges undermining developing countries' trade performance, the World Trade Organization (WTO) and the Organization of Economic Cooperation and Development (OECD) instituted the Aid for Trade (Aft) initiative, in the mid-2000s, to assist developing countries trade effectively. SSA countries have historically suffered from supply-side constraints and high trade costs, resulting in poor export performance (Prihoda, 2016). Therefore, Aft initiatives that lower supply-side constraints and trade costs are likely to spur exports and growth in the region.

Since the inception of the above initiative, international institutions have increased their participation in promoting market access for developing countries. By improving market access, reducing supply-side constraints, and enhancing trade policy of aid receiving countries, Aft enhances export performance of developing countries (Ghimire et al., 2016).

The share of primary commodities in the volume of exports in SSA is very high, indicating an overliance on a narrow range of products. This structure or narrow composition of exports has attracted much attention, mainly because it has negative implications for long-term growth. For example, a larger manufacturing share of exports tends to raise long-term growth in developing countries (Fosu, 1990), whereas a high proportion of primary products in total exports has little impact (Fosu, 1996). But what promotes export diversification? Fonchamnyo and Akame (2017), for example, observe that a regulatory framework that facilitates international trade, improves foreign direct investment, while improving infrastructural development and performance in the agricultural and industrial sectors, will likely enhance export

*Email: smasunda@gmail.com
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diversification of SSA countries. In another dimension, Aditya and Acharyya (2015) and Osakwe et al. (2018) argue that export diversification can be achieved through tariff reductions.

Although African countries have made progress on export diversification since the 1960s, the gap with the world increased until about the mid-2000s, when it began to close somewhat (see Fosu and Abass, 2019; Figure 1). Furthermore, there is much dispersion in country performance; however, it appears that most African countries have improved their export diversification especially since the early 1990s (see Fosu and Abass, 2019; Table 1).

The present study seeks to empirically examine the effect of *Aft* on export diversification in SSA. Previous studies have mainly focused on measuring the Aft effects on bilateral trade flows between the donor and the recipient countries (e.g., Seck, 2016; Lemi, 2017). However, given the importance of diversification in transforming economies, the study is intended to provide further evidence on the implications of Aft for export structure.

This article is organised as follows: Section 2 discusses the Aft and export diversification terminologies. Section 3 reviews the theoretical and empirical literature. Sections 4 and 5 present the methodology and results of the study, respectively. Section 5 provides the conclusion.

2. AID FOR TRADE AND EXPORT DIVERSIFICATION: DEFINITIONS OF TERMS

2.1. Aid for Trade

Aft is categorized into six areas of trade-related assistance: (1) trade policy and regulation, (2) trade development, (3) trade-related infrastructure, (4) building productive capacity (including private sector development), (5) trade-related adjustment, and (6) other trade-related needs. This classification follows the purposive system of the Creditor Reporting System (CRS), which was jointly produced by the OECD and the World Bank in 1967. Under the CRS, Aft can be classified into three broad sectors: (1) economic infrastructure; (2) building productive capacity; and (3) trade policy and regulations. "Economic infrastructure" includes aid for communications, energy, transport, and storage. "Productive capacity" is constituted by aid for sectoral developments in the fields of banking and financial services, business and other services, agriculture, forestry, fishing, industry, mineral resources, mining, construction, and tourism (OECD/WTO, 2013). Finally, "trade policy and regulations" refers to Aft policy and administrative management, regional economic cooperation and multilateral negotiations, trade education, and training. "Economic infrastructure" and "building capacity" constitute on average 90% of total Aft, whereas "trade policy and regulations" makes up for the remaining 10% (Kim, 2013).

2.2. Export Diversification

Export diversification measured in terms of products can either be horizontal or vertical. Horizontal diversification is defined as an increase in the number of export products within the same sector and at the same level of the production process (Herzer and Nowak-Lehmann, 2006). This is often referred to as "extensive margin." Vertical diversification, or "intensive margin," is the transition of a country's exports from a lower to a higher-value production sector (Dogruel and Tekce, 2011), such as from primary to manufacturing. The most common measure of export diversification is the Herfindahl–Hirschman Index (HHI) of export values across a given range of products or sectors. This index is used in the present study. Also used is a measure of the "extensive margin," involving the number of export products.

