



**Economic development
in Africa report 2024**

Chapter III

**Maximizing trade
resilience and
regional market
benefits in Africa**



**United
Nations**



Introduction

Economically vulnerable countries often fall into an instability trap when hit by endogenous shocks, which further weaken their productive and trading capabilities and limit their prospects for equitable and sustainable development. However, the scope for economies of scale and trade expansion provided by the agglomeration of domestic markets under a regional trading bloc could incentivize economically vulnerable countries to build stronger linkages with neighbouring countries and lay solid foundations for vibrant cross-border trade and growth spillover opportunities. UNCTAD research shows that trade within trade agreements has been more resilient to global supply chain shocks such as the COVID-19 pandemic (Nicita and Saygili, 2021), calling for stronger South–South ties (Grynspan, 2022; UNCTAD, 2022c). In a global market where economies are closely connected, risks and opportunities from one country can easily flow over the borders of its neighbours (Borin and Mancini, 2019). Collier (2007) estimated that for each additional 1 per cent in growth from a neighbouring country, a landlocked country could gain between 0.2 per cent and 0.7 per cent in growth. Such growth spillovers are, however, conditional on the infrastructure and policies in place within a regional trading bloc.

As noted by UNCTAD (2022c), the provision of regionally oriented physical infrastructure is an indispensable element of building stronger resilience. Having adequate infrastructure in place to facilitate the cross-border movement of goods and services is a significant challenge for many countries and regional markets in Africa. As stated in chapter I, connectivity ranks among the top two domains across which African countries are most vulnerable in the context of the polycrisis. However, domestic and regional efforts to bridge the gaps in infrastructure and trade capabilities are

unfolding. By eliminating barriers to trade and investment, the African Continental Free Trade Area is expected to enhance the cross-national transfer of technology and skills and broaden knowledge diffusion across Africa. In turn, this will make cross-border production easier as firms are better able to diversify into specific value chain components based on their capabilities and the availability of enabling economic infrastructure. More diversified economies are also less vulnerable to external shocks (UNCTAD, 2021a).

While the benefits of effective participation in regional and global value chains have been widely discussed (Ignatenko et al., 2019; Taglioni and Winkler, 2016), little has been done to highlight the potential risks that firms and investors should prepare for when seeking entry into value chains, as well as requirements for their survival therein.

Within the context of regional integration in Africa, this chapter will analyse the opportunities for successful participation in regional value and supply chains and discuss the potential risks. The first part of the chapter provides an overview of the structural changes in intra-African trade in value added since 2012. It focuses on the relative roles and importance of African countries in the trade in value added network to provide valuable insights on the potential risks and opportunities that can be leveraged to enhance trade resilience. The second part of the chapter assesses the role of infrastructure and trade-related policies in reducing potential risks from global value chains and reviews the progress made in improving regional infrastructure.

The provision of regionally oriented physical infrastructure is an **indispensable element of building stronger resilience**



Regional value added trade networks: A means to reduce potential risks from global shocks

Africa in value added trade networks

According to data from the UNCTADstat database, the remarkable growth of the gross exports of most African countries is not a reflection of enhanced competitiveness or an ability to integrate into global markets. In today's global production network, there is an increasing utilization of foreign intermediate inputs in the production process, accounting for about two thirds of world trade (UNCTAD, 2022b) and an equally growing share of domestic producers who are moving away from the confinements of their domestic markets and are selling a substantial proportion of their intermediate inputs in international markets. In this regard, effective participation in global value chains provides better opportunities for domestic economies to raise their overall productivity and competitiveness in export markets through better access to competitive inputs and skills and technology transfer. Overall, the nature and level of engagement determine the extent to which countries can leverage the benefits of global value chains. While forward integration allows developing countries to take part in these global networks, the extent of their participation in backward integration is key to unleashing their potential in transforming and adding more value to the goods and services they produce and supply. As suppliers of raw materials or semi-processed goods, most countries in Africa have low levels of backward integration. This implies minimal internalization of advanced technology and other competitive inputs in their production process, as these are generally not easily accessed within their domestic economies (Das and Hussain, 2017; UNCTAD, 2021b). In addition, this limits the returns to industrialization and the development of the continent (UNCTAD, 2022b).

