Received: 2 August 2023 | Accepted: 29 August 2023

DOI: 10.1111/twec.13503

ORIGINAL ARTICLE

The World Economy WILEY

Integration of African countries in regional and global value chains: Static and dynamic patterns

Emmanuel B. Mensah[1] | **Johannes Van Biesebroeck**[2]

[1]Utrecht University, School of Economics, Utrecht, The Netherlands

[2]Department of Economics, KU Leuven, Leuven, Belgium

Correspondence
Johannes Van Biesebroeck, Department of Economics, KU Leuven, Leuven, Belgium.
Email: jo.vanbiesebroeck@kuleuven.be

Funding information
AERC; the IGC; KU Leuven Methusalem Project on the Granular Economy; the Fonds Wetenschappelijk Onderzoek – Vlaanderen (FWO); the Fonds de la Recherche Scientifique – FNRS under EOS Project, Grant/Award Number: G073619N and G0G4318N (EOS ID 30784531)

Abstract

We study the geographic concentration of trade flows of African countries using information on the global input–output structure of trade from the Eora database. Most countries show a similar concentration between close-by versus long-distance trade in their foreign input sourcing as in their export sales. However, changes over the last two decades indicate that many countries increasingly focus their long-distance trade on only one of these two dimensions. This trend is most pronounced in manufacturing industries with stronger global value chains. In line with the learning-by-exporting hypothesis, export success on distant markets is a leading predictor (Granger causes) of regional export success. Only in light manufacturing do we find some evidence of a reverse pattern, that is, regional exports preceding global exports.

KEYWORDS

global value chain, Granger causality, upgrading

1 | INTRODUCTION

International trade provides a potent development path for at least two reasons. First, exporters face a highly elastic import demand for their output and importers can source from a highly elastic supply of inputs. As a result, successful firms can expand without facing adverse price changes that would hamper growth in the domestic market (Rodrik, 2016). Second, trade with developed countries provides access to advanced technology and exposes firms to international

competition. It allows and forces firms in developing countries to improve productivity and product quality.

Historically, developing countries needed extensive capabilities, and had to master all activities necessary to produce a finished product before they could export more than raw materials or simple goods (Whittaker et al., 2010). Such capabilities were often acquired by shielding the domestic 'infant industry' from foreign competition using import tariffs or a dual-exchange rate regime. Trade in manufacturers featured international product cycles as products were first introduced in developed countries and production only shifted to developing countries after the technology matured (Feenstra & Rose, 2000). Exports progressed only gradually from simple goods and light manufacturing to more sophisticated industries (Van Biesebroeck & Zaurino, 2019).

The situation is markedly different for late-developing African countries. Nowadays, the manufacturing process of many goods has fragmented and production of individual activities is increasingly spread across several countries (Antràs & Chor, 2022). By integrating in such global value chains (GVCs), African countries can participate in the global production network after mastering only a narrow range of capabilities. In this paper, we study two challenges that countries face to insert themselves successfully in this process: specialisation and upgrading.

The first challenge for firms is to specialise and develop a comparative advantage in a specific activity. While firms access global technology and demand through a GVC, they also need to integrate into local production networks that provide complementary inputs. Especially given high transportation costs in Africa, it is not cost-effective to incur long-distance shipping costs twice.[1] Firms should rely on long-distance trade to source inputs from distant locations or to send their output to faraway destinations, but not both. Ma et al. (2009) document a clear specialisation along this dimension for the processing trade of Chinese provinces. We investigate whether African countries similarly choose to establish global trade linkage either for input sourcing or for output exporting and how this specialisation has evolved over time.

The second challenge is that activities performed in a GVC need to be performed immediately at 'world-class' level. Output will be sold around the world, and product quality needs to be higher than what would be optimal if products were tailored to the domestic market. The required knowledge and technology generally come from interacting with clients, suppliers or competitors in more developed, faraway markets. We will use a Granger causality approach (Granger, 1969) to study which of the following two upgrading strategies is most successful.[2]

On the one hand, firms can start exporting regionally and enter successively more advanced export markets as they gain experience and advanced capabilities (Eaton et al., 2011). On the other hand, firms can learn from export activities on advanced markets to access technology

[1]When distinguishing close and far trade, our focus on goods trade naturally leads us to consider physical distance. The growing importance of services trade increases the relevance of other dimensions of distance, for example, online connectedness, but such considerations go beyond this study.

[2]The Granger causality test evaluates, in a regression framework, whether lagged values of a first variable have predictive power for a second variable once lagged values of the second variable are controlled for. If this predictive power goes one way, but not the other, one says that the first variable 'Granger causes' the second one.

(Van Biesebroeck, 2005). Even if those activities are not immediately profitable, firms can earn a return on the knowledge accumulated this way through improved local competitiveness and subsequently higher regional exports.

The two ways that firms can specialise in their long-distance trade, either on the export or on the import side, naturally relate to the two alternative upgrading processes. Fafchamps et al. (2007) provides a theoretical framework that explicitly links export market entry to the upgrading process. Learning by doing that accrues with production, especially for more advanced countries, is a way to lower marginal costs or increase product appeal. It allows firms to raise their size and afford the fixed cost associated with additional export market entry. This interpretation, which links specialisation on faraway exports with upgrading through learning by exporting is consistent with the evidence in De Loecker (2007). Sourcing inputs from high-income countries is an alternative way to lower production costs (Kasahara & Rodrigue, 2008). It provides a natural connection between global input sourcing and regional export success. This interpretation, which links long-distance trade specialisation on imports with regional exports preceding faraway exports, is consistent with the evidence in Antràs et al. (2017). While the vast majority of US exporters only export regionally, intermediate inputs are frequently sourced from very distant countries, especially high-income countries.[3] Crucial for both interpretations is that trading partners that are distant from African countries are systematically more developed than close partners. As a result, a partner's distance can be interpreted as its level of technological sophistication.

We study specialisation and upgrading of African countries using the multi-region input–output (IO) table that is part of the Eora database. It is the only global IO table that separately identifies all African countries. In particular, it provides information on bilateral flows of final products and inputs broken down by sector between all African country pairs and with countries outside the region. We will use it, in particular, to calculate trade in value added at the sectoral level.

In terms of geographic specialisation of African trade, the pattern in the cross-section differs from the change over time. Most African countries show a similar concentration of regional versus global trade on the export or import side. Countries exporting mostly faraway also tend to source from faraway and vice versa. This pattern is particularly strong for landlocked countries and is in contrast with the pattern observed across Chinese provinces in Ma et al. (2009). However, over the last two decades, many African countries have increased their global trade specialisation on exports or imports, but not both. This is especially true for the relatively more 'Advanced manufacturing' sectors where differentiated intermediate inputs are more important.

In terms of time dependency between local and long-distance trade, which we interpret as indicative of an upgrading pattern, we find only a relatively weak relationship that differs by sector. In the 'Light manufacturing' sector, local exporting success is a leading indicator for subsequent long-distance export success. However, when we estimate separately by country, pooling across sectors, or when we omit uniform time effects, we additionally find that long-distance export success precedes regional export success in the majority of countries and especially in the advanced manufacturing sector.

Our findings relate to several literatures. A number of papers have advanced theories of why firms engage in long-distance trade on imports or exports, but rarely on both dimensions simultaneously. In the model of market-seeking FDI in Ma et al. (2009), the minimisation of

[3]Kasahara and Lapham (2013) also show for Chile that in most industries firms are more likely to only import than only export, although not in food or wood products which are tend to use agricultural inputs.

transportation costs provides a straightforward mechanism. Gereffi et al. (2008) illustrate how the nature of demand and product development in the automobile industry naturally lead to one form of specialisation: global input sourcing with local exporting. Even though global automakers developed platforms that underpin a range of products, specific models are tailored to regional markets. As a result, most final assembly is regionally organised and exports of finished vehicles outside of the region are a minor share of output. Long-distance trade in automotive components is nevertheless rising, but it consists of either highly specialised, often electronic, parts or unsophisticated parts produced in low-wage countries.

Some studies have considered whether integrating a GVC provides firms in developing countries with upgrading opportunities, for example, Humphrey and Schmitz (2002) and Giuliani et al. (2005). Pahl and Timmer (2020) show a positive effect of GVC participation, constructed from national IO tables, on labour productivity growth and employment growth measured using UNIDO industry statistics. Amighini and Sanfilippo (2014) specifically evaluate the upgrading potential in Africa. They show that South–South import flows and R&D FDI flows have the potential to generate positive spillovers and induce structural transformation. They emphasise the importance of appropriate technology as well as diversification.

