

Phiri, Horace

**Article**

## Public investment and export diversification in low skilled labor force economies. Evidence from sub Saharan Africa

Cogent Economics & Finance

**Provided in Cooperation with:**

Taylor & Francis Group

*Suggested Citation:* Phiri, Horace (2022) : Public investment and export diversification in low skilled labor force economies. Evidence from sub Saharan Africa, Cogent Economics & Finance, ISSN 2332-2039, Taylor & Francis, Abingdon, Vol. 10, Iss. 1, pp. 1-13,  
<https://doi.org/10.1080/23322039.2021.2008586>

This Version is available at:

<https://hdl.handle.net/10419/303538>

**Standard-Nutzungsbedingungen:**

Die Dokumente auf EconStor dürfen zu eigenen wissenschaftlichen Zwecken und zum Privatgebrauch gespeichert und kopiert werden.

Sie dürfen die Dokumente nicht für öffentliche oder kommerzielle Zwecke vervielfältigen, öffentlich ausstellen, öffentlich zugänglich machen, vertreiben oder anderweitig nutzen.

Sofern die Verfasser die Dokumente unter Open-Content-Lizenzen (insbesondere CC-Lizenzen) zur Verfügung gestellt haben sollten, gelten abweichend von diesen Nutzungsbedingungen die in der dort genannten Lizenz gewährten Nutzungsrechte.

**Terms of use:**

*Documents in EconStor may be saved and copied for your personal and scholarly purposes.*

*You are not to copy documents for public or commercial purposes, to exhibit the documents publicly, to make them publicly available on the internet, or to distribute or otherwise use the documents in public.*

*If the documents have been made available under an Open Content Licence (especially Creative Commons Licences), you may exercise further usage rights as specified in the indicated licence.*



<https://creativecommons.org/licenses/by/4.0/>

## Public investment and export diversification in low skilled labor force economies. Evidence from sub Saharan Africa

Horace Phiri

**To cite this article:** Horace Phiri (2022) Public investment and export diversification in low skilled labor force economies. Evidence from sub Saharan Africa, Cogent Economics & Finance, 10:1, 2008586, DOI: [10.1080/23322039.2021.2008586](https://doi.org/10.1080/23322039.2021.2008586)

**To link to this article:** <https://doi.org/10.1080/23322039.2021.2008586>



© 2022 The Author(s). This open access article is distributed under a Creative Commons Attribution (CC-BY) 4.0 license.



Published online: 15 Feb 2022.



Submit your article to this journal [↗](#)



Article views: 1973



View related articles [↗](#)



View Crossmark data [↗](#)



Citing articles: 2 View citing articles [↗](#)



Received 13 March 2020  
Accepted 16 November 2021

\*Corresponding author: Horace Phiri,  
P.O. Box 219 Lilongwe, Malawi  
E-mail: [hphiri@uanar.ac.mw](mailto:hphiri@uanar.ac.mw)

Reviewing editor:  
Christian Nsiah, School of Business,  
Baldwin Wallace University, OH, USA

Additional information is available at  
the end of the article

## GENERAL & APPLIED ECONOMICS | RESEARCH ARTICLE

# Public investment and export diversification in low skilled labor force economies. Evidence from sub Saharan Africa

Horace Phiri\*

**Abstract:** Export diversification is a means for sustainable economic growth in low-income countries. Consequently, public investment is made in various sectors to attain diversification. In this study, we assessed the long-run elasticity of export diversification to various forms of public expenditure in economies with a dominant unskilled labor force. Public investments in agriculture, education, manufacturing and mining, and transport and ICT were found to promote diversification in the long term, but all were inconsequential in the short term except for education. We conclude that for countries where a larger proportion of the labor force is unskilled public investment in public expenditures in economic and supporting sectors can encourage export diversification. However, outcomes are as dependent on the quantity of investment as they do on quality. Deliberate strategies to promote diversification should be encouraged.

**Subjects:** Macroeconomics; International Trade; Incl; Trade Agreements & Tariffs; Development Economics

**Keywords:** export diversification; intensive margins; extensive margins; public expenditure; SSA

## 1. Introduction

The sub-Saharan Africa (SSA) region is a typical example of a region that has both a disproportionately large unskilled labor force and a less diversified economy. In 2019, the

## ABOUT THE AUTHOR



Horace Phiri

Horace Phiri is a Lecturer in the Department of Agriculture and Applied Economics at Lilongwe University of Agriculture and Natural Resources. He holds a PhD in Agriculture and Resource Economics from the University of Malawi. His research interests are in international economics and policy analysis.

## PUBLIC INTREST STATEMENT

Export diversification is considered a means for achieving sustainable economic growth in low-income countries. Consequently, public investment is made to various sectors to attain diversification. In this study, we assessed the responsiveness of export diversification to changes in public expenditure. The results show that in countries where a large proportion of the labor force is unskilled, investments in agriculture, education, and transport and ICT lead to greater diversification while manufacturing and mining expenditures had the opposite effect. Noteworthy, is the weak responsiveness of diversification to outlays. This is indicative of lack of tailor-made interventions to promote diversification in the sectors. Deliberate strategies to promote diversification should be encouraged.

region was the least competitive in terms of human capital skills, with a score of 44.3 (Schwab, 2019). The majority [52.3%] of them are employed in the agricultural sector (International Labor Organization, 2020), which has a small number of crops with many countries highly reliant on the production of one crop for national food security (Heumesser & Kray, 2019). The manufacturing sector is small, and its development has been shaped by state policies and external shocks. In 2017, manufacturing's share of sub-Saharan Africa's total GDP was just under 10% (Signe & Johnson, 2018). Consequently, economic growth has been sluggish with a period of growth rates undone by long recessions. For instance, between 1960 and 2016, the countries in SSA grew at an average of about 0.7% per year in per capita terms Gill and Karakulah, 2019.