Global production and supply networks can potentially increase the vulnerability of domestic economies to external shocks (Amador et al., 2018; McKinsey, 2020; OECD, 2020; Seric and Tong, 2019). Through intrinsic production and supply linkages, which are the backbone of global value chains, a country's imports of intermediate goods and services and hence, output, are sensitive to the shocks of its partner countries, including indirect trading partners. Without undermining the relevance of all the actors in the value chain, Amador et al. (2018), Carvalho (2014) and Serrano et al. (2007) suggest that the extent of the overall vulnerability to specific shocks of value chain anchor countries determines the fragility or strength of the chain or network. Similarly, Korniyenko et al. (2017) show that the extent of the vulnerability to external shocks also depends on the goods traded. Therefore, for goods that require specialized processing channels, which might be difficult to substitute, failure by any single supplier in the network could affect the entire value and supply chain, with major implications for overall costs when choosing alternative suppliers or halting production (Koenig and Antràs, 2023). Each link in the trade network relies on the next for the production and supply of intermediate inputs and final products, suggesting that both direct and indirect linkages act as transmission channels of the shocks from the source country to the rest of the network. These impacts are also explained by recent global and regional shocks, such as the COVID-19 pandemic and the war in Ukraine. This shows that social and economic shocks and their negative impacts on one part of the value chain are likely to spill over to the rest of the trade and production network and dictate overall aggregate incomes, owing to global supply linkages (UNCTAD, 2020; UNCTAD, 2023a). UNCTAD (2023a) points to higher vulnerability to shocks in the supply chain with a high concentration of markets and sources of inputs.

The overall vulnerability to specific shocks of value chain anchor countries **determines the fragility or strength of the chain or network**



While some shocks can universally affect supply chains, the sources of exposure and vulnerabilities in the supply chains generally vary with the degree of fragmentation, the length of the supply chain and the geographical spread of production networks (UNCTAD, 2020). Thus, depending on its geographic footprint, a supply chain may be vulnerable to climate change-related shocks, though not necessarily to shocks emanating from geopolitical tensions. Moreover, potential risks threatening the sustainability of part or all of the network can be contained or mitigated when many countries participate more effectively in the production and supply of goods and services, both at the core and periphery of the network. When there are only a few countries at the core of the network, it becomes highly vulnerable to shocks emanating from those countries at the core. This was the case of the 2008–2009 global financial crisis that originated in the United States mortgage market, but quickly spread throughout the entire financial system, affecting financial markets of other developed countries (UNCTAD, 2009). The ensuing economic recession resulting from the credit crunch and the fall in private demand affected world economies due to the central position of the United States and other developed countries in the global trade network (UNCTAD, 2021a). Although the United States is a relatively low-risk country in the entire chain, and therefore should not present a potential risk to the trade network, any instability or uncertainty stemming from its domestic market or affecting its trade can easily be transmitted or spill over to the whole of the global trade network structure because of its hub position in the network (Ge and Wang, 2024).

Understanding the potential risks and opportunities associated with value chains is important in guiding investments to build more resilient ones. The main risks associated with most networks of trade in value added are related to inadequate infrastructure, which heightens the

negative impact of the geographical distance between markets and undermines company productivity, as this limits the internalization of high-technology-intensity intermediate inputs. Other common risks include political stability and governance. Valuable opportunities include knowledge and skills diffusion, and better access to a larger variety of inputs at lower cost.

The network analysis of bilateral value added linkages between countries provides a good framework for assessing the potential risks and vulnerabilities associated with the different segments of the African market (Crowe and Rawdanowicz, 2023; Jackson, 2014). However, global trade network dynamics are now changing, and countries that were once at the periphery of the trade network, for example, China, are increasingly moving towards the centre, creating more value added trade ties between a diversified pool of low-risk countries at the core periphery (Ge and Wang, 2024). This shift in the position of China in the global supply network is facilitating the emergence of Bangladesh, Cambodia, India, Pakistan and Viet Nam as important nodes, partly because of their trade links with China (UNCTAD, 2023g). Hence, the evolution of the network over time is also essential in highlighting the changes in the extent of integration, particularly in the context of regional economic integration and the development of regional value chains.

This chapter uses the UNCTAD–Eora Global Value Chain database from 2012 and 2022¹ to analyse the characteristics and composition of the value added trade network in Africa. Although the Eora database is the most comprehensive data set on value added trade for all 54 African countries, its multi-region input-output tables are to some degree modelled when national input-output or supply-use tables are not available, which is the case for most African countries (Casella et al., 2019). (See box III.1 for the description of the key measures of the trade network analysis.)