Both upgrading mechanisms that we consider have support in the literature. Van Biesebroeck (2005) provides evidence for the learning-by-exporting hypothesis for manufacturing firms in nine sub-Saharan African countries. Firms are shown to improve their productivity more rapidly than other firms after they start exporting. De Loecker (2007) further shows that Slovenian exporters only raise their productivity if they trade with more advanced economies, not in response to trade with neighbouring countries.

In the canonical heterogeneous firm models, export market entry is explained by self-selection based on productivity. Firms enter the more easily accessible export destinations first and only penetrate more challenging markets when the productivity distribution shifts up. Hence, strong regional export success is expected to precede long-distance trade. Eaton et al. (2011) shows that, indeed almost all French exporters enter the same destination market first and only the more productive firms enter a second market and so on.[4] However, in the model of Regolo (2017) with multi-product firms, export diversification is accompanied by regionalisation of trade. The probability of market entry is still negatively associated with distance, but firms start exporting products in which they do not have a strong comparative advantage at a later time, increasingly focusing on nearby markets.

Finally, Granger causality has been used in several applications in the international economics literature, but often with inconclusive results. For example, Reuveny and Kang (1996) find a reciprocal effect of international trade and political conflict, that is, causality seems to go both ways. Seyoum et al. (2014) also find two-way causation between FDI and trade openness in a panel of sub-Saharan African countries. Jenkins and Katircioglu (2010) find long-run causation going from real GDP to the monetary base and trade flows, but not the other way around. In the short run, they do find a positive, unidirectional effect of the monetary base on imports while bank credit shows two-way causation with imports.

The remainder of this paper is organised as follows. In Section 2, we describe the Eora database. The next three sections that follow contain the empirical results. First, in Section 3, we show that African integration in GVCs is stronger than it appears from existing evidence which is based on aggregate economy statistics. Second, in Section 4, we investigate to what

[4]The ordering of different export destinations is determined by a combination of market size and ease of access, which is itself a function of the fixed costs of entry and variable trading costs.

extent African countries specialise in long-distance trade on the import or export side, or both. Third, in Section 5, we investigate the dynamics in regional versus global exporting using a Granger causality test. In Section 6, we draw some conclusions and discuss policy implications.

2 | DATA

The multi-region input–output (IO) table that is part of the Eora database provides a detailed window on GVC integration of African countries. There exist several alternative IO tables, but Eora is the only one with information on all African countries individually.[5] Unavoidably, this level of detail comes at a cost, which is the greater reliance on imputations and proportionality assumptions to complement the relatively sparse data for some countries. The IO table is freely downloadable and the construction of the various components is described in detail in Lenzen et al. (2013).[6]

It contains information for 190 countries and 26 harmonised sectors over the period 1990–2015. These dimensions imply that just the matrix of bilateral input coefficients at the country-industry level is a (190×26) by (190×26) square matrix that contains more than 24 million coefficients. In addition, there are columns for six final demand components that add another 5.6 million pieces of information. This information is available for 26 years. Clearly, in order to learn something from this gigantic source of information, we need to aggregate and zoom in on particular areas of interest. Along three dimensions – time, industry and country – we made the following choices.

2.1 | Time

We observe a different IO table for 26 consecutive years, but the structure of the economy and the bilateral trading relationships change only gradually. Therefore, we only used the information for three equidistant years: 1995, 2005 and 2015. We look both at the most recent composition of input–output relationships and document changes over the last two decades.

2.2 | Industries

There are a total of 26 harmonised industries, which we combine into 6 more broadly defined sectors (in brackets are the numbers of the original industries included in each aggregate):

[5]A widely used alternative is the World Input–Output Database (WIOD; http://www.wiod.org/home) maintained by the Groningen Growth and Development Centre. The 2016 release covers 43 individual countries (including the 28 EU Member States) and a rest-of-the-world aggregate for the period 2000–2014. Another alternative is the Trade in Value-Added (TiVA) database of the OECD (http://www.oecd.org/sti/ind/measuring-trade-in-value-added.htm). The most recent 2016 edition covers 63 countries for the period 1995–2011. IDE-JETRO provides yet another alterative (https://www.ide.go.jp/English/Data/Io.html) with three multi-country IO tables released for 2005 focusing on Asia, BRICs countries and China–Japan–Korea.

[6]Eora can be downloaded at http://worldmrio.com/. The appendix of Kowalski et al. (2015) compares the characteristics and results on forward and backward integration for WIOD, TIVA and Eora.

1. Agriculture (2): Agriculture; Fishing.
2. Mining and quarrying (1).
3. Light manufacturing (3): Food & beverages; Textiles & wearing apparel; Wood & paper.
4. Advanced manufacturing (5): Petroleum, chemical & non-metallic mineral products; Metal products; Electrical & machinery; Transport equipment; Other manufacturing.
5. Trade and business services (7): Maintenance & repair; Wholesale trade; Retail trade; Hotels & restaurants; Transport; Post & telecommunications; Financial intermediation & business activities.
6. Other services (8): Recycling; Electricity, gas & water; Construction; Public administration; Education, health & other services; Private households; Others; Re-export and re-import.

We aggregate all six components of final demand into a single final demand vector[7]; that is, we do not distinguish between final demand stemming from consumers or governments, nor whether it represents consumption or capital formation.

2.3 | Countries

Our analysis focuses on 51 African countries listed in Table A1 in the Appendix A, which includes North Africa, sub-Saharan Africa and a few island states. Because many input coefficients in the Eora global IO table are estimated or interpolated and these calculations are performed for a large number of countries and sectors, the original IO table contains some data problems. In some parts of the analysis, we omit a few countries where the data show suspect patterns, or where changes over time are implausible: Ethiopia, Somalia, South Sudan and Sudan.[8]

Each country's trade within Africa is aggregated into three groups: domestic transactions, trade with neighbouring countries and trade with the rest of Africa. All non-African trading partners are aggregated into five regions. As a result, we study trade patterns of each of the 51 countries with 8 exhaustive groups, with the first 3 groups varying by country:

1. OWN: Domestic transactions
2. CLO: African countries that neighbour the country considered
3. FAR: Remaining African countries[9]
4. EU: 28 EU countries
5. USA: United States
6. OECD: Remaining OECD countries
7. CHN: China, including Hong Kong and Macau
8. ROW: Rest of the World; there already is a ROW category in the original Eora database, but we enlarged this group, adding all countries not in regions 2–7.

[7]The six final demand components are final consumption by households, non-profit institutions and government, as well as gross fixed capital formation, changes in inventories and the net change in valuables.

[8]Not all these countries necessarily have data problems for all indicators, but when unsure about the data accuracy we erred on the side of caution and omitted these countries.

[9]Van Biesebroeck and Mensah (2019) limited their analysis to sub-Saharan African countries and divided the FAR category into two distinct groups: (1) Non-neighbouring sub-Saharan Africa, (2) Other African countries: South Africa and the five North African countries (Morocco including Western Sahara, Algeria, Tunisia, Libya and Egypt).

We also constructed an alternative aggregated table, splitting the African trading partners not by geography, but by membership of the same Regional Trade Agreement (RTA) as the country considered. We distinguish RTA and non-RTA partners using Mario Larch's Regional Trade Agreements Database (Egger & Larch, 2008). This only changes the allocation of trading partners across groups 2 and 3:

2. RTA:African countries that are members of an RTA with this country
3. Non-RTA:Remaining African countries

3 | REGIONAL INTEGRATION AND TRADE IN VALUE ADDED

The literature has shown that African economies are not well regionally integrated and did not experience the rapid integration seen in South-East Asia over the last decades. Van Biesebroeck and Mensah (2019) document several relevant patterns and we summarise two.

First, already in 1995, fully 70% of the value of manufacturing output consisted of purchased intermediate inputs, but less than one-fifth of this was imported and only one-sixth of imports were sourced from other African countries. By 2015, imports made up almost one-quarter of intermediates, but the Chinese and ROW shares in imports rose much more than the African share. At the same time, of all the different origins of manufacturing value, the share of African imports showed by far the greatest variation across countries.

Second, statistics on GVC integration of African economies can be misleading if one only focuses on the aggregate economy. The share of output exported directly is much higher for mining (59%) and agriculture (24%) than for manufacturing (11%) or trade and business services (4%). However, given that the last sector makes up more than half of GDP, direct exports of services have become non-negligible; see Ariu (2022) and Shepherd (2022) for a recent analysis of trade in services in Africa. Moreover, given that approximately half of services output consists of intermediates, indirect export of services is also sizable. The strong pattern of forward integration in GVC, documented in De Melo and Twum (2021) at the aggregate level, is not limited to exports of unprocessed, raw materials.