3. THE LITERATURE

3.1. Theoretical Framework

Bebczuk and Berrettoni (2006) argue that there exists no unified theoretical framework to explain the drivers of export diversification. However, in David Ricardo's international trade theory of comparative advantage, a country will export those goods in which it has comparative advantage. In this case, the country's export concentration will be determined by its level of relative efficiency. A corollary to the Ricardian model is the Heckscher–Ohlin theory (henceforth H-O). The H-O theorem states that a country should specialize in the production and export of the good that intensively uses its relatively abundant factor of production. Thus, in this context, the export product range of the countries will be relatively narrow. Under the H-O model, the basis for trade is differences in factor endowments.

The new trade theories improve upon the traditional theories by focusing on the dynamic effects of international trade. Helpman and Krugman (1985), for instance, theorize that international trade exposes firms to international competition, leading to efficiency through specialization. Traditional trade theories, therefore, tend to explain inter-industry trade whereas new trade theories generally explain intra-industry trade.

The theoretical underpinnings of the relationship between Aft and export diversification are drawn from the new trade theories and, in particular, from the Dixit–Stiglitz heterogeneous product model (Dixit and Stiglitz, 1977). In the Dixit–Stiglitz model, it is assumed that there

are firms that sell only in their home market. These firms do not pay transport costs. However, if they decide to sell in a foreign market, they will encounter iceberg trade costs, such as transport cost and tariffs.

The market entry costs that exporting firms encounter differ from country to country. Thus, firms that enter one market only need to pay one entry cost whereas those that enter multiple markets must also pay multiple entry costs. Based on the combination of market entry costs, other trade costs and productivity distributions, individual firms must self-select into three groups: those with low productivity, which cannot produce for the market and so drop out; those with intermediate productivity serving the domestic market only; and those with high productivity serving the domestic market and one export market. Assuming that each firm manufactures a distinct product, the higher productivity firms in a given country will have a wide range of products to export to at least one foreign market.

According to Helpman et al. (2008), higher market entry costs tend to increase the productivity threshold, thereby making it more difficult for domestic firms to access foreign markets. Similarly, trade costs facing the exporters such as transport costs and other export costs make it difficult for firms to start exporting. Thus, lower trade costs are likely to be associated with a more diversified export base, and an increase in productive capacity should be positively correlated with export diversification. In addition, trade policy and regulations are hypothesized to be related with greater export diversification, to the extent that Aft serves to increase productivity and reduce trade costs.

3.2. The Empirical Literature

The literature on the relationship between Aft and export diversification is limited despite export diversification being a most desired objective of the aid-receiving countries. Much of the published literature closest to the present study is in the form of the effect of trade facilitation on export diversification. For example, Dennis and Shepherd (2011) estimated the effect of trade facilitation on export diversification for a group of 246 developing countries. The study concluded that export costs, market entry costs, and international transport costs negatively affect export diversification. These results suggest that if Aft succeeds in reducing trade costs, it can help developing countries diversify their exports.

Relatedly, Munemo (2011) found that if the proportion of foreign aid to the Gross Domestic Product (GDP) of a country is ≤20%, then exports will tend to be diversified. Thus, foreign aid may influence export diversification. However, unlike Aft, foreign aid is not necessarily targeted to aid trade. Meanwhile, studies on the impact of Aft tend to focus on trade flows rather than on export diversification (e.g., Lemi, 2017). The current study, therefore, uniquely explores the extent to which Aft may have influenced export diversification in African countries.

4. METHODOLOGY

4.1. Empirical Model and Estimation

The Generalised Method of Moments (GMM) is used for the estimation. The choice of this approach is necessitated by the possible endogeneity associated with the Aft–export diversification relationship, given its dynamic nature (Arellano and Bover, 1995; Blundell and Bond, 1998). We estimate a dynamic panel model of the form:

$$\text{Exdiv}_{it} = \delta \text{Exdiv}_{i,t-1} + x'_{it}\beta + \mu_{it}, \tag{1}$$

where Exdiv_{it} is export diversification in country i in year t; x'_{it} is a $1 \times K$ vector of explanatory variables and β is a $K \times 1$ vector of parameters being estimated. The residuals in Equation (1) are assumed to follow a one-way error component model specified as follows:

$$\mu_{it} = \mu_i + \nu_{it}, \tag{2}$$

with $\mu_i = IID(0, \delta_\mu^2)$ and $\nu_{it} = IID(0, \delta_\nu^2)$ assumed to be independent of each other and among themselves (Baltagi, 2013). The dynamic panel data regression models described in Equations (1) and (2) are characterized by two sources of persistence over time: autocorrelation resulting from the inclusion of a lagged dependent variable as an explanatory variable, and the individual country effects (ibid).