The nexus between export diversification and economic growth has propelled the former to feature on the development agenda of most low-income nations in SSA. Prebisch and Singer Thesis and other structural models recommend that countries should diversify from primary exports into manufactured exports to achieve sustainable economic growth. Empirical studies, such as Aditya and Acharyya (2013) in 65 countries, Olaleye et al. (2013) in Nigeria, Francis et al. (2007) in Barbados and Belize, reaffirm the positive relationship between export diversification and economic growth. Globally, the determinants of export diversification are one of the widely studied research questions. Among the general conclusions from empirical work is that an educated labor force improves a country's capability to diversify its exports (Cabral & Veiga, 2010). Sectoral growth in agriculture and manufacturing or indeed overall economic growth is also associated with greater diversification (Fonchamnyo & Akame, 2016).

A few studies have empirically tested the effect of public investment on diversification and found contrasting evidence. In their analysis of exports in Brazil, Giri, et al., 2019 found a weak positive relationship between the two variables. On contrary, a negative effect was reported by Elhiraika and Mbate (2014). Overall, the literature indicates that public investment is an important determinant of diversification, but there is a lack of consensus on the direction of influence. Therefore, the definitive aim of this study was to contribute to the growing body of knowledge on the subject matter by analyzing the effect of public investment on export diversification in SSA countries. Our study is unique in several ways; past studies (Elhiraika & Mbate, 2014; Giri, et al., 2019; Oliveira et al., 2020) used the aggregate public expenditure measured as a percentage of GDP, whereas this study used sector level public expenditures in agriculture, education, transport and ICT and manufacturing sectors to allow us to isolate effects of investing in particular sectors. Besides, the study used a panel ARDL model as opposed to the widely used generalized method of moments (GMM) estimator to estimate short-run and long-run elasticities in SSA countries where the majority of the labor force is unskilled thereby offering insights for this specific group of countries. Lastly, we do not build a measure of diversification but utilize the indexes, i.e., extensive and intensive margin estimated by International Monetary Fund (2014) to capture the effects on either vertical or horizontal diversification

## 2. Literature review

Export diversification can either be horizontal or vertical. The former refers to the diversity of products across different types of industry, while the latter covers the diversity of products within the same industry—i.e. value-added ventures in further downstream activities (Arip et al., 2010; Kenji & Mengistu, 2009). The importance of diversification for economic development has been promoted by many economists, including Grossman and Helpman (1992) and Kuznets (1971). Recent empirical studies (Aditya & Acharyya, 2013; Al-Marhubi, 2000) also find that export diversification is associated with a considerably faster average annual growth rate of real GDP per capita.

The drivers of export diversification can be grouped into three main groups: economic reforms; structural reforms and macroeconomic variables (Agosin, Alvarez & Bravo-Ortega, 2012). The first group is composed of trade openness and financial development. The most common measure of trade openness is the ratio of the sum of imports and exports to GDP, and financial development as the share of domestic credit to the private non-bank sector in GDP. Theoretically, trade liberalization can induce export diversification through an increase in the number of exporters in those sectors facing improved export opportunities (Melitz, 2003). In sub-Saharan Africa where exported are predominantly primary commodities, classical theories such as the Heckscher–Ohlin model better explain the role of trade openness (Agosin et al., 2012). Financial development play is crucial to alleviating the liquidity constraints that affect firms' participation in international markets (Manova, 2008).

Melitz (2003) provides explanations for the potential effects of structural determinants such as factor endowment and economic distance. One of the key indicators of factor endowment is human capital, its accumulation allows countries to attain a competitive advantage and change their specialization patterns from primary commodities to manufactured goods. A recent extension to Melitz (2003) also considers private sector growth as an important driver of export diversification as it can lead to increased productivity especially in new sectors. A thriving private sector is associated with research and development, innovation motives, and risk-taking ability while engaging in unexploited sectors of the economy (UNDP, 2011). Complementing physical capital, human capital accumulation is a prerequisite for technological advancement and for boosting innovation, technology, and skills that are instrumental in the creation of quality and high value products (Hausmann & Klinger, 2006). Similarly, Foreign Direct Investment (FDI) can positively affect export diversification through the acceleration of technology transfer and improvement in a country's production capabilities (Iwamoto & Nabeshima, 2012). It has been argued that the impact of FDI on export diversification in Africa has been weak owing to its concentration on enclave sectors that have limited linkages to the rest of the economy (Ofa et al., 2016).

In the case of economic distance, the effect is reversed as high shipping costs associated with distance make goods expensive and less competitive on international markets. Earlier studies used a weighted average distance of each country from its trading captures distance. However, recent studies have evaluated the same using indicators such as whether a country is landlocked, e.g., Fonchamnyo and Akame (2016) or not and the status of public infrastructure. The effect of the variables in the third group, macroeconomic factors, stems from their ability to enhance or reduce export profitability (Agosin et al., 2012). Exchange rate manipulation by governments affects the price of goods and the cost of trade. An overvalued exchange rate or volatility negatively affects export diversification due to a reduction in the profitability of exports and the number of exporters (Melitz, 2003). A currency depreciation should induce the entry of new exporters, but where fixed entry costs are important, firms can decide to stay out of international markets if expected gains are lower than entry costs. In this case, exchange rate volatility increases uncertainty and may affect diversification negatively.

On the empirical front, a growing literature has examined determinants of export diversification. The studies by (Agosin et al., 2012; Alemu, 2008; Fonchamnyo & Akame, 2016) confirm a positive relationship between trade openness and export diversification. Fosu and Abass (2019) analyzed the role of domestic credit in promoting export diversification. The estimation was based on a panel regression analysis for the 1962–2010 period involving 80 countries around the world, of which 62 are developing and 29 African countries, using as covariates variables traditionally viewed as affecting export diversification. Domestic credit was found to significantly affect export diversification in Africa but not in non-African countries. In contrast, Agosin et al. (2012) found that financial development did not affect export diversification.