In order to account for indirect trade as well as re-exports of imported inputs, we measure a country's international trade exposure using trade in value added. Johnson and Noguera (2012) proposed the VAX ratio, dividing the domestic value added consumed by a trading partner by the bilateral gross export flow, as an indicator of the importance of GVC integration. This ratio will be less than 1 when exports contain imported inputs – either sourced abroad directly or embedded in inputs sourced from other sectors – or when exports are not consumed by a trading partner, but exported in turn.

The literature contains several approaches to measure value added in trade which provide complementary perspectives. Johnson (2018) provides an instructive overview and discusses some unresolved methodological issues. The original Johnson and Noguera (2012) paper decomposes the value of all final goods according to the location of consumption. We use the hypothetical extraction method of Los et al. (2016), which decomposes the value by location of production, which is more relevant to our purpose. This intuitive method is explained in appendix B of Mensah and Van Biesebroeck (2022).

International integration of production chains tends to raise gross export flows more than the amount of value-added consumed abroad, which lowers the VAX ratio. The finding that many

sub-Saharan African countries have a relatively high VAX ratio, as documented among others by the International Monetary Fund (2015), is taken as evidence of limited GVC integration. However, the small size of the manufacturing sector in most African countries makes the VAX ratios calculated for the aggregate economy less informative.

Figure 1 shows the VAX ratio for all African countries, both at the aggregate level (light bars) and for manufacturing (dark bars). Countries are listed by region and sorted by rising manufacturing VAX.[10]

Two findings are worth highlighting. First, the range of manufacturing VAX ratios that we find across African countries spans the entire range of values found in other regions. For a few small countries, more than 80% of the value of their exports consists of value added that is sourced from abroad, that is, the VAX ratio is less than 20%. Several Northern African countries are tightly integrated into European value chains, and South Africa provides a similar role at the southern end of the continent. At the same time, some other countries, even some non-oil exporters, source more than 80% of the value of their exports domestically. VAX ratios are especially high not only for several Central African countries but also for fragile economies like Libya and Zimbabwe.

Second, in many countries, there is a large difference between the VAX ratios for the aggregate economy and the ratio for manufacturing. With few exceptions (most notably the oil producers) and in line with expectations, VAX ratios are lower for manufacturing. The extent to which this is the case reflects both varying importance of manufacturing and variation in the share of manufacturing in countries' exports. If we are interested in understanding GVC integration, it is important to focus on manufacturing trade in value added as country differences in strategies and successes are a lot more pronounced.

4 | GVC SPECIALISATION

4.1 | Methodology

If a country wants to integrate GVCs to access high-income sources of output demand or high-tech sources of input supply, but avoid incurring high transportation costs on both the import and export sides, it can follow two strategies. It can source imports from far away and after adding its own value added, it sells the output within the region. Alternatively, it can import inputs regionally and access faraway export markets for its output. To assess whether a country has specialised in either of these two types of GVC integration, we use the multi-country IO table to construct two indicators for regional export and import concentrations. Figure 2 illustrates for a generic Country 1 which values from the IO table are used in the calculations.

The seven groups of trading partners for Country 1 are further collapsed into three groups of 'close', 'far' or 'other' countries. We used all neighbouring countries or all African countries as two alternative definitions for the close group and all OECD countries as far.[11] In a final specification, we include countries that belong to an RTA with Country 1 in the close group and all other African countries in the far group.

[10]Here, we combine the light and advanced manufacturing sectors. We use the World Bank definition for the five African regions. Figure 1 shows the VAX ratios for 2015, but there is only a weak (negative) time trend. For three important oil producing countries – Angola, Gabon, and Nigeria – we obtain aggregate VAX ratios above 1 and we have top-coded these values at 1.05 to make them fit on the figure. Results for Tanzania are omitted due to data problems.
[11]Limiting the denominator to trade with the EU or expanding it to trade with China has very little impact.

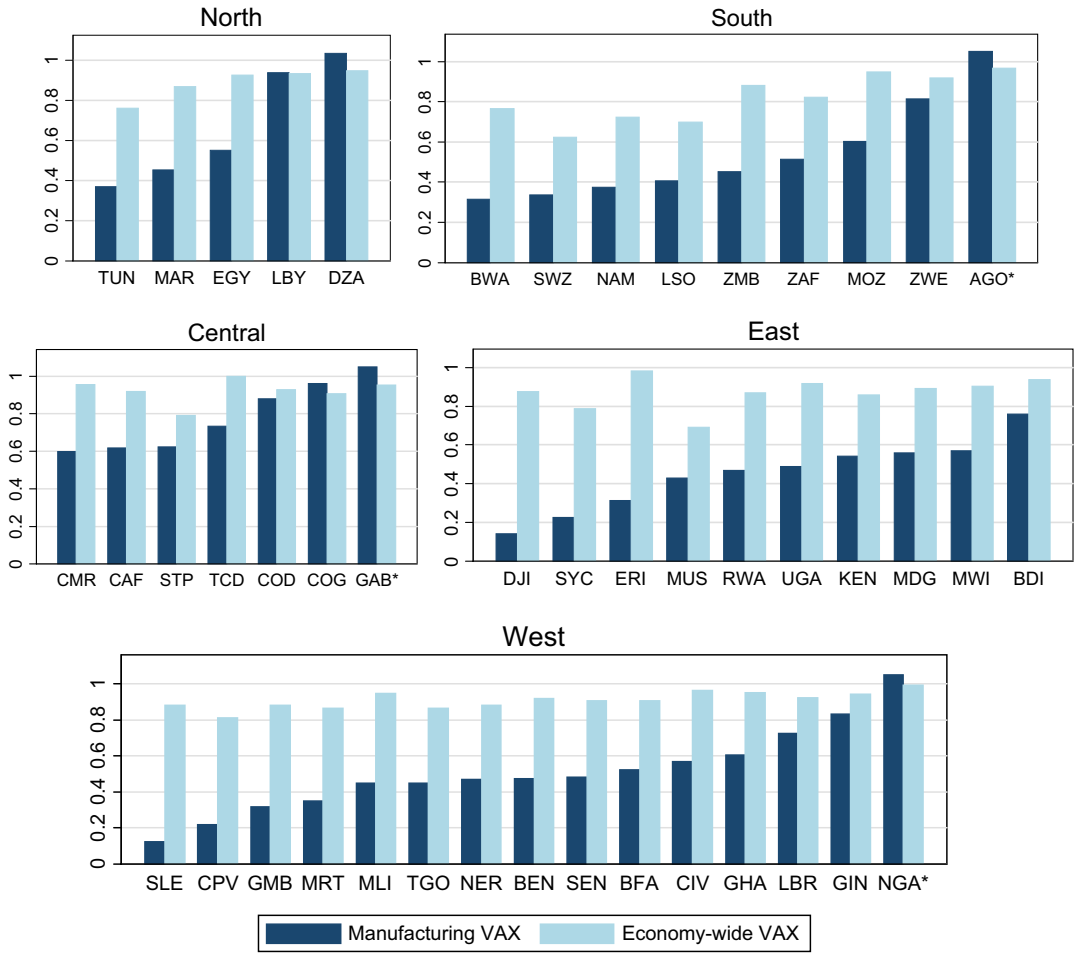


FIGURE 1 VAX ratio for the aggregate economy and manufacturing. *Note*: Statistics for 2015. The manufacturing VAX for countries marked with * is top coded at 1.05. [Colour figure can be viewed at wileyonlinelibrary.com]

The two regional concentration indices are the ratios of trade with the close group to trade with the far group. In the benchmark calculations, we count all exports, that is, summing intermediate input and final demand, but only include intermediate inputs used in Sector s of Country 1, summing over inputs coming from all foreign sectors. The two measures of interest are thus:

$$\text{Regional export concentration for sector } s\text{: } \ln\left(\frac{\sum_{k=1}^{S} X_I^{\text{close}}[sk] + X_{\text{FD}}^{\text{close}}[s]}{\sum_{k=1}^{S} X_I^{\text{far}}[sk] + X_{\text{FD}}^{\text{far}}[s]}\right),$$

$$\text{Regional import concentration for sector } s\text{: } \ln\left(\frac{\sum_{j=1}^{S} M_I^{\text{close}}[js]}{\sum_{j=1}^{S} M_I^{\text{far}}[js]}\right).$$

In a robustness check, we include only intermediate input in exports. For sourcing decisions that optimise over transportation costs, it is immaterial whether exports are purchased