The actual model estimated is:

$$\log \text{Exdiv}_{it} = \beta_0 + \beta_1 \log \text{Exdiv}_{i,t-1} + \beta_2 \log \text{RGDP}_{it} + \beta_3 \log aft\,\text{inf}_{it} + \beta_4 \log aft\text{prod}_{it} + \beta_5 \log aft\text{pr}_{it} + \beta_6 \log \text{pop}_{it} + \mu_{it} \tag{3}$$

For country i in period t: Exdiv_{it} = export diversification; $\text{Exdiv}_{i,t-1}$ is the lagged value of export diversification; RGDP_{it} = real gross domestic product, $aft\text{inf}_{it}$ = aid for trade for economic infrastructure; $aft\text{prd}_{it}$ = aid for trade for building productive capacity; $aft\text{pr}_{it}$ = aid for trade for trade policy and regulation and pop_{it} = population size.

4.2. Data and Variables

The study covers 42 countries receiving Aft in SSA for the period 2005–2015. Export diversification is measured using the HHI and by the number of active export lines. The HHI measure ranges from 0 to 1. An index value of 1 implies a perfectly concentrated export structure, and 0 perfectly diversified. Data for the HHI is obtained from UNCTADStat, 2017. The data for the number of active export lines is drawn from the World Bank World Integrated Trading System online interface (World Bank, 2017).

As already indicated above, Aft is categorised into three measures: trade policy and regulation,[1] economic infrastructure,[2] and building productive capacity.[3] Given that all these forms of Aft are intended to improve the global integration of SSA countries by reducing trade costs and improving productivity, we expect a positive relationship between each of these Aft measures and export diversification. Data on Aft are drawn from the OECD/DAC (2016).

The control variables include Real per capita GDP (RGDP), measured in constant 2010 US$ prices. It is expected to have a positive effect on export diversification, as it is a measure of economic development and SSA countries are mostly not high-income (Cadot et al., 2013).

The other control variable is population size, which is also hypothesized to have a positive effect on export diversification. A high population may act as a large internal market, which can help countries diversify their exports (Carrère et al., 2011).

The sample comprises a balanced panel for 42 SSA countries for the period 2005–2015. The sample of countries is shown in Table A1.[4] Variable definitions and data sources are all detailed in Table A2.

5. RESULTS AND DISCUSSION

5.1. Descriptive Statistics

Table 1 reports the descriptive statistics. On average, exports from SSA countries are concentrated on few products, as indicated by a high HHI index of 0.77. Although this figure is high, there is some variation, with a minimum value of 0.44 indicating the most diversified and 0.92 for the most concentrated. Similarly, the average number of products exported per country is 110, with a minimum of 4 and a maximum of 256, but with the Kernel density showing that a large number of countries export less than 100 products at the SITC Rev 3, 3-digit level. There appears to be limited skewness (see Figure 1).

Table 1 also shows that the average size of Aft per country over the period 2005–2015 is US$220 million. A disaggregation of the total Aft shows that disbursements are much higher toward improving infrastructure with a mean of US$120 million, followed by Aft toward building productive capacity with an average disbursement of US$96 million. By contrast, the disbursements of aid toward trade policy and regulation constitute a meagre value of US$4 million. Apparently, donors attach more weight to improving infrastructure and reducing supply bottlenecks than to improving trade policy.

The Kernel density (Figure 2) shows the distribution of total Aft. The graph is positively skewed, indicating that Aft accrues to only few countries, with a large number receiving relatively little.