Evidence on the impact of human capital development on diversification is widely documented.

Alemu (2008), Agosin et al. (2012), Elhiraika and Mbate (2014), and Fosu and Abass (2019) find a positive relationship between average schooling years and diversification. Another dimension of capacity is physical infrastructure: both Alemu (2008) and Elhiraika and Mbate (2014) report a positive and significant influence on export diversification in Africa. The size of economic sectors has also been tested as was the case in Fonchamnyo and Akame (2016) who examined the determinants of export diversification using a fractional logit model in 32 sub-Saharan Africa countries. A Herfindahl–Hirschman Index was used to measure export diversification in the sampled countries and found that GDP per capita, FDI, value added in agriculture, value added in manufacturing significantly affected export diversification. However, the effect of public investment is not well entrenched in economic theory. It is predicted to positively accelerate diversification where government investments are channelled to the provision of infrastructure and basic services, which favour the growth of new sectors of the economy. Public investment can have an opposite effect if channelled to support existing export industries that are characterized by limited value addition and impact on diversification.

### 3. Methodology

#### 3.1. Model specification

We construct the Shin et al. (2014) nonlinear ARDL model in panel form, which is suitable for large T panels. This approach was preferred for three reasons. First, it allows us to capture asymmetries nonlinearly. Second, it accounts for the inherent heterogeneity effect in the data as we have observed for stock prices. Third, it is more appropriate when there is the presence of unit root or mixed order of integration of not more than I(1). Data used in this study consist of large N and large T dynamic panels, which are different from the asymptotic of traditional large N and small T dynamic panels. The estimation of the latter is usually done using fixed or random effects estimators or generalized methods of moments (Elhiraika & Mbate, 2014; Fonchamnyo & Akame, 2016; Fosu & Abass, 2019). Thus, the dynamic heterogeneous panel data model is considered suitable for this study since we are dealing with large T panels.

We begin our analysis by assuming an asymmetric response of extensive margin index (EMI) and intensive margin index (IMI) to changes in public investment and trade openness. Thus, is to say an increase and decrease in government expenditure has the same effect on the diversification indicators. The asymmetric version of the panel ARDL is given as

$$y_{it} = \alpha_i \sum_{l=1}^p B_0 y_{i,t-l} + \sum_{i=0}^p (B_2 p_{i,t-1}^+ + B_2 p_{i,t-1}^-) + \sum_{i=0}^q (B_3 x_i \quad (1)$$

where  $y_{it}$  is the log of export diversification for each country  $i$  over a time period  $t$ ;  $p_t$  denotes the log of public investment benchmark at period  $t$ ;  $p_t^+$  and  $p_t^-$  denote the positive and negative changes to public expenditure.  $u_i$  is the group-specific effect;  $i$  is the sampled countries, and  $t$  is the number of sampled periods.

By reparameterising eq. (1) yields

$$\begin{aligned} \Delta y_{it} = & \alpha_i + \phi_i (y_{i,t-1} - \theta_1 d_{i,t-1}^+ - \theta_2 d_{i,t-1}^- - \theta_3 x_{i,t-1} + \sum_{l=1}^{p-1} \lambda_1 \Delta y_{i,t-l} + \lambda_2 \Delta p_{i,t-1}^+) \\ & + \sum_{l=0}^{p-1} (\lambda_3 \Delta p_{i,t-l}^- + \sum_{l=0}^{p-1} (\lambda_4 \Delta x_{i,t-l} + u_{it} \end{aligned} \quad (2)$$

### 3.2. Tests and choice of the estimation procedure

Several tests were carried out to ascertain that the correct model and estimation method is being used. First, panel unit root tests were performed to check the order of integration of the variables. The Im–Pesaran–Shin (IPS) test for panel data unit root (Im et al., 2003; Levin et al., 2002) was performed. Pedroni's panel cointegration test (Pedroni, 2004) was then employed to check the existence of long-run relationships among the variables. The two prominent techniques used in the estimation of a dynamic heterogeneous panel data model are the Pooled Mean Group (PMG) estimator and the Mean Group (MG) estimator. The MG estimator relies on estimating N time-series regressions and averaging the coefficients, whereas the PMG estimator involves the combination of pooling and averaging of coefficients (Blackburne & Frank, 2007). The Hausman test is employed to test whether there is any systematic difference between the two estimators. A CD test that accounts for the presence of cross-section dependence was then performed. Asymmetric panel ARDL test was then run to check if the asymmetry assumption made in this study was justified.

### 3.3. Data properties and variables used

We attempt to explain how public expenditure in economic sectors affects export diversification by analyzing the effects on extensive (EMI) and intensive (IMI) margins. The extensive margin captures the concentration in the number of products by country while the intensive margin reflects the concentration in export volumes of active products. Data on these indicators were obtained from Export Diversification Database developed by Henn et al. (2013) that covers 200 countries with data from 1962 to 2014. It has three indicators: Export Diversification Index (EDI) which is the total theil index and can be disaggregated into EMI (Between Theil Index) and IMI (Within Theil Index). An increasing index entails that exports are becoming more concentrated, while a decrease signals greater diversification.

The explanatory variables used include a set of public expenditure variables and trade openness which have theoretically been assumed to have an impact on export diversification in Africa. Data on public expenditures in agriculture, education, manufacturing, and transport & ICT were obtained from the Statistics on Public Expenditures for Economic Development IFPRI, 2015. Theoretically, growth or improvements in the four sectors is predicted to spur diversification. We assume that governments are benevolent and spend public money only to achieve greater efficiency in the economy. Such spending will likely increase human and physical capital via investment in schools, research, and infrastructure. The coefficients of public investment variables are expected to be negative. Trade openness is also expected to have a negative coefficient as the removal of tariff and non-tariff measures leads to a greater propensity to export. Summary statistics on variables used in the study are presented in Table 1.