Country:		Country 1		Countries close to Country 1		Countries far from Country 1		Other countries		Ctry 1	Close	Far	Other	
	Sector:	S1	S2	S1	S2	S1	S2	S1	S2	FD	FD	FD	FD	Total
Ctry 1	S1	·	·	·	·	·	·	·	·	·	·	·	·	·
	S2	·	·	X_I^{close}	X_I^{close}	X_I^{far}	X_I^{far}	·	·	·	X_{FD}^{close}	X_{FD}^{far}	·	·
Close	S1	·	M_I^{close}	·	·	·	·	·	·	·	·	·	·	·
	S2	·	M_I^{close}	·	·	·	·	·	·	M_{FD}^{close}	·	·	·	·
Far	S1	·	M_I^{far}	·	·	·	·	·	·	·	·	·	·	·
	S2	·	M_I^{far}	·	·	·	·	·	·	M_{FD}^{far}	·	·	·	·
Other	S1	·	·	·	·	·	·	·	·	·	·	·	·	·
	S2	·	·	·	·	·	·	·	·	·	·	·	·	·
	VA	·	·	·	·	·	·	·	·					
	Total	·	·	·	·	·	·	·	·					

FIGURE 2 Calculating regional concentration indices from the multi-country IO table: Illustration for Sector 2 in Country 1. *Note*: The relevant import (M) and export (X) values used to calculate importance of trade by distance are indicated from the perspective of Sector 2 (S2) in Country 1. Only a single 'close', 'far' and 'other' country/region is shown, in practice there will be several countries or regions in each group. There are really six sectors, but only two are shown. The columns labelled FD represent final demand and the row labelled VA represent the value added produced locally.

by final consumers or by other firms using them as inputs. However, input supply chains might be more sensitive to transportation costs. In a second robustness check, we include Country 1's final demand imports in the regional import concentration index, that is, adding $M_{FD}^{close}[s]$ and $M_{FD}^{far}[s]$ in the numerator and denominator. In principle, these imports should not be counted as they will not leave Country 1 anymore. However, some trade flows might be misclassified and some imported inputs might be recorded in the IO table as imported final goods.

4.2 | Results

Figure 3 shows the specialisation pattern using the benchmark assumptions. It is based on all manufacturing exports for 2015, using all African countries in the group of 'close' destinations and including final demand in exports, but not in imports. The vertical and horizontal dashed lines show the median values for the two trade ratios and the solid red line is a best-fit regression line. Table A1 (in the Appendix A) shows the country associated with each label.

The pattern is rather dispersed, but there is a moderate positive relationship between regional concentration in imports and exports. The majority of countries are in the upper-right or the lower-left quadrants. Countries towards the right that export a lot to close destinations also tend to import a lot of intermediates from close countries. Malawi, Zambia and Mozambique are among the most pronounced examples. At the other extreme, the five North African countries (shown in red) show the opposite pattern as they mostly trade with Europe.

There are a number of countries that show a negative relationship between the regional concentration of their exports and imports, mirroring the pattern for processing trade of China's provinces (Ma et al., 2009). At the top left are countries such as Eswatini (formerly Swaziland), Seychelles and Ivory Coast that trade much more within Africa for imports than for exports. At the bottom right are countries such as South Africa, Benin, Djibouti and Cape Verde that export much more intensively to other African countries than they import from them. For some of these countries, the difference in regional concentration between imports and exports is very pronounced, which is masked by the log scale. For example, Cape Verde's exports to other African

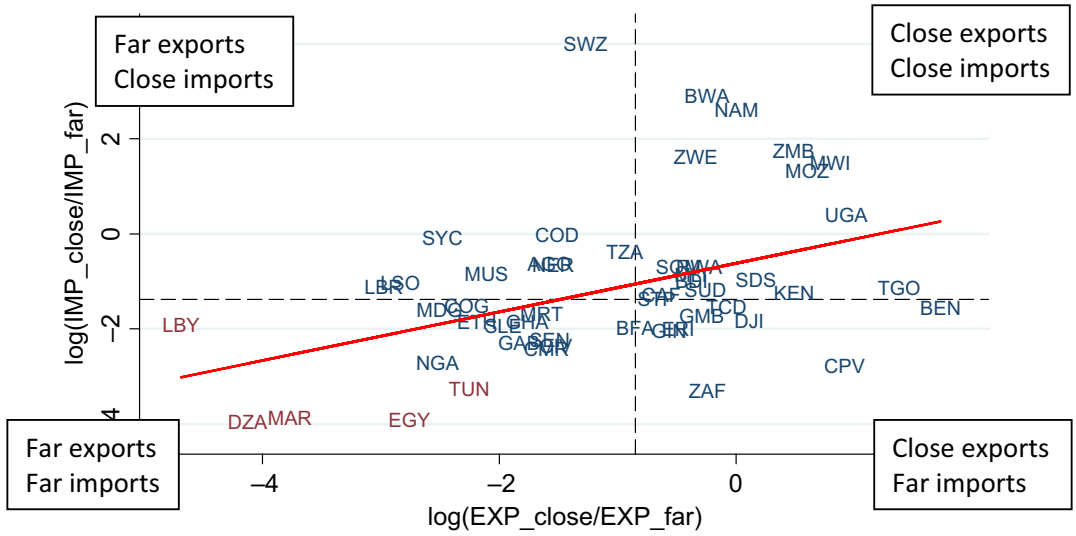


FIGURE 3 Specialisation in close or far trade on imports and/or exports (2015). *Note*: The dashed lines indicate the median values for the relative importance of close-to-far imports (on the vertical axis) and close-to-far exports (on the horizontal axis). Values above 0 indicate that close trade (within the continent) is larger than far trade (outside the continent). The solid red line indicates the best-fit regression line. [Colour figure can be viewed at wileyonlinelibrary.com]

countries represent approximately 75% of the sum of African and OECD trade. In contrast, only 5% of imports come from Africa.

The above pattern is robust to changes in the specification. Each statistic in Table 1 represents the slope of a regression line like the one shown in Figure 3 for a different sample or change in the calculation of relative trade ratios. All point estimates are positive, but the variation in absolute magnitude and statistical significance reflects variation in the strength of the relationship.

The benchmark results in the first line show the pattern for manufacturing in 2015 for sub-Saharan Africa. Excluding the North African countries leads to a much flatter regression line than in Figure 3. Results are similar for 1995, showing an even stronger positive relationship. Results are almost entirely invariant to changing the type of trade included in the aggregates. It strongly suggests that the patterns would be unchanged if forward and backward trade linkages were included instead of only direct trade flows. Finally, in the sub-sector of advanced manufacturing, which are industries where intermediate inputs are more important and more differentiated, the positive relationship disappears almost entirely. In that case, regional specialisation of exports is no longer a predictor for a similar regional specialisation for imports.

Results in the three columns use different definitions for close trade that appear in the numerator of the dependent and explanatory variables. The coefficient is almost always smallest for the narrowest definition of close trade, that is, only counting geographical neighbours. Defining close trade as all trade within the African continent, shown in column (3), the slope loses statistical significance entirely in the benchmark sample and also in 1995.

The pattern tends to be the reverse if close trade is defined as all trade with partner countries within a Regional Trade Agreement (RTA), in column (2). This definition always leads to the strongest positive relationship between regional specialisation in exports and imports. Successful RTAs that lead to a tighter integration of production networks between partner countries make both exports and imports more regionally concentrated. It is consistent with trade barriers in

TABLE 1 Robustness of the close versus far trade pattern.