The main risks associated with most networks of trade in value added are related to inadequate infrastructure

¹ The choice of the period is aimed at highlighting the most recent trends, informing the current status of trade in the value added landscape in Africa.



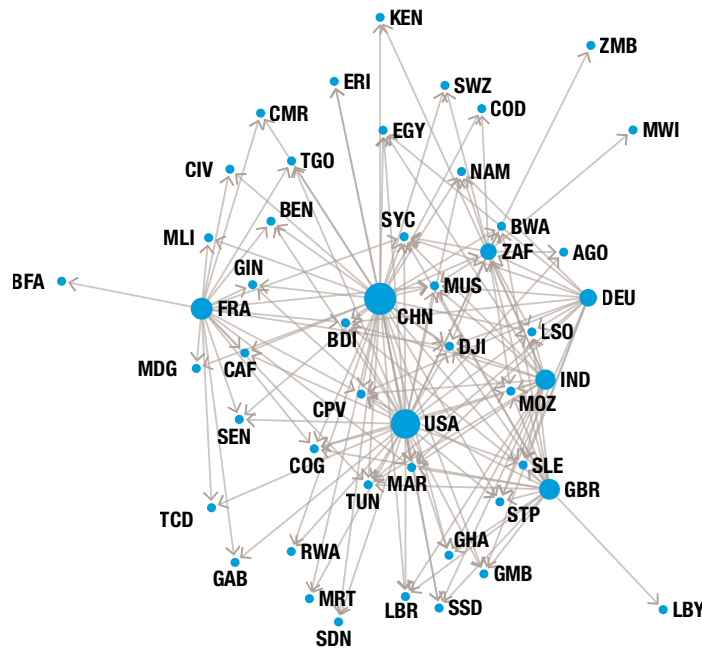
China, France, Germany, India, the United Kingdom and the United States are major global suppliers of value added intermediate inputs to African countries

Figure III.1 shows that China, France, Germany, India, the United Kingdom and the United States are major global suppliers of value added intermediate inputs to African countries. China heads the list, supplying value added goods and services to at least 36 countries in Africa. Its top 10 importers, in order of importance, are Djibouti, Lesotho, Mauritius, Seychelles, Cabo Verde, Tunisia, Burundi, Sao Tome and Principe, Morocco and South Africa. Leading import sectors by country are agricultural and industrial machinery (China, Germany, the United Kingdom and the United States), leather, furniture and wood products (China and France), motor vehicles and parts (France and

Germany), technical services for agriculture (China), electricity-generating equipment (Germany), transport-related services (France), communications equipment (the United Kingdom and the United States) and financial services (the United States).

According to the aforementioned Eora database, the domestic content of exported value added in Africa ranges from about 89 to 99.9 per cent in the primary and manufacturing sectors and from about 95 to 99.8 per cent in the service sector. Hence, some countries are marginally integrated into global value chains through backward linkages, meaning that they import little foreign value added.

Figure III. 1 Principal global partners in the value added trade network, 2022



Source: UNCTAD calculations, based on the UNCTAD–Eora Global Value Chain database.

Note: The arrows representing the edges point toward the importer of the value added whose imported share of foreign value added is at least 0.5 per cent of its exported value added. The size of each node is proportional to its total degree. The size of the bigger nodes reflects a country's relative importance as a supplier of foreign value added. Users are depicted by the smallest nodes regardless of their relative weight as a user.

Abbreviations: AGO, Angola; BDI, Burundi; BEN, Benin; BFA, Burkina Faso; BWA, Botswana; CAF, Central African Republic; CHN, China; CIV, Côte d'Ivoire; CMR, Cameroon; COD, Democratic Republic of the Congo; COG, Congo; CPV, Cabo Verde; DEU, Germany; DJI, Djibouti; EGY, Egypt; ERI, Eritrea; ETH, Ethiopia; FRA, France; GAB, Gabon; GBR, United Kingdom; GHA, Ghana; GIN, Guinea; GMB, Gambia; IND, India; KEN, Kenya; LBR, Liberia; LBY, Libya; LSO, Lesotho; MAR, Morocco; MDG, Madagascar; MLI, Mali; MOZ, Mozambique; MRT, Mauritania; MUS, Mauritius; MWI, Malawi; NAM, Namibia; RWA, Rwanda; SDN, Sudan; SEN, Senegal; SLE, Sierra Leone; STP, Sao Tome and Principe; SYC, Seychelles; TCD, Chad; TGO, Togo; TUN, Tunisia; USA, United States; ZAF, South Africa; ZMB, Zambia; ZWE, Zimbabwe.