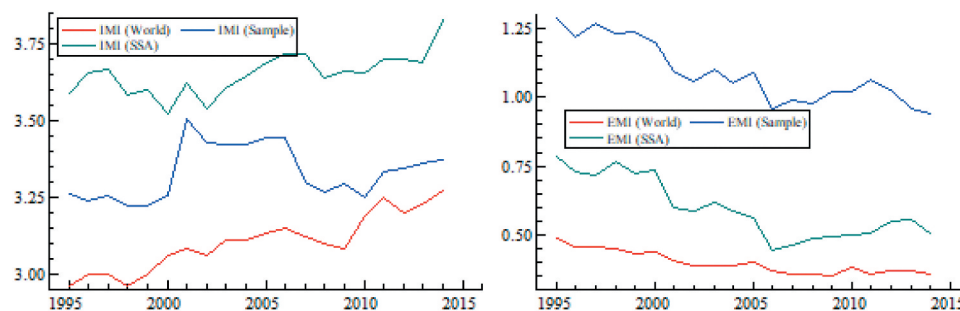
## 4. Results

### 4.1. Export diversification in sampled countries

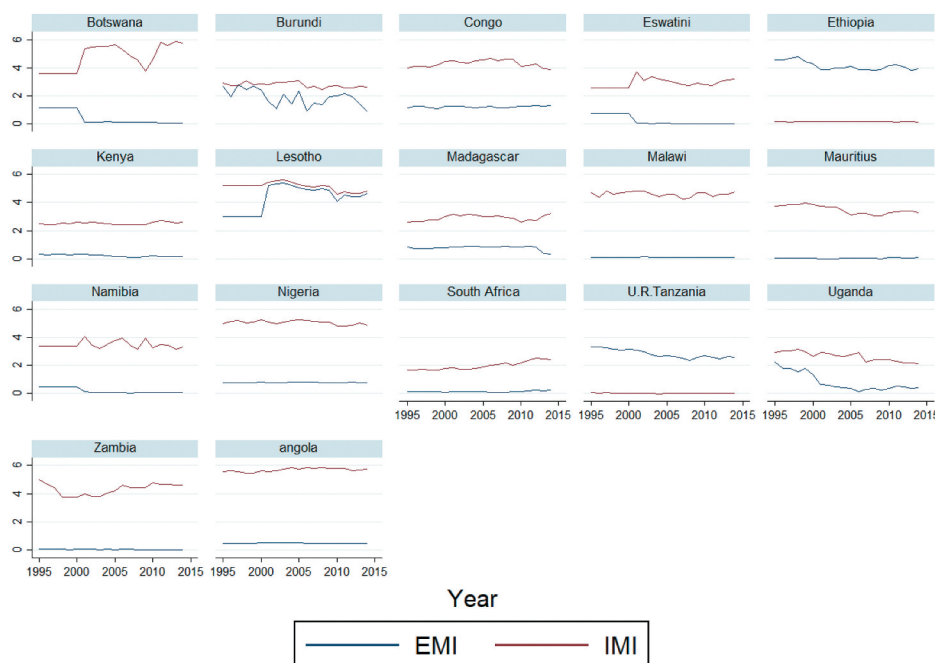
The data used in this paper consist of a balanced panel for 17 SSA countries (Botswana, Burundi, Congo, Eswatini, Ethiopia, Kenya, Lesotho, Madagascar, Malawi, Mauritius, Namibia, Nigeria, South Africa, Tanzania, Uganda, Zambia, and Angola) over 20 years from 1995 to 2014. Figure 1 shows that exports from the sampled countries were less diversified, as illustrated by an EMI that is higher than that of the World. However, the EMI has declined in the period from 1.3 in 1995 to 0.9 in 2014. According to Amurgo-Pacheco and Pierola (2008), this is a consequence of new export destinations (geographical diversification) rather than new export products (product diversification). This is reaffirmed by an increase within the Theil index (IMI) during the study period unmasking the growing importance of traditional exports in the economies. The IMI has increased from 3.26 in 1995 to 3.37 in 2014 with the highest recorded in 1995 at 3.5. Probably due to



**Figure 1. Sampled countries EMI and IMI compared to SSA and world.**



**Figure 2. Extensive and intensive margin of exports in 17 SSA countries.**



countries' inability to develop new, non-traditional export products (International Trade Center, 2018). This continued reliance on few agricultural commodities and sectors has serious implications: it severely limits trade potential, undermines the ability to create jobs, and increases exposure to external economic shocks (Isukur et al., 2018). Individual country export diversification indices are presented in Figure 2.

## 4.2. Effects of public investment on export diversification

### 4.2.1. Stationarity, cointegration, and correlation tests

The first step in the estimation of the panel ARDL is to test the order of the integration of variables. A series is said to be integrated if it accumulates some past effects, so that following any perturbation the series will rarely return to any particular 'mean' value, hence is non-stationary. The order of integration is given by the number of times a series needs to be differenced to make it



**Table 1. Summary statistics. overall, within and between statistics**

Variable		Mean	Std. Dev.	Min	Max	Observations
Agriculture expenditure (per person/year)	Overall	46.795	55.867	0.372	300.105	$N = 340$
	Between		53.446	4.084	187.170	$n = 17$
	Within		20.608	-9.064	184.887	$T = 20$
Education expenditure (per person/year)	Overall	109.423	152.173	3.881	763.262	$N = 340$
	Between		150.206	8.106	547.464	$n = 17$
	Within		43.121	-35.442	425.766	$T = 20$
Manufacturing expenditure (per person/year)	Overall	0.342	1.743	0.001	12.844	$N = 340$
	Between		1.192	0.005	4.960	$n = 17$
	Within		1.303	-4.570	8.225	$T = 20$
Transport and ICT expenditure (per person/year)	Overall	0.446	0.977	0.002	6.077	$N = 340$
	Between		0.798	0.009	3.115	$n = 17$
	Within		0.594	-1.384	4.563	$T = 20$
Extensive Margin Index	Overall	1.089	1.395	-0.015	5.412	$N = 340$
	Between		1.389	0.020	4.304	$n = 17$
	Within		0.355	-0.207	2.500	$T = 20$
Intensive Margin Index	Overall	3.332	1.608	-0.039	5.861	$N = 340$
	Between		1.623	0.015	5.686	$n = 17$
	Within		0.317	2.156	4.439	$T = 20$
Trade as % of GDP	Overall	79.115	40.655	20.964	175.798	$N = 340$
	Between		39.790	33.752	155.851	$n = 17$
	Within		12.585	32.339	128.472	$T = 20$