Dependent variable is $\ln\left(\frac{IMP^{close}}{IMP^{far}}\right)$ and the explanatory variable is $\ln\left(\frac{EXP^{close}}{EXP^{far}}\right)$			
	Neighbouring countries	**RTA partners**	**All African countries**
Close is defined as:	**(1)**	**(2)**	**(3)**
Benchmark estimates	0.233*	0.550***	0.311
	(0.135)	(0.179)	(0.197)
Including North Africa	0.496***	0.603***	0.490***
	(0.111)	(0.157)	(0.157)
1995	0.361***	0.627***	0.276
	(0.124)	(0.203)	(0.234)
Excluding final demand exports	0.286*	0.580***	0.314
	(0.144)	(0.187)	(0.215)
Including final demand imports	0.241	0.553***	0.346*
	(0.148)	(0.188)	(0.211)
Advanced manufacturing	0.089	0.326*	0.097
	(0.130)	(0.175)	(0.206)
Observations	46	46	46

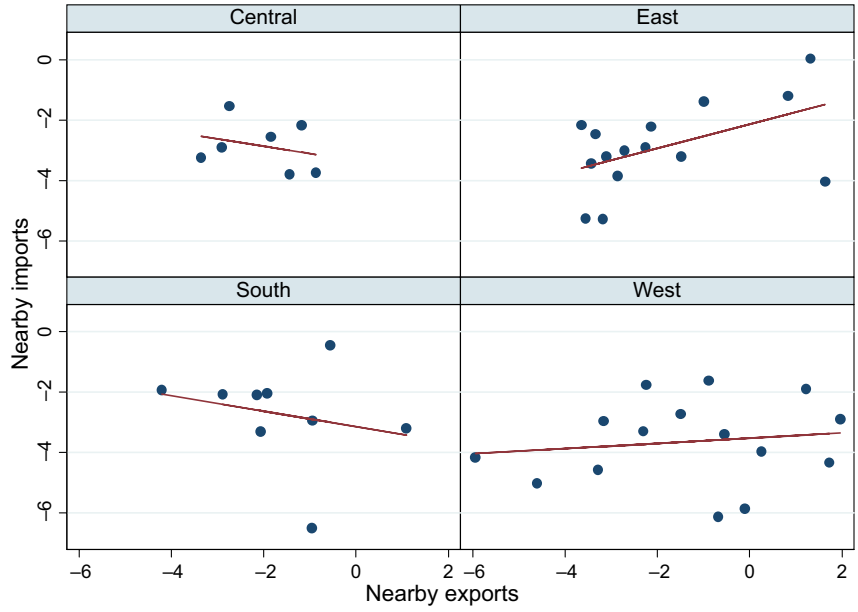
Note: Each statistic reports the coefficient on the export indicator in a regression with the import indicator as dependent variable. Benchmark estimates are for 2015, all manufacturing, using only imports and exports of intermediate goods and excluding the (five) North African countries. Each column uses a different definition of close trade in the numerators, indicated in the column heading. The definition of far trade in the denominators is trade with OECD countries in columns (1) and (2) and trade with non-RTA countries in column (3). ***, ** and * indicate significance at the 1%, 5% and 10% level respectively.

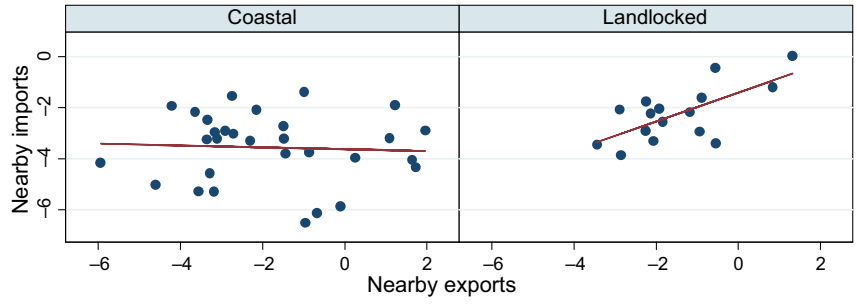
the absence of RTAs remaining important deterrents of trade, in particular for GVC trade where goods might cross borders multiple times (De Melo & Twum, 2021).

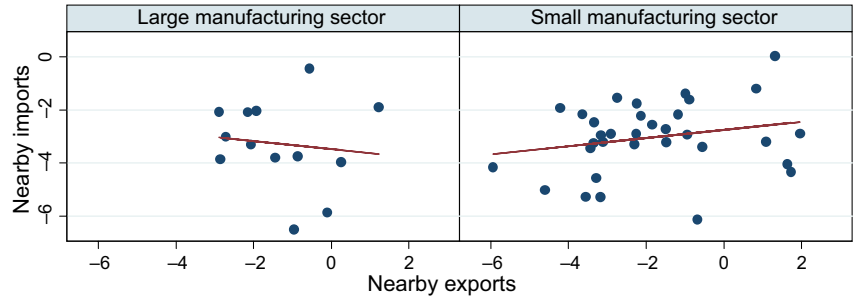
As manufacturing sectors integrate in GVCs, economising on transportation costs should lead to a concentration of long-distance trade on either exports or imports, but not both simultaneously. The lack of such a pattern likely reflects that African countries are much less integrated in GVCs than Chinese provinces. However, we do find some evidence for such a specialisation when we focus on certain sub-groups of countries. To illustrate such instances, we focus on a specification where this is most likely, that is, using data for 2015 and the narrow definition of close trade. Given the comparative advantage of African countries, we also expect GVC integration to be most relevant in the more advanced manufacturing sector. African firms might be able to perform some of the activities and produce some of the components, but their capabilities are unlikely to be sufficiently developed to produce the entire product domestically.

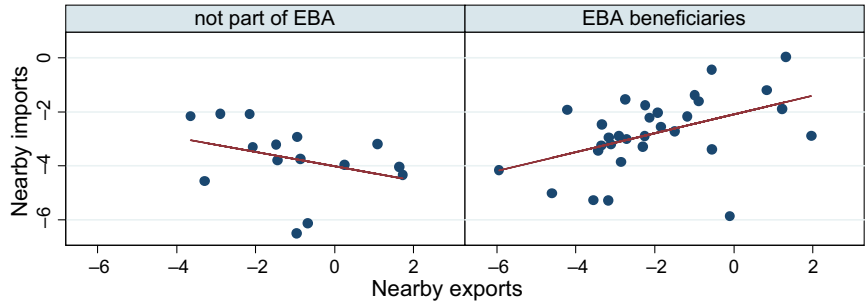
Figure 4 shows the trade concentration separately for a several sub-groups of countries. We always put the groups that show instances of specialisation on the left and those with a lack of specialisation on the right.

FIGURE 4 Specialisation in sub-groups of countries. *Note*: Results are for 'Advanced manufacturing', 2015, the narrow definition of close trade and exclude North Africa. [Colour figure can be viewed at wileyonlinelibrary.com]









Within Central Africa or within Southern Africa, different countries do specialise their long-distant trade on exports or imports, showing up as a weak, but clearly negative relationship between the two regional concentration indices. The same is true for West Africa if the broader definition of close trade is used (not shown).

The positive relationship documented in Figure 3 is especially strong in landlocked countries, which make up one-third of the sample. The much higher cost of long-distance trade affects imports and exports similarly, leading to a stronger regional focus on both dimensions. It is harder for landlocked countries to integrate in GVCs and this lowers incentives to specialise. Coastal countries show a very wide dispersion in regional concentration, especially on the export side. The negative relationship becomes more pronounced with population weights, although still not statistically significant.

The relationship also turns negative for countries where 'Advanced manufacturing' makes up at least 10% of total GDP. Countries with a more developed and more successful manufacturing sector are likely to have more trade success and have more incentives to specialise.

Finally, the bottom panel distinguishes between countries that are part of the Everything But Arms (EBA) programme that grants virtually all imports duty and quota-free access to the EU. Excluding the North African countries, there is a clear negative pattern for non-EBA beneficiaries. Countries that have to take trade protectionism into account focus their faraway trade either on the export or the import side, but not both. It is impossible to tell from this aggregate analysis whether this is due to the presence of trade barriers or because non-EBA countries are generally more developed and their economies are organised more efficiently.

A second instance where we find evidence of specialisation is in the changes over time. In Figure 5, we show the position of each country twice: for 1995 (in blue) and 2015 (in red). The arrows indicate how each country's regional specialisation has evolved over the 20-year period. To highlight different patterns, we show countries in four groups with different experiences.

Countries depicted in the top right increased their regional concentration for both exports and imports. This is the largest group of 18 countries, but almost all show relatively minor changes, consistent with a gradual, broad-based increase in regional trade. In contrast, countries in the bottom left increased their concentration on long-distance trade for either exports or imports, without an opposite change on the other dimension. There are only five countries in this group and most of them experienced important domestic turbulences, such as the end of the Apartheid regime in South Africa or the war in Liberia.

The majority of countries, however, fall in either of the two off-diagonal graphs. At the top left are 14 countries for which the most important change is increased input sourcing from within Africa (close imports). They move upward in the graph. Some also increase the regional share of exports but to a lesser extent, while others even shift left which indicates relatively more long-distance exports. The 14 countries in the bottom-right graph show a reverse specialisation. They increasingly export within Africa but show no corresponding increase in regional input sourcing. For many of these countries, the shift to the right is very pronounced.

We conclude that the overall pattern of trade in Africa still shows a similar reliance on close trade for exports and imports, but this is changing over time. Within certain regions and for industries with more GVC potential, there is evidence that some African countries mostly focus on trade with developed countries for sourcing advanced inputs, while other countries mostly send exports to developed countries, but few countries do both simultaneously. Over time, the majority of countries experienced a notably larger change in long-distance trade on one of the two dimensions, that is, they start to specialise more.