Therefore, in striking a balance between the focus of the chapter (shedding light on the current value chain landscape in Africa) and ensuring a meaningful evaluation and eased visualization of the networks, only countries that have a considerable share of foreign value added in their exports are considered in the trade network analysis. At the global level, a threshold of at least 0.5 per cent foreign value added content in a country's exported value added is chosen (figure III.1).

Only 16 of the 54 countries in Africa receive 0.5 to 6 per cent of their total intermediate inputs from other African countries, mainly South Africa, followed by Kenya (figure III.1).² Furthermore, the figure suggests that the network is highly concentrated in a few countries. These countries represent critical chokepoints of the value chains in Africa, as they have the greatest potential to disrupt production and output in most economies by amplifying the impact of different shocks.

Diversifying sources of intermediate goods and the overall footprint of a value chain strengthens the resilience of countries to external shocks. Although managing a large partner network at a country level might require a substantial commitment of resources (Cigna et al., 2022), a wider network provides firms with options for substituting trading partners (suppliers and buyers) (Solingen et al., 2021), increasing access to a range of inputs that gives them more options for adjusting to the shocks and cushioning their businesses from the impact of the shocks through trade (OECD, 2020).

A network analysis of intra-African trade

Low levels of technology internalization, reduced investment in research and development, high trade costs, limited sources of capital and weak productive

capacities, as reflected by poor economic infrastructure, are among the most commonly cited reasons for the low degree of integration of African countries into global value chains. Nonetheless, countries in Africa have great potential for upgrading and diversifying their exports and improving the likelihood of better integration into the global market by leveraging the opportunities of deeper regional integration (UNCTAD, 2021a; UNCTAD, 2023e).

While most of the exports from Africa to the rest of the world are either raw or semi-processed, processed and semi-processed goods account for 61 per cent of intra-African exports and are more diversified (UNCTAD, 2021c).

More viable and well-integrated regional value chains are generally expected with deeper integration, as they enhance the odds of more profitable engagement in the global production and supply networks for the countries concerned (Obasaju et al., 2021). The regional economic integration of Africa has gradually deepened over the years. Eight regional economic communities have received official recognition from the African Union³ and, recently, the African Continental Free Trade Area.

However, the development of value chains in Africa was modest from 2012 to 2022. Figure III.2 shows minimal additions to the overall trade linkages in the network. For intra-African trade, a threshold of 0.05 per cent foreign value added in exports is chosen to allow for more trade connections. The overall density of the networks between 2012 and 2022 remained relatively unchanged across three sectors (manufacturing, service and primary sectors).

Only 16 of the 54 countries in Africa receive 0.5% to 6% of their total **intermediate inputs from other African countries, mainly South Africa, followed by Kenya**

² Angola, Botswana, Burundi, Democratic Republic of the Congo, Djibouti, Eswatini, Lesotho, Malawi, Mauritius, Mozambique, Namibia, Sao Tome and Principe, Seychelles, Togo, Uganda, Zambia.

³ The Arab Maghreb Union, the Community of Sahelo-Saharan States, the Economic Community of Central African States and the Intergovernmental Authority on Development do not have free trade agreements. The Common Market for Eastern and Southern Africa, the East African Community, the Economic Community of West African States and the Southern African Development Community have a free trade agreement and/or a customs union.





Box III. 1

Value added trade network measures

A description of the parameters used to measure a value added trade network is provided below.

Nodes: Countries in the network.

Edges: Lines highlighting the linkages between countries.

Density: Share of existing connections relative to potential total connections.

Assortativity: Measures the extent to which countries (nodes) with similar characteristics connect. Its values range between -1 and 1, where values closer to 1 reflect an assortative network, that is, a higher probability that countries trade more based on their similarities (for example, size of the economy).

Centralization: Measures the relative importance of countries and the extent of concentration of trade in the network. Indegree centralization measures the importance of a country as a user (importer), outdegree centralization measures the importance of a country as a supplier (exporter) of value added and between centralization illustrates the extent to which a country is important in connecting other countries. For instance, higher values of outdegree centralities reflect a country's central role as a supplier of value added intermediate inputs in the trade network. In this chapter, the commonly used eigenvector centrality is applied, where the overall relative importance of a country in the network recursively accounts for the importance of the nodes to which it is connected.