Table 1 | Summary statistics, full sample 2005–2015[a]

Variables	Observations	Mean	Standard deviation	Minimum	Maximum
Expdiv: HHI	588	0.7707235	0.0688306	0.4356	0.9215605
Expdiv: no of products	588	110.2925	66.60714	4	256
*aft*inf	588	120.466204	204.8024	0.0014	2217.334
*aft*prod	588	95.66635	219.0617	2217.334	4642.487
*aft*tp	588	4.043176	14.42619	0.000183	209.7878
*aft*tot	588	219.9766	353.6389	0.024893	5109.306
Pop	588	1.87e+07	2.78e+07	82475	1.81e+08
RGDP	588	1952.472	3258.067	111.3634	22742.38

[a]For definitions of the variables and data sources, see Table A2 in the Appendix.

[1]Aid for trade for trade policy is the sum of Aft policy and administrative management (crs 33110), trade facilitation (crs 33120), regional trade agreements (crs33130), multilateral negotiations (crs 33140), trade related adjustments (crs 33150), and trade education/training (crs 33181).
[2]This is a sum of aid toward (1) transport and storage, (2) communications, and (3) energy generations and supply.
[3]Aid for trade for productive capacity is aid in the following sectors: banking and financial services, business and other services, agriculture, forestry, fishing, industry, mineral resources and mining, and tourism.
[4]Somalia and Eritrea have been omitted from the sample of countries owing to data limitation.

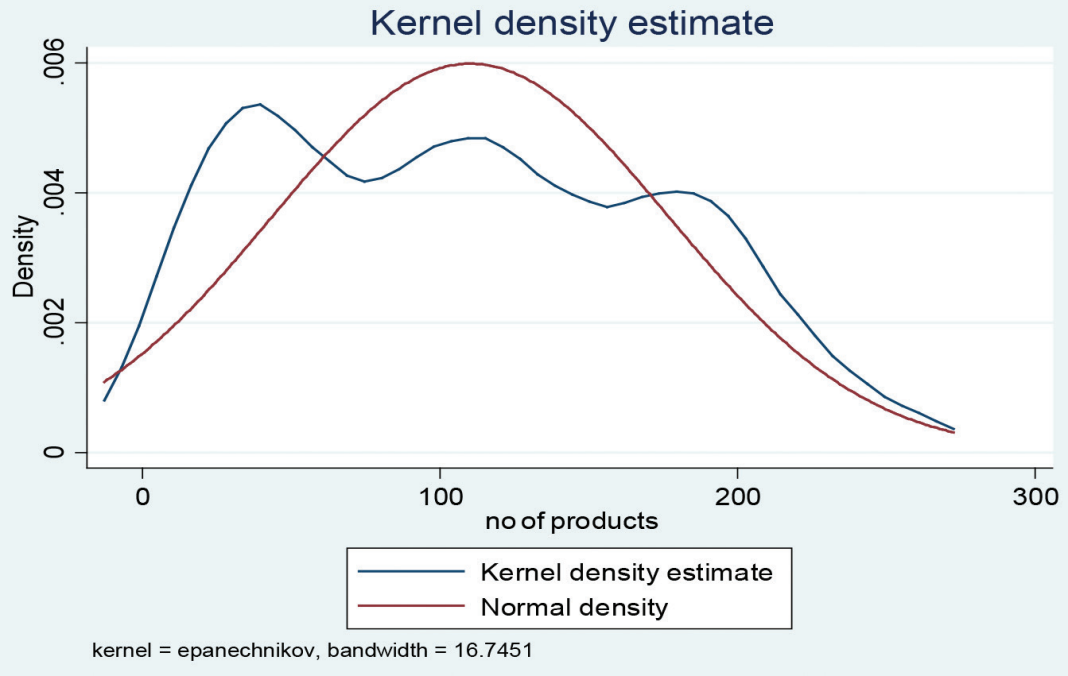

Figure 1 | Kernel density estimate of export diversification (active product lines).