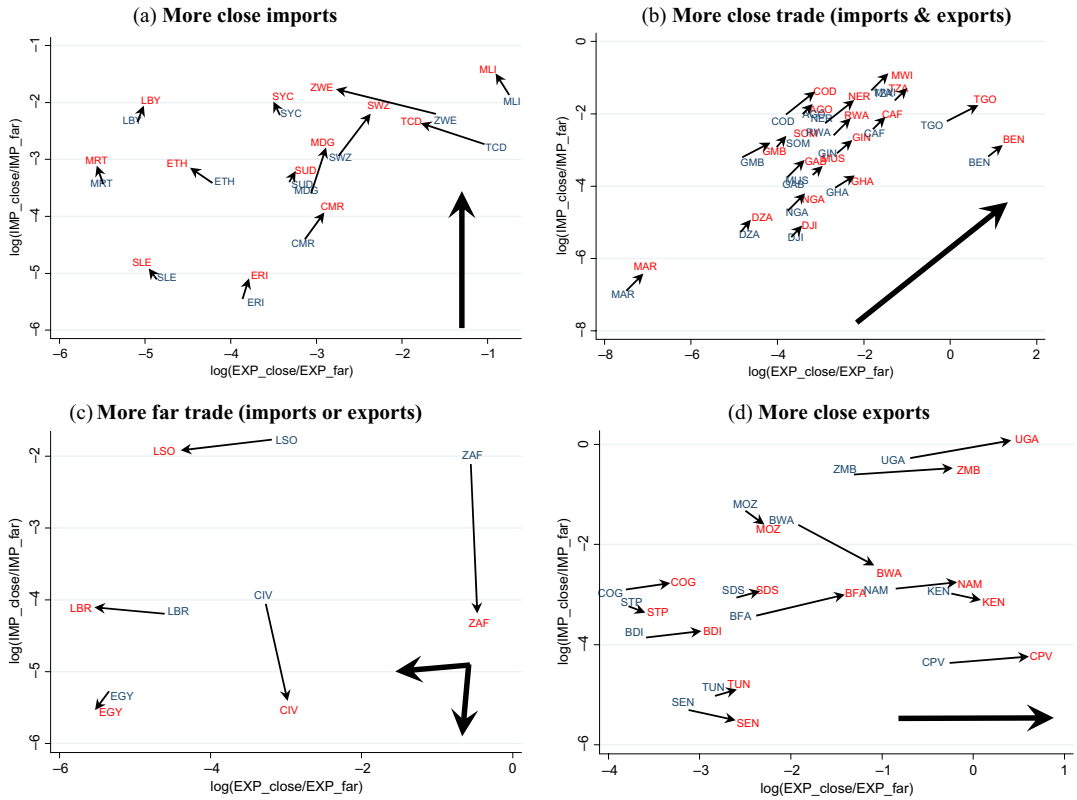


FIGURE 5 Change in the pattern of close versus far trade specialisation (1995 → 2015). *Note*: Similar to Figure 3, but position of countries in 1995 is indicated in blue, and red for 2015. Countries are categorised into four groups based on their evolution. [Colour figure can be viewed at wileyonlinelibrary.com]

5 | GVC UPGRADING

5.1 | Methodology

As discussed in the introduction, the trade literature contains two predictions on the upgrading process which imply a different sequencing of close and long-distance trade. The learning-by-exporting hypothesis predicts that firms gather expertise regarding production technology and product quality from long-distance trade with advanced economies. The accompanying productivity increase eventually leads to overall export success, including in close markets. On the other hand, most heterogeneous firm models assume constant firm-level productivity. Changes in fixed or variable trading costs lead to export market entry first in easy-to-reach destinations, which tend to be close. Only afterward, as the country develops and the entire productivity distribution shifts up, more distant markets become accessible. We use a Granger causality test to study the direction of causality and learn which upgrading process dominates.

The core idea is to evaluate in a regression framework whether lagged values of one variable have predictive power for a second variable once lagged values of the second variable are already controlled for. If x_{t-k} is a significant predictor of y_t (after controlling for y_{t-k}), but y_{t-k} is insignificant in a regression with x_t as dependent variable, we say that x causes y, but not the other way around. Importantly, as we are interested in the contribution of trade to value creation in

the domestic economy, we use the domestic value-added content, not gross export flows, for all results in this section.

The regressions we estimate take the following form:

$$\ln X_{cst}^{\text{close}} = \rho_s \ln X_{cst-5}^{\text{close}} + \alpha_s \ln X_{cst-5}^{\text{far}} + \gamma_c + \gamma_t + \epsilon_{cst} \quad \text{by } s \tag{1}$$

$$\ln X_{cst}^{\text{far}} = \overline{\rho}_s \ln X_{cst-5}^{\text{far}} + \overline{\alpha}_s \ln X_{cst-5}^{\text{close}} + \overline{\gamma}_c + \overline{\gamma}_t + \overline{\epsilon}_{cst} \quad \text{by } s \tag{2}$$

The dependent variables are exports to either type of destination and we control for lagged exports to the same destination. We estimate by sector s, but pool across countries c and years t. To control for comparative advantage and differences in export growth by level of development, we include country fixed effects. Year fixed effects control for the global or regional business cycle that influences exports to all countries. The coefficients of interest are those on lagged exports to the region that differs from the dependent variable: coefficients α_s in Equation (1) and $\overline{\alpha}_s$ in Equation (2).

We also estimate a specification that pools observations across all sectors and include country–sector interaction fixed effects to capture the baseline export level. A final specification pools across sectors, and includes sector and year fixed effects, to estimate a different pair of α_c and $\overline{\alpha}_c$ coefficients for each country.

We are interested in structural changes that are likely to require several years. The process of firms learning from their export experience in faraway markets, improving productivity levels and then entering closer markets is likely to take several years. Similarly, the reverse causal channel of firms entering close markets first and gradually expanding their operations to more difficult-to-reach destinations will also not happen overnight. Firms need to discover their own productivity level or learn how to export efficiently even in cases where fixed or variable trade costs are sizeable. To allow for changes in operations and cost structures to materialise, we look for an impact after 5 years.

The Granger causality test is only valid for stationary or cointegrated time series. We performed the standard unit root tests, but the small sample produced highly imprecise test statistics. Moreover, different versions of unit root tests for panel data produce different results. At the level of our six broad sectors and for our time period of 25 years, we could reject that regional and global export flows are non-stationary using the Levin–Lin–Chu and Fisher–Phillips–Peron unit root tests. However, the Harris–Tzavalis test indicates that this is not the case for each panel category (country). As exports of individual countries to different regions are likely to grow at similar rates in the very long run, the time series of close and far exports are likely cointegrated. In that case, the Granger causality test is valid as well. To err on the safe side, we have included country and time fixed effects in all regressions.

5.2 | Results

Estimates by sector are in the first two rows of Table 2, and the results pooling across all sectors are in the bottom row. Results for Equations (1) and (2) are, respectively, in the odd-numbered and even-numbered columns. As before, we use three alternative definitions for close trade, gradually broadening the category, but far trade is always defined as transactions with OECD countries.[12]

[12]All results in this section use 49 countries, excluding South Sudan and Sudan, because the domestic value added in exports are extremely low and unreliable due to data concerns.

TABLE 2 Granger causality between long-distance and close-by trade.

Close is defined as:	Neighbouring countries		RTA partners		All African countries	
Coefficient on lagged exports to:	Close	Far	Close	Far	Close	Far
	(1)	(2)	(3)	(4)	(5)	(6)
Light manufacturing	0.053	−0.076	0.273**	−0.166	0.291**	−0.198
	(0.114)	(0.125)	(0.132)	(0.132)	(0.143)	(0.133)
Advanced manufacturing	−0.067	−0.018	0.006	0.016	0.009	−0.014
	(0.080)	(0.116)	(0.095)	(0.111)	(0.112)	(0.117)
Observations	245	245	245	245	245	245
All sectors	0.017	−0.121**	0.069*	−0.100**	0.086*	−0.086
	(0.037)	(0.051)	(0.042)	(0.054)	(0.051)	(0.057)
Observations	1470	1470	1470	1470	1470	1470

Note: Each reported statistic is estimated using a separate regression. They are the coefficients on the lagged export value for the region that differs from the dependent variable. For example, results in column (1) are for exports to faraway destinations as dependent variable and control for lagged exports to faraway and close destinations, but only the last coefficient is reported. Regressions by sector use year and country fixed effects; regressions pooling all sectors, with results in the bottom row, use year and country–sector interaction fixed effects. ***, ** and * indicate significance at the 1%, 5% and 10% level respectively.