Reciprocity: Measures the extent to which trade ties between countries are reciprocated, while accounting for the density of the network. For instance, negative values of the reciprocity coefficient indicate that the probability of countries acting both as suppliers and buyers of value added goods and services is low.

Transitivity or clustering: Measures the extent to which a group of nodes is densely connected within the network. For a network with a wide regional footprint such as the one discussed in this chapter, higher values of the transitivity coefficient could reflect deeper trade ties within the regional economic communities.

Source: UNCTAD, based on Amador and Cabral, 2016; Amador et al., 2018; Miura, 2012; Taglioni and Winkler, 2016.



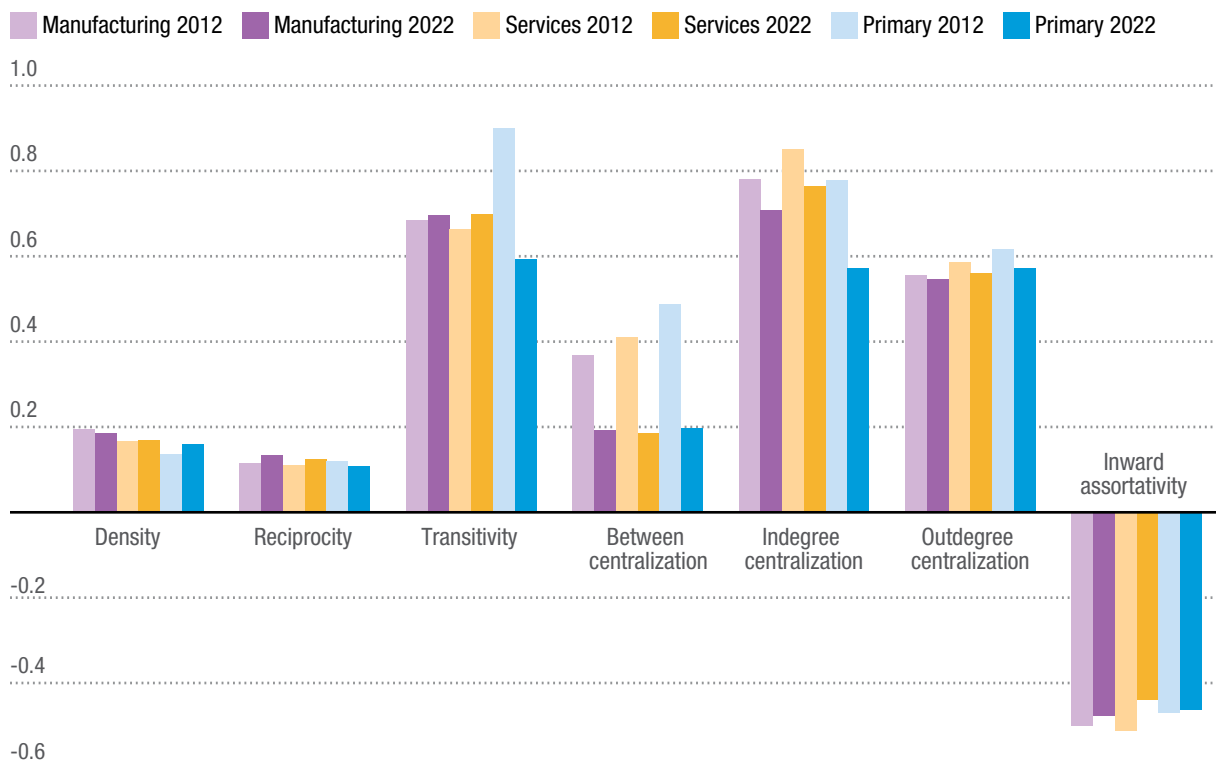
This is an indication that countries in the region have not been able to effectively expand their value added product lines or partners, despite a rise in the net volume of existing goods. Most importantly, this highlights an increased proportion of disengagement in value chains by some countries in the region relative to those who joined due to greater dependence on domestic and/or extra-continental markets for their intermediate inputs. This is clearly illustrated by the average reduction in the trading edges identified by the indegree and outdegree centralization coefficients in figure III.2 (see table III.1 for country-level values of indegree and outdegree centralities).