stationary. Im-Pesaran-Shin test for panel data unit root (Im et al., 2003; Levin et al., 2002) was employed to test for the presence of unit root. The underlying test regression had no intercept and lag length of 1. The results in Table 2 indicate that the null hypothesis that all panels contain unit root could only be rejected at a 5% level of significance for agriculture expenditure entails that it is integrated of order 0,  $I(0)$ . However, differencing the other series once led to the rejection of the null hypothesis of unit root at a 5% level of significance. This implies that all other variables are integrated of order 1,  $I(1)$ .

Given that there is a combination of  $I(0)$  and  $I(1)$  variables, then a linear relationship between these variables can be estimated by way of ARDL model as Vector Error Correction (VEC) model is only applicable when all variables are integrated to the same order  $I(1)$ , and co-integration can be tested by examining the order of integration of this linear relationship. Pedroni's panel cointegration test (Pedroni, 2004) was used and results are presented in Table 3. Overall, the results indicate a cointegrating relationship between export diversification and public expenditure. All tests are significant at least at a 5% level.

Despite the significant result of the variables of interest, the ARDL method disregards contemporaneous correlation across countries, which is caused by unobserved factors. Ignoring these factors can lead to less consistent parametric and non-parametric estimators Baltagi, 2014. Both EMI and IMI models exhibited cross-sectional independence, i.e.,  $p$ -value  $> 0.1$  entailing that the null hypothesis could not be rejected. The results of the asymmetry test are presented in Table 5. There was no evidence to support our initial assumption of asymmetry as such we proceed to estimate a linear panel ARDL model.

**Table 2. Im–Pesaran–Shin unit root test results**

Variable	Test Statistic Level	p-Value	Test Statistic First difference	Critical values 5pct
LN_AGRI	–1.8675	–0.0309		
LN_EDU	–0.9910	–0.1609	–8.3724	0.0000
LN_TC	–1.6359	–0.9491	–7.9890	0.0000
LN_EMI	–0.0381	0.4848	–7.9290	0.0000
LN_IMI	–0.3433	0.3657	–9.1371	0.0000
LN_MAN	–0.4557	0.3243	–8.1112	–0.0000
LN_TOPP	–1.0920	–0.1374	–8.5063	–0.0000

**Table 3. Pedroni’s panel cointegration test results**

Test statistic	EMI model		IMI model	
	Panel	Group	Panel	Group
V	–2.243		–2.521	
rho	2.092	2.904	1.942	3.287
t	–3.605	–6.485	–3.702	–4.759
ADF	3.247	6.229	5.161	5.821

Panel cointegration test includes intercept and trend.

V: the variance ratio, t: Pedroni test, ADF: Augmented Dickey–Fuller test.

#### 4.2.2. Empirical results

The panel ARDL model was utilized to account for the long-run and short-run relationships. Three methods can be used to estimate the equations: Pooled Mean Group (PMG), Mean Group (MG), and Dynamic Fixed Effects (DFE). Hausmann tests were carried out to select the most efficient estimator among the three. We first run the test to compare the MG and PMG which showed that PMG was better ( $\chi^2$ , 0.92 and  $p$ -value 0.9690). Comparisons between DFE and PMG also established PMG as the most efficient estimator ( $\chi^2$ , 1.25 and  $p$ -value 0.7321). Table 4 presents the results of the panel ARDL model using PMG methodology.

Public expenditure in agriculture carries negative and significant long-run coefficients, while its influence in the short run is insignificant in both equations. In the long run, a 1% increase in agricultural expenditure resulted in 0.03% and a 0.32% decline in intensive and extensive margins, respectively. Education expenditure influenced both long-run and short-run levels of IMI and EMI albeit in different directions. A 1% increase in PE expenditure resulted in a 1.3% decline in EMI by 1.3% and 0.12% for IMI in the long run but positively affected EMI by 0.15% and IMI by 0.07% in the short run. Public expenditure on transport and communication was associated with and reduction in both margins by 0.42% and 0.04% for EMI and IMI, respectively. Since lower values of the indices correspond to greater diversification the results entail that increasing expenditure in agriculture, education, and transport and communication sectors resulted in diversification. Contrary to expectation, manufacturing expenditure had the opposite effect with EMI and IMI increasing by 0.2% and 0.05%, respectively.

**Table 4. Vector error correction model results**

Variable (in log)		EMI	IMI
Long run	Agriculture Expenditure	−0.325068*** (0.0831154)	−0.0266837** (0.0112623)
	Education Expenditure	−1.270838*** (0.1707087)	−0.1254805*** (0.0211307)
	Transport and Communication Expenditure	−0.4159259*** (0.0463917)	−0.037684*** (0.0079751)
	Manufacturing Expenditure	0.2114871 (0.0640744) ***	0.0500354*** (0.0103187)
	Trade Openness	0.5021069* (0.2627188)	0.0010758 (0.0558055)
Short run	Agriculture Expenditure	0.1012299 (0.0711494)	0.0197406 (0.0309692)
	Education Expenditure	0.1517196 (0.0720061)**	0.0712717*** (0.0257895)
	Transport and Communication Expenditure	0.1011456 (0.1082632)	−0.014816 (0.0356344)
	Manufacturing Expenditure	−0.4096775 (0.408812)	0.0579794 (0.0742534)
	Trade Openness	−0.1424333 (0.14698)	−0.0568169 (0.0729824)
	Constant	−0.064522 (0.3636324)	0.2375591 (0.2384105)
Error Correction Term		−0.2691379 (0.155594)	−0.3576025*** (0.0827006)
CD test static p-value		0.57 0.567	0.09 0.926
Residual		I(0)	I(0)

Number in parentheses is the standard error \*\*\*, \*\*, \* show 1%, 5% and 10% significance level, respectively.