For most sectors, there is no predictive power in either direction. Most coefficients are statistically insignificant and the point estimates are often negative. The results for light manufacturing are the exception. They show a causal effect of close trade on far trade, but not the other way around. The effects are strongest if exports to all African countries are considered in the regional trade definition, but results are almost indistinguishable using RTA trade. The same pattern also appears in the results pooling all sectors, but absolute magnitudes are smaller. Interestingly, this pattern does not apply to the advanced manufacturing sector, which contains more sophisticated goods. Regional export success prepares firms well for competition in high-income countries in light manufacturing, but not in more sophisticated industries. This result is consistent with the finding that most manufacturing activities in sub-Saharan Africa involve the production of basic manufactures to meet local and regional demand (Kruse et al., 2022). Local and regional markets serve as a stepping stone for exporting into more advanced markets.

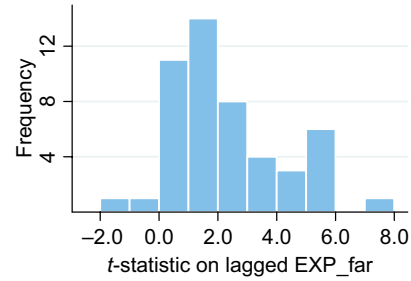
The results in Table 2 assume that effects are the same for all countries, although it is likely that countries have heterogeneous experiences. If we are willing to pool across sectors, we can estimate country-specific variants of Equations (1) and (2).

The estimates by country in Figure 6 show a rather distinct pattern from Table 2. Classifying countries in four cells according to the statistical significance of the two coefficients (at the 5% level), the most crowded cell is the bottom left using both definitions of close trade. In the first case, 23 of the 49 countries show a positive and statistically significant coefficient on global trade in Equation (1), but an insignificant coefficient for regional trade in Equation (2).[13] Only four countries show the opposite pattern of a significant regional and insignificant global coefficient. For a single

[13]Using a 10% significance level as threshold, the first group grows to 26 countries.

(a) Narrow definition for close (neighbours)

		t-statistic CLOSE	
		< 1.96	> 1.96
t-stat. FAR	<1.96	21	4
	>1.96	23	1



(b) Broad definition for close (all African countries)

		t-statistic CLOSE	
		< 1.96	> 1.96
t-stat. FAR	<1.96	19	5
	>1.96	25	0

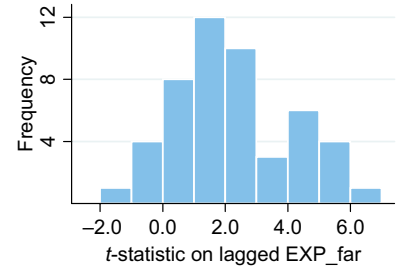


FIGURE 6 Distribution of country-specific effects. [Colour figure can be viewed at wileyonlinelibrary.com]

country, the causation goes both ways; and for 21 countries, the effects are significant in both directions. Effects are broadly similar using the broader definition of regional trade.

The full distribution of the *t*-statistic for the coefficient on faraway trade, shown in the histograms on the right, indicates that often the effects are quite strong. Negative coefficients are rare, but positive effects with a *t*-statistic exceeding even 3 or 4 are not.

The results in Table 2 not only impose the same effect on all countries but also assume that a uniform cyclical time pattern applies to all countries. In Table 3, we omit the year fixed effects. These results are only valid if the two types of trade are stationary in levels or if they are cointegrated. Moreover, if the difference between countries' close and far exports is systematically correlated with the global business cycle, that effect will now also be captured by the coefficient of interest. It is interesting, however, that the results are now more closely aligned with the country-specific results in Figure 6.

For each of the three definitions of close trade, the results now show a significant positive effect of lagged close trade on far trade in the light manufacturing sector. Global export success is more likely after being successful in regional trade. The reverse pattern appears in the more sophisticated (advanced) manufacturing sector and this is also the pattern that shows up if we include all sectors in a single regression.

6 | CONCLUSION

The newly ratified African Continental Free Trade Agreement (AfCFTA) is widely expected to be an impetus for greater trade integration and economic collaboration in Africa. While certainly a

TABLE 3 Granger causality results by country type without time fixed effects.

	Neighbouring countries		RTA partners		All African countries	
	Close	Far	Close	Far	Close	Far
Lagged exports to:	**(1)**	**(2)**	**(3)**	**(4)**	**(5)**	**(6)**
Light manufacturing	0.172*	0.163	0.293**	0.070	0.291**	0.046
	(0.097)	(0.114)	(0.105)	(0.117)	(0.112)	(0.116)
Advanced manufacturing	0.071	0.266**	0.135*	0.233**	0.134	0.188*
	(0.070)	(0.107)	(0.079)	(0.103)	(0.089)	(0.107)
Observations	245	245	245	245	245	245
All sectors	0.043	0.386***	0.057	0.410***	0.046	0.419***
	(0.035)	(0.051)	(0.044)	(0.054)	(0.044)	(0.057)
Observations	1470	1470	1470	1470	1470	1470

Note: Always using the broad definition of 'close' exports, counting all African trade. ***, ** and * indicate significance at the 1%, 5% and 10% level respectively.

step in the right direction, this policy initiative will not automatically improve African countries' integration in GVCs. To accomplish that, it is important that firms and/or countries specialise and carve out unique roles in the global production network. Our results show that, in contrast with Chinese provinces, few African countries currently have a clear specialisation in terms of relying on long-distance trade for input sourcing or export sales. An encouraging sign is that, together with greater regional integration overall, the majority of African countries have seen their concentration in long-distance trade between imports and exports diverge in recent years.

Our analysis shares with Ma et al. (2009) the disadvantage of working with aggregate trade information – Chinese provinces for them and African countries for us – while the specialisation pattern is likely to be strongest at the firm level. Given that comparative advantage induces similar specialisation for firms located in one country (or province), it is not surprising that we still find systematic patterns. However, it would be very interesting to replicate our analysis using more detailed, firm-level data, in case studies focused on the manufacturing sector specialisation for individual countries. That is something we leave for future work.

Long-distance trade is important because trade with more advanced economies is an important channel for developing countries to gain access to technology and stimulate productivity improvements. Embedding firms in GVCs and strengthening forward and backward linkages is one way for firms to upgrade their capabilities and activities. We find some evidence for the relevance of this upgrading channel in Africa. In particular, a Granger causality test shows that countries can leverage past export success in global, faraway markets into higher regional exports to neighbours and other African countries at a later time. This is in line with the learning-by-exporting hypothesis. Interaction with clients and competitors in developed-country markets lifts productivity levels and improves firms' competitiveness in all export markets.

A natural next question is which policies can further stimulate this process. The relative lack of specialisation in landlocked countries or countries with a smaller manufacturing sector suggests that investments in infrastructure to lower trade costs would be valuable. Stimulating the development of clusters would be another example. If firms can source more inputs and more sophisticated inputs locally, they will be in a better position to compete in final goods markets. Also, if firms of the same industry co-locate, foreign knowledge would more easily spread and

generate spillovers from firms not trading long-distance themselves. If regional trade barriers are removed, there is no reason why such clusters should fall entirely within one country. However, abolishing tariffs should be accompanied by regulatory harmonisation and lower administrative burdens on international trade.

While export success in faraway, advanced markets can lead to upgrading and improved productivity and product quality, employment creation may be limited. High product quality tends to require more capital-intensive production and these exporters may diffuse labour-saving technologies. Close by or regional export success may be more conducive for job creation given that light manufacturing sectors are low tech and labour intensive. In this light, a combination of both types of specialisations may be more desirable than an either–or approach. Policies that incentivise light manufacturing export to regional markets and export of semi-finished products from metals, petroleum, chemicals, etc. industries (advanced manufacturing) to global markets may be the best strategy.

ACKNOWLEDGEMENTS

We thank Jaime de Melo, Dominique Njikeu, Marcelo Olarrega, workshop participants at the African Economic Research Consortium (AERC) and an anonymous reviewer for useful comments. Financial support by the AERC, the IGC, KU Leuven Methusalem Project on the Granular Economy and the Fonds Wetenschappelijk Onderzoek – Vlaanderen (FWO) and the Fonds de la Recherche Scientifique – FNRS under EOS Project No. G0G4318N (EOS ID 30784531) and Project No. G073619N is gratefully acknowledged.

DATA AVAILABILITY STATEMENT

The multi-region input-output (IO) table that is part of the Eora database provides a detailed window on GVC integration of African countries. [...] The IO table is freely downloadable and the construction of the various components is described in detail in Lenzen et al. (2013).