A sectoral view of intra-African trade in value added: Manufacturing sector

To perform the trade network analysis of the manufacturing sector discussed in this section and enable a good visualization

of the networks with only key trade flows captured, manufacturing foreign value added trade network is presented at a 0.1 per cent threshold in 2012 and 2022 (figure III.3 (a and b)). While the lower thresholds (0.05 per cent as used in the intra-African total trade network) increase the overall number of trading edges in the networks, this does not affect the core components of the analysis as regards the relative importance of countries in the networks and the associated potential risk. In other words, the network metrics tell the same story, regardless of whether the analysis is performed at 0.05 per cent or 0.1 per cent. The intra-African value added networks analysis of the service and primary sectors in 2012 and 2022 is maintained at the threshold of 0.05 per cent, as these sectors are not as dense as the manufacturing sector.

Figure III. 2
Intra-African value added network metrics



Source: UNCTAD calculations, based on the UNCTAD–Eora Global Value Chain database.
Note: The metrics are drawn from the assessment carried out under the 0.05 per cent of foreign value added content in exports.



Table III. 1
Outdegree and indegree centralities in the manufacturing, service and primary sectors, 2012 and 2022

Country	Manufacturing sector				Service sector				Primary sector			
	2012		2022		2012		2022		2012		2022	
	Outdegree	Indegree	Outdegree	Indegree	Outdegree	Indegree	Outdegree	Indegree	Outdegree	Indegree	Outdegree	Indegree
Algeria	3	22	2	2	1	25	3	3	1	17	2	2
Angola	1	21	1	13	1	18	0	8	0	13	0	11
Benin	12	2	16	9	8	2	8	9	8	1	9	9
Burkina Faso	8	5	13	13	7	4	12	13	4	4	2	13
Botswana	7	1	6	18	5	1	6	17	8	2	11	13
Burundi	26	2	14	2	14	1	9	1	5	1	15	2
Cameroon	10	6	11	5	8	6	10	6	6	3	6	6
Cabo Verde	8	2	13	10	14	1	16	12	18	1	19	10
Central African Republic	15	2	9	1	6	2	8	2	6	1	12	1
Chad	17	3	9	9	15	2	8	6	3	2	3	6
Congo	1	21	0	18	1	20	0	17	1	17	0	17
Côte d'Ivoire	13	8	11	5	10	7	11	4	3	7	3	5
Democratic Republic of the Congo	4	7	5	23	3	5	3	20	3	5	3	16
Djibouti	20	1	18	37	14	1	17	38	14	1	19	25
Egypt	4	6	3	4	3	5	3	6	3	5	3	9
Eritrea	19	1	20	1	14	1	21	1	17	1	21	1
Eswatini	10	4	9	3	16	0	10	3	7	3	7	3
Ethiopia	1	28	2	0	13	3	2	0	2	17	1	0
Gabon	5	6	4	6	2	29	2	4	2	3	2	5
Gambia	27	1	29	2	2	4	24	1	15	1	21	1
Ghana	4	9	5	17	17	1	5	18	3	6	2	18
Guinea	8	5	9	19	4	6	6	20	4	4	5	13
Kenya	8	23	9	6	4	5	7	5	6	15	6	7
Lesotho	4	18	10	16	8	24	13	15	12	11	19	12
Liberia	2	15	2	5	11	14	2	5	2	12	4	4
Libya	2	11	3	2	2	15	3	1	2	9	3	2
Madagascar	2	3	3	2	2	6	3	2	3	3	4	3
Malawi	9	7	6	2	3	2	6	0	6	6	6	2
Mali	14	4	10	7	7	5	7	5	6	0	5	3
Mauritania	6	23	18	11	9	3	12	10	3	15	7	11
Mauritius	6	17	4	23	6	19	4	22	3	15	4	21
Morocco	1	23	1	20	4	20	1	19	1	20	1	26
Mozambique	7	2	9	22	2	21	8	17	3	1	4	17
Namibia	2	7	4	8	8	1	5	6	5	3	5	8
Niger	5	10	6	3	5	4	11	0	8	4	12	0
Nigeria	2	22	1	11	6	6	5	7	1	8	1	4
South Africa	12	48	10	44	4	17	10	46	12	45	12	36
Rwanda	17	4	15	4	9	50	14	5	7	1	12	2
Senegal	14	5	21	7	13	3	15	6	6	6	9	7
Seychelles	6	6	11	25	12	3	11	21	3	3	5	15



Country	Manufacturing sector				Service sector				Primary sector			
	2012		2022		2012		2022		2012		2022	
	Outdegree	Indegree	Outdegree	Indegree	Outdegree	Indegree	Outdegree	Indegree	Outdegree	Indegree