The error correction terms are again negative and significant, showing convergence in the long run. The extensive margins adjust faster to changes in public expenditures at 26.9% (−0.2691379) than intensive margins that had a speed of adjustment of 35.8% (−0.3576025).

## 5. Discussion

The insignificant effect of agriculture expenditure on diversification in the short run and the significant but inelastic relationship, i.e.,  $0 < \text{elasticity} < 1$  exhibited in the long run is worrying. Agriculture is one of the most important sectors in SSA employing over half [52%] of the labor force in sub-Saharan Africa is employed in the agriculture sector (International Labor Organization, 2020). Consequently, a significant amount of public resources is channeled towards its development as a means of achieving food security and poverty reduction. For instance, under the Maputo Declaration on Agriculture and Food Security in Africa countries committed to spending at least 10% of the national budgetary resources on agriculture and rural development policy implementation (NEPAD, 2003). However, the re-emergence of input subsidies to support food production in most countries has resulted in the largest share of the national budget being taken up by the programs. Jayne and Rashid (2013) observe that 10 African governments spend roughly US \$1 billion every year on input subsidy programs, amounting to 28.6% of their public expenditures

**Table 5. Asymmetry test results**

	EMI		IMI	
	$\chi^2$	<i>p</i> Value	$\chi^2$	<i>p</i> Value
Agriculture expenditure				
LR	0.63	0.4266	2.87	0.0903
SR	3.53	0.0602	1.73	0.1879
Education expenditure				
LR	0.57	0.4498	1.647	0.2245
SR	1.76	0.184	0.15	0.6984
Transport and ICT expenditure				
LR	0.3	0.8713	0.131	0.3232
SR	0.97	0.3242	0.466	0.131
Manufacturing and mining				
LR	0.54	0.4631	0.103	0.1347
SR	0.68	0.4105	0.78	0.3773

on agriculture. This crowds out support to research and other services that would facilitate export product diversification.

Although there is overwhelming empirical evidence of the positive impact of public expenditure on economic growth (Baldacci et al., 2008; Bose et al., 2007; Cooray, 2009; Günalp, 2002; Yasin, 2011). This finding suggests that this did not translate into diversification. The coefficient for public investment in manufacturing and mining returned a positive sign for both EMI and IMI. This shows that current investment patterns in these sectors do not promote the creation of new products but promote concentration in already existing products. This agrees with UNDP (2011) who reported worsening export concentration in Africa between 1995 and 2008 despite countries being on positive growth trajectories.

The finding that public investment in education enhanced diversification, in the long run, agrees with Giri et al. (). This can be attributed to declining illiteracy levels and increased labor productivity. Contrary to expectation, increasing education expenditure led to less diversification in the short term. In SSA government spend 43% of the education budget on primary education (UNESCO, 2020). Jetter and Ramírez Hassan (2015) report the importance of basic education in raising export diversification, but this can only manifest in the long term. This finding is important because most export strategies are contained medium-term frameworks that seek to achieve results between 5 and 10 years and ignore long-term strategies that have a greater impact. A mixture of short-term and long-term policy interventions is desirable to achieve greater diversification.

Infrastructure development is a key element of a countries' ability to produce and move goods (Mbekeani, 2007). Transport infrastructure investment reduces the costs of doing business over distance and thus improves the capacity of firms to compete in global markets Albarran, et al., 2013. The finding that government expenditure in the transportation and communication sector promotes diversification is not uncommon. However, add a voice to the importance of facilitatory functions or support services in the quest to diversify exports.

## 6. Conclusion

The objective of this paper was to analyze how public expenditure affects export diversification in countries that have a predominantly unskilled labor force. Using a panel ARDL model, the effect of agriculture, education, transport and ICT, and manufacturing and mining sector expenditures on intensive and extensive margins in 17 SSA countries were investigated. The findings underpin the importance of public expenditure as a long-term determinant of export diversification. The lack of impact in the short term highlights the need for tailor-made investment in economic sectors to promote diversification in the short to medium term. Education is a human right, and countries will always invest to have an educated society. However, in the case of SSA where most of the labor force is unskilled, education can be used to achieve a lot more. Unless the education system changes to encourage innovation and entrepreneurship. The opportunity of improving export diversification and performance via the tertiary education sector is forgone. Rising agriculture expenditure also resulted in diversified exports in the long term. This is encouraging as under the Maputo Declaration African countries have committed to spend at least 10% of the national budget on agriculture development. However, export diversification to be inelastic to agriculture spending, i.e., a huge change in expenditure only triggered a small change in either EMI or IMI. The observation suggests the need for a balanced approach to investment in the sector to ensure that vital support services such as research and extension are well supported but also complementary policies be adopted that will encourage product diversification and commercialization. Likewise, investment in the manufacturing sector was detrimental to diversification. A clear indication of the need to reform the industrial development strategies currently being implemented in SSA.

### Funding

The author received no direct funding for this research.

### Author details

Horace Phiri  
 E-mail: [hphiri@luanar.ac.mw](mailto:hphiri@luanar.ac.mw)  
 ORCID ID: <http://orcid.org/0000-0003-0258-3775>  
 Department of Agricultural and Applied Economics,  
 Lilongwe University of Agriculture and Natural Resources,  
 Lilongwe, Malawi.

### Disclosure statement

No potential conflict of interest was reported by the author(s).