ORCID


Johannes Van Biesebroeck https://orcid.org/0000-0003-4144-5578

REFERENCES

Amighini, A., & Sanfilippo, M. (2014). Impact of south-south FDI and trade on the export upgrading of African economies. *World Development*, *64*, 1–17.

Antràs, P., & Chor, D. (2022). Global value chains. In *Handbook of international economics* (Vol. *5*). North Holland.

Antràs, P., Fort, T. C., & Tintelnot, F. (2017). The margins of global sourcing: Theory and evidence from US firms. *American Economic Review*, *107*(9), 2514–2564.

Ariu, A. (2022). "Services trade in Africa: Structure and growth". AERC Working Paper, forthcoming.

De Loecker, J. (2007). Do exports generate higher productivity? Evidence from Slovenia. *Journal of International Economics*, *73*(1), 69–98.

De Melo, J., & Twum, A. (2021). Prospects and challenges for supply chain trade under the Africa continental free trade area. *Journal of African Trade*, *8*, 49–61.

Eaton, J., Kortum, S., & Kramarz, F. (2011). An anatomy of international trade: Evidence from French firms. *Econometrica*, *79*(5), 1453–1498.

Egger, P. H., & Larch, M. (2008). Interdependent preferential trade agreement memberships: An empirical analysis. *Journal of International Economics*, *76*(2), 384–399.

Fafchamps, M., El Hamine, S., & Zeufack, A. (2007). Learning to export: Evidence from Moroccan manufacturing. *Journal of African Economies*, *17*(2), 305–355.

Feenstra, R. C., & Rose, A. K. (2000). Putting things in order: Trade dynamics and product cycles. *Review of Economics and Statistics*, *82*(3), 369–382.

Gereffi, G., Sturgeon, T., & Van Biesebroeck, J. (2008). Value chains, networks, and clusters: Reframing the global automotive industry. *Journal of Economic Geography*, *8*(3), 297–321.

Giuliani, E., Pietrobelli, C., & Rabellotti, R. (2005). Upgrading in global value chains: Lessons from Latin American clusters. *World Development*, *33*(4), 549–573.

Granger, C. W. J. (1969). Investigating causal relations by econometric models and cross-spectral methods. *Econometrica*, *37*(3), 424–438.

Humphrey, J., & Schmitz, H. (2002). How does insertion in global value chains affect upgrading in industrial clusters? *Regional Studies*, *36*(9), 1017–1027.

International Monetary Fund (IMF). (2015). *Regional Economic Outlook: Sub-Saharan Africa, Navigating Headwinds*. World Economic and Financial Surveys. Washington, DC: International Monetary Fund.

Jenkins, H. P., & Katircioglu, S. T. (2010). The bounds test approach for cointegration and causality between financial development, international trade and economic growth: The case of Cyprus. *Applied Economics*, *42*(13), 1699–1707.

Johnson, R. C. (2018). Measuring global value chains. *Annual Review of Economics*, *10*, 207–236.

Johnson, R. C., & Noguera, G. (2012). Accounting for intermediates: Production sharing and trade in value added. *Journal of International Economics*, *86*(2), 224–236.

Kasahara, H., & Lapham, B. (2013). Productivity and the decisión to import and export: Theory and evidence. *Journal of International Economics*, *89*(2), 297–316.

Kasahara, H., & Rodrigue, J. (2008). Does the use of imported intermediates increase productivity? Plant-level evidence. *Journal of Development Economics*, *87*(1), 106–118.

Kowalski, P., Gonzales, J. L., Ragoussis, A., & Ugarte, C. (2015). "Participation of developing countries in global value chains: Implications for trade and trade-related policies". OECD Trade Policy Papers No. 179. Organization for Economic Co-operation and Development.

Kruse, H., Mensah, E., Sen, K., & de Vries, G. (2022). A manufacturing (re)naissance? industrialization in the developing world. *IMF Economic Review*, *71*, 439–473.

Lenzen, M., Moran, D., Kanemoto, K., & Geschke, A. (2013). Building Eora: A global multi-regional input-output database at high country and sector resolution. *Economic Systems Research*, *25*(1), 20–49.

Los, B., Timmer, M. P., & de Vries, G. (2016). Tracing value-added and double counting in gross exports: Comments. *American Economic Review*, *106*(7), 1958–1966.

Ma, A. C., Van Assche, A., & Hong, C. (2009). Global production networks and China's processing trade. *Journal of Asian Economics*, *20*(6), 640–654.

Mensah, E. B., & Van Biesebroeck, J. (2022). "Integration of African countries in regional and global value chains: Static and dynamic patterns". AERC Working Paper No. 2022-07.

Pahl, S., & Timmer, M. P. (2020). Do global value chains enhance economic upgrading? A long view. *Journal of Development Studies*, *56*(9), 1683–1705.

Regolo, J. (2017). Manufacturing export diversification and regionalization of trade: Which destinations for newly exported goods. *International Economics*, *151*, 26–47.

Reuveny, R., & Kang, H. (1996). International trade, political conflict/cooperation, and Granger causality. *American Journal of Political Science*, *40*(3), 943–970.

Rodrik, D. (2016). Premature deindustrialization. *Journal of Economic Growth*, *21*(1), 1–33.

Seyoum, M., Wu, R., & Lin, J. (2014). Foreign direct investment and trade openness in sub-Saharan economies: A panel data Granger causality analysis. *South African Journal of Economics*, *82*(3), 402–421.

Shepherd, B. (2022). "Regional integration, multilateralism, and services in African value chains: Retrospect and prospect". AERC Working Paper, forthcoming.

Van Biesebroeck, J. (2005). Exporting raises productivity in sub-Saharan African manufacturing firms. *Journal of International Economics*, *67*(2), 373–391.

Van Biesebroeck, J., & Mensah, E. B. (2019). "The extent of GVC engagement in sub-Saharan Africa". World Bank Policy Research Working Paper No. 8937. The World Bank, Washington, DC, July.

Van Biesebroeck, J., & Zaurino, E. (2019). "Effects of trade liberalization on textile and apparel exports from sub-Sahara Africa". World Bank Policy Research Working Paper No. 8936. The World Bank, Washington, D.C., July.

Whittaker, D. H., Zhu, T., Sturgeon, T., Tsai, M. H., & Okita, T. (2010). Compressed development. *Studies in Comparative International Development*, *45*(4), 439–467.

How to cite this article: Mensah, E. B., & Van Biesebroeck, J. (2023). Integration of African countries in regional and global value chains: Static and dynamic patterns. *The World Economy*, *46*, 3259–3281. https://doi.org/10.1111/twec.13503

APPENDIX A

Countries and labels

TABLE A1 Sample countries.

Country	ISO code	Landlocked	Region
Algeria	DZA	0	North
Angola	AGO	0	South
Benin	BEN	0	West
Botswana	BWA	1	South
Burkina Faso	BFA	1	West
Burundi	BDI	1	East
Cameroon	CMR	0	Central
Cape Verde	CPV	0	West
Central African Republic	CAF	1	Central
Chad	TCD	1	Central
Comoros	COM	0	East
Congo	COG	0	Central
Côte d'Ivoire	CIV	0	West
Dem. Republic of the Congo	COD	0	Central
Djibouti	DJI	0	East
Egypt	EGY	0	North
Equatorial Guinea	GNQ	0	Central
Eritrea	ERI	0	East
Ethiopia	ETH	1	East
Gabon	GAB	0	Central
Gambia	GMB	0	West
Ghana	GHA	0	West
Guinea	GIN	0	West
Guinea-Bissau	GNB	0	West
Kenya	KEN	0	East
Lesotho	LSO	1	South
Liberia	LBR	0	West

TABLE A1 (Continued)

Country	ISO code	Landlocked	Region
Libya	LBY	0	North
Madagascar	MDG	0	East
Malawi	MWI	1	East
Mali	MLI	1	West
Mauritania	MRT	0	West
Mauritius	MUS	0	East
Morocco	MAR	0	North
Mozambique	MOZ	0	South
Namibia	NAM	0	South
Niger	NER	1	West
Nigeria	NGA	0	West
Rwanda	RWA	1	East
Sao Tome and Principe	STP	0	Central
Senegal	SEN	0	West
Seychelles	SYC	0	East
Sierra Leone	SLE	0	West
Somalia	SOM	0	East
South Africa	ZAF	0	South
South Sudan	SDS	1	East
Sudan	SUD	0	East
Swaziland	SWZ	1	South
Togo	TGO	0	West
Tunisia	TUN	0	North
Uganda	UGA	1	East
United Republic of Tanzania	TZA	0	East
Zambia	ZMB	1	South
Zimbabwe	ZWE	1	South