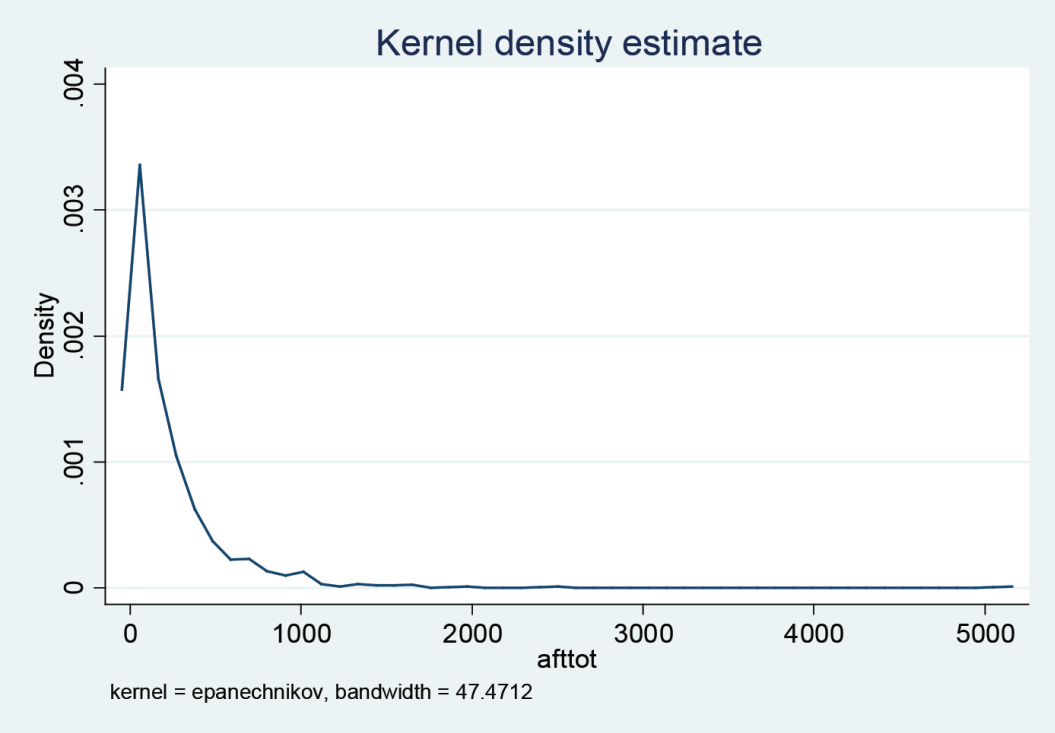

Figure 2 | Kernel density estimate for total Aft disbursements in sub-Saharan African countries (2005–2015).

5.2. Regression Results

The regression results, based on the System-GMM, are presented in Table 2. The dependent variables in the model are the number of export product lines and the HHI. According to the Hansen test statistics, the instruments based on lagged values of the relevant Aft variables are viable. We also note from the Arellano and Bond second-order correlation (AR (2)) values that there is little evidence of a second-order autocorrelation, which is an essential condition for the statistical reliability of the results.

Table 2 | Effects of aid for trade on export diversification in sub-Saharan Africa (2005–2015)[a,b]

	(1)	(2)	(3)	(4)
	Log no of products	**Log no of products**	**LogHHI**	**LogHHI**
L.log no of products	0.408** (2.62)	0.288* (1.87)	–	–
Logafttpr	–	−0.00162 (−0.30)	–	0.0000479 (0.01)
Logaftprod	–	0.0667*** (2.97)	–	−0.0197** (−2.58)
Logaftinfr	–	0.00903 (0.67)	–	0.00290 (0.70)
Logrgdp	0.205*** (2.80)	0.219*** (3.86)	−0.00402 (−0.34)	−0.00169 (−0.20)
Logpop	0.160** (2.34)	0.160** (2.65)	0.0146 (1.20)	0.0179* (1.73)
Logafttot	0.0569** (2.17)	–	−0.0162* (−1.99)	–
L.logexpdiv	–	–	0.239** (2.03)	0.330*** (3.25)
Constant	−1.503 (−1.55)	−1.059 (−1.11)	−0.332 (−1.57)	−0.386** (−2.16)
Observations	546	546	546	546
No. of countries	42	42	42	42
AR (2) [*p*]	1.40 [0.163]	0.78 [0.434]	1.03 [0.302]	1.10 [0.273]
Hansen J [*p*]	29.16 [0.110]	16.90 [0.392]	22.70 [0.304]	27.50 [0.491]
Time effects	No	No	No	No

*$p < 0.10$, **$p < 0.05$, ***$p < 0.01$. [a]*t* statistics are presented in parentheses. [b]The dependent variables are log of HHI and log of the number of export products. The independent variables are lagged dependent variables, log of real GDP (logrgdp), log of population (logpop), log of total aid for trade (logafttot), log of aid for trade for infrastructure development (logaftinfr), log of aid for trade for trade policy and regulation (logafttpr), log of aid for trade for building productive capacity (logaftprod). Time variables are excluded, as a joint test of the presence of time effects is rejected for each model.

In the first two models of Table 2, export diversification is measured by the number of products. The results show that population and real GDP have positive and significant effects. Consistent with Kim (2013), this finding indicates that as the size of the market increases products are likely to be differentiated.

Turning to the variables of interest, involving Aft, Model 1 indicates that total Aft, Logafttot, has a positive and significant effect on export diversification as measured by the number of export products. Model 2 shows that only Aft devoted to productive capacity matters for export diversification, however. Whereas the effects of Aft for infrastructure and for policy and regulation are insignificant, that of productive capacity Aft, Logaftprod, is highly significant at the 0.01 level. The result suggests that with a 1% increase in productive capacity, Aft could increase the number of exports by 0.067%.

Results in Models 3 and 4 are for the HHI measure of export diversification. Note that a higher value of the index implies greater concentration and thus less export diversification. We find from Model 3 that the effect of total Aft is negative and significant at the 5% level, implying a positive effect on export diversification. Furthermore, Model 4 indicates that Aft on production capacity has a negative and highly significant coefficient at the 0.01 level, whereas the effects of infrastructure and for policy and regulation are insignificant. This result suggests that it is, again, the productive capacity Aft that apparently contributed to the favourable Aft effect. The results suggest that a 1% increase in the Aft devoted to production capacity would likely result in a reduction in export concentration, and thus an increase in export diversification by 0.02%, *ceteris paribus*. We also note that the measures of market size, real GDP, and population size have generally insignificant effects on export diversification as measured by the HHI.

6. CONCLUSION

Through the WTO process, developed countries were to assist African developing countries, in particular, to improve the latter's participation in trade. The Aft initiative came into force in 2005.

Some studies have found that Aft has generally increased the trade levels of African economies. However, the region's narrow export base is often cited as a major cause of its relatively poor trade and economic growth performance. This study, therefore, explored the effectiveness of Aft in improving export diversification in SSA. Using 2005–2015 panel data, the study finds that Aft for productive capacity, the main component, has positively affected African countries' export diversification, whether measured by the number of products exported or by HHI.

Nonetheless, these findings should be considered as preliminary, as such results tend to be sensitive to the methodology used (Prihoda, 2016). For example, the model might be underspecified or suffer from an endogeneity bias. The reliability of the present results should, however, benefit from the use of the sys-GMM, which tends to account for such concerns.

CONFLICTS OF INTEREST

The author declares no conflicts of interest.

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APPENDIX

Table A1 | Sample of sub-Saharan African countries

Angola	Liberia
Benin	Madagascar
Botswana	Malawi
Burkina Faso	Mali
Burundi	Mozambique
Cameroon	Namibia
Cape Verde	Niger
Central Africa Republic	Nigeria
Chad	Rwanda
Comoros	Soa Tome and Principe
Congo	Senegal
Cote d'lvoire	Seychelles
Democratic Republic of Congo	Sierra Leone
Equatorial Guinea	South Africa
Ethiopia	Swaziland
Gabon	Togo
Gambia	Uganda
Ghana	Tanzania
Guinea	Zambia
Guinea-Bissau	Zimbabwe
Kenya	
Lesotho	

Table A2 | Definitions and sources of variables

Variable name	Definition	Source
$Exdiv_{it}$: HHI	For country *i* and year *t*, the index takes on a value between 0 and 1, with a higher value indicating lower diversification.	UNCTADStat
$Exdiv_{it}$: no of products	A measure of the number of active product lines measured at the SITC Rev 3, 3-digit level, for country *i* in year *t*.	UNCTADStat
$aftp_{it}$; $aftpr_{it}$; $aftinf_{it}$; $afttot_{it}$	Measures of aid for trade (Aft) for country *i* in year *t* for: trade policy and regulation, building productive capacity, economic infrastructure, and the total, respectively.	OECD/DAC
Pop_{it}	Total population for each country *i* in time *t*. This variable is measured in millions.	World Development Indicators
$RGDP_{it}$	The value of the total gross domestic product in time *t* for country *i*. This variable is measured at constant 2010 prices (US$).	World Development Indicators