### Citation information

Cite this article as: Public investment and export diversification in low skilled labor force economies. Evidence from sub Saharan Africa, Horace Phiri, *Cogent Economics & Finance* (2022), 10: 2008586.

### References

- Aditya, A., & Acharyya, R. (2013). Export diversification, composition, and economic growth: Evidence from a cross-country analysis. *The Journal of International Trade and Economic Development*, 22(7), 959–992. <https://doi.org/10.1080/09638199.2011.619009>
- Agosin, M. R., Alvarez, R., & Bravo-Ortega, C. (2012). Determinants of export diversification around the world: 1962–2000. *The World Economy*, 35(3), 295–315. <https://doi.org/10.1111/j.1467-9701.2011.01395.x>
- Al-Marhubi, F. (2000). Export diversification and growth: An empirical investigation. *Applied Economics Letters*, 7(9), 559–562. <https://doi.org/10.1080/13504850050059005>
- Albarran, P., Carrasco, R., & Holl, A. (2013). Domestic transport infrastructure and firms' export market participation. *Small Business Economics*, 40(4), 879–898. <https://doi.org/10.1007/s11187-011-9393-9>
- Alemu, A. M. (2008). Determinants of vertical and horizontal export diversification: Evidence from sub-Saharan Africa And East Asia. *Ethiopian Journal of Economics*, 17(2). <https://doi.org/10.4314/eje.v17i2.47311>
- Amurgo-Pacheco, A., & Pierola, M. D. (2008). Patterns of export diversification in developing countries: Intensive and extensive margins Policy Research Working Paper No. 4473 (Washington DC: The World Bank).
- Arip, M. A., Yee, L. S., & Karim, B. A. (2010). *Export diversification and economic growth in Malaysia*. Munich Personal RePEc Archive, (20588).
- Baldacci, E., Clements, B., Gupta, S., & Cui, Q. (2008). Social spending, human capital, and growth in developing countries. *World Development*, 36(8), 1317–1341. <https://doi.org/10.1016/j.worlddev.2007.08.003>
- Baltagi, B.H. 2014. *The oxford handbook of panel data* (USA: Oxford University Press)
- Blackburne, E. F., & Frank, M. W. (2007). Estimation of non-stationary heterogeneous panels. *Stata J*, 7(2), 197–208. <https://doi.org/10.1177/1536867X0700700204>
- Bose, N., Haque, M., & Osborn, D. (2007). Public expenditure and economic growth: A disaggregated analysis for developing countries. *Manchester School*, 75(5), 533–556. <https://doi.org/10.1111/j.1467-9957.2007.01028.x>
- Cabral, M., & Veiga, P. (2010). Determinants of export diversification and Sophistication in sub-Saharan Africa. FEUNL Working Paper Series No. 550 doi: <https://dx.doi.org/10.2139/ssrn.1665116>.
- Cooray, A. (2009). Government expenditure, governance, and economic growth. *Comp Econ Stud*, 51(3), 401–418. <https://doi.org/10.1057/ces.2009.7>
- Elhiraika, A., & Mbate, M. (2014). Assessing the determinants of export diversification in Africa. *Applied*

- Econometrics and International Development* 14, (1) <http://www.usc.es/economet/reviews/aeid1411.pdf>.
- Fonchamnyo, D. C., & Akame, A. R. (2016). Determinants of export diversification in Sub-Sahara African region: A fractionalized logit estimation model. *Journal of Economics and Finance* 41 330–342. <https://doi.org/10.1007/s12197-016-9352-z>
- Fosu, A. K., & Abass, A. F. (2019). Domestic credit and export diversification: Africa from a global perspective. *Journal of African Business*, 20(2), 160–179. <https://doi.org/10.1080/15228916.2019.1582295>
- Francis, B., Iyare, S. O., & Lorde, T. (2007). Agricultural Export-Diversification and economic growth in Caribbean countries: Cointegration and error-correction models. *The International Trade Journal*, 21(3), 228–256. <https://doi.org/10.1080/08853900701416325>
- Gill, I. S., and Karakülah, K. 2019. Has Africa Missed the Bus? The Confusing Consensus about the Continent's Growth. SSRN Journal, doi: [10.2139/ssrn.3364639](https://doi.org/10.2139/ssrn.3364639)
- Giri, R., Quayyum, S. N., and Yin, R. J., 2019. Understanding Export Diversification: Key Drivers and Policy Implications. SSRN Journal, doi: [10.2139/ssrn.3404061](https://doi.org/10.2139/ssrn.3404061)
- Grossman, G., & Helpman, E. (1992). *Innovation and growth in the global economy*. MIT Press.
- Güralp, B. G. T. (2002). Government expenditures and economic growth in developing countries: Evidence from a panel data analysis. *METU Stud Dev*, 29(3), 311–332.
- Hausmann, R., & Klinger, B. (2006). *Structural Transformation and patterns of comparative advantage in the product space*. CID Working Paper Series 2006. Center for International Development, Harvard University, Cambridge, MA.
- Henn, C., Papageorgiou, C., & Spatafora, N. (2013). *Export quality in developing countries* IMF Working Paper (International Monetary Fund), (WP/13/108).
- Heumesser, C., & Kray, H. A. (2019). *Productive diversification in African Agriculture and its effects on resilience and nutrition*. Retrieved from Washington DC: IFPRI, (2015). Statistics on Public Expenditures for Economic Development doi:<http://dx.doi.org/10.7910/DVN/INZ3QK>
- Im, K. S., Pesaran, M. H., & Shin, Y. (2003). Testing for unit roots in heterogeneous panels. *Journal of Econometrics* 115, (1), 53–74. [https://doi.org/10.1016/S0304-4076\(03\)00092-7](https://doi.org/10.1016/S0304-4076(03)00092-7)
- International Labor Organization. (2020). *ILOSTAT database* (International Labor Organization).
- International Monetary Fund. (2014). *Sustaining long-run growth and macroeconomic stability in low-income countries - the role of structural transformation and diversification*.
- International Trade Center. (2018). Exploring Malawi's export potential (Geneva: ITC)<https://www.intracen.org/publication/Exploring-Malawis-export-potential/>.
- Isukur, A., Chizea, J., & Agbugba, I. (2018). Economic Diversification in Nigeria: Lessons from other Countries of Africa. *DBN Journal of Economics and Sustainable Growth*.
- Iwamoto, M., & Nabeshima, K. (2012). *Can FDI promote export diversification and sophistication of host countries?: Dynamic panel system GMM analysis*. IDE Discussion Papers (Japan: IDE).
- Jayne, T. S., & Rashid, S. (2013). Input subsidy programs in sub-Saharan Africa: A synthesis of recent evidence. *Agricultural Economics*, 44(6), 1–16. <https://doi.org/10.1111/agec.12073>
- Jetter, M., & Ramírez Hassan, A. (2015). Want export diversification? Educate kids first. *Economic Inquiry*, 53(4), 1765–1782. <https://doi.org/doi:10.1111/ecin.12213>
- Kenji, Y., & Mengistu, A. A. (2009). The Impacts of vertical and horizontal export diversification on growth: An empirical study on factors explaining the gap between Sub-Sahara Africa and East Asia's performances. *Ritsumeikan International Affair*, 17.
- Kuznets, S. (1971). *Economic growth of nations: Total output and production structure*. Harvard University Press.
- Levin, A., Lin, C.-F., & Chu, C.-S. J. (2002). Unit root tests in panel data. *Asymptotic and Finite-sample Properties Journal of Econometrics* 108, 108, 1–24 [https://doi.org/10.1016/S0304-4076\(01\)00098-7](https://doi.org/10.1016/S0304-4076(01)00098-7).
- Manova, K. (2008). *Credit Constraints, Heterogeneous Firms, and International Trade*. NBER Working Paper (14531). Cambridge, MA: National Bureau of Economic Research.
- Mbekeani, K. (2007). *The Role of Infrastructure in Determining Export Competitiveness: Framework Paper* (Kenya: Africa Economic Research Consortium).
- Melitz, M. J. (2003). The Impact of Trade on Intra-Industry Reallocations and Aggregate Industry Productivity. *Econometrica*, 71(6), 1695–1725. <https://doi.org/10.1111/1468-0262.00467>
- NEPAD. (2003). *Comprehensive Africa Agriculture Development Programme* (CAADP).
- Ofa, S. V., Spence, M., Mevel, S., & Karingi, S. (2016). Export Diversification and intra-industry trade in Africa Mugerwa, Steve, Shimeles, Abebe, Lusigi, Angela, and Moumami, Ahmed Inclusive Growth in Africa: Policies, Practice, and Lessons Learnt 1 (Routledge)9781315562179).
- Olaleye, S., Olasode, E. F., & Taiwo, S. B. (2013). Export diversification and economic growth in Nigeria: An empirical test of relationship using a Granger causality Test. *Journal of Emerging Trends in Economics and Management Sciences*, 5(1), 70–79.
- Oliveira, H. C. D., Jegu, E., & Santos, V. E. (2020). Dynamics and determinants of export diversification in Brazil from 2003 to 2013. *Economia E Sociedade*, 29(1), 29–51. <https://doi.org/10.1590/1982-3533.2020v29n1art02>
- Pedroni, P. (2004). Panel cointegration: Asymptotic and finite sample properties of pooled time series tests with an application to the PPP hypothesis. *Econometric Theory*, 20(3), 597–625. <https://doi.org/10.1017/S0266466604203073>
- Schwab, K. 2019. *The Global Competitiveness Report* (Geneva: World Economic Forum). Retrieved from.
- Shin, Y., Yu, B., & Greenwood-Nimmo, M. (2014). *Modeling asymmetric cointegration and dynamic multipliers in an ARDL framework*. (Newyork, NY: Springer) [https://doi.org/10.1007/978-1-4899-8008-3\\_9](https://doi.org/10.1007/978-1-4899-8008-3_9) : In: W. C. Horrace
- Signe, L., & Johnson, C. Chelsea Johnson (2018). *The Potential of Manufacturing and Industrialization in Africa; Trends, Opportunities and Strategies* (New York: Carnagie).
- UNDP. 2011 (New York: UNDP). Towards Human Resilience: Sustaining MDG Progress in an Age of Economic Uncertainty.
- UNESCO. (2020). *UNESCO Institute for Statistics*. <http://uis.unesco.org/>
- Yasin, M. (2011). Public spending and economic growth: An empirical investigation of Sub-Saharan Africa. *Southwestern Econ Rev*, 30, 59–68.



© 2022 The Author(s). This open access article is distributed under a Creative Commons Attribution (CC-BY) 4.0 license.

You are free to:

Share — copy and redistribute the material in any medium or format.

Adapt — remix, transform, and build upon the material for any purpose, even commercially.

The licensor cannot revoke these freedoms as long as you follow the license terms.

Under the following terms:

Attribution — You must give appropriate credit, provide a link to the license, and indicate if changes were made.

You may do so in any reasonable manner, but not in any way that suggests the licensor endorses you or your use.

No additional restrictions

You may not apply legal terms or technological measures that legally restrict others from doing anything the license permits.

***Cogent Economics & Finance* (ISSN: 2332-2039) is published by Cogent OA, part of Taylor & Francis Group.**

**Publishing with Cogent OA ensures:**

- Immediate, universal access to your article on publication
- High visibility and discoverability via the Cogent OA website as well as Taylor & Francis Online
- Download and citation statistics for your article
- Rapid online publication
- Input from, and dialog with, expert editors and editorial boards
- Retention of full copyright of your article
- Guaranteed legacy preservation of your article
- Discounts and waivers for authors in developing regions

**Submit your manuscript to a Cogent OA journal at [www.CogentOA.com](http://www.CogentOA.com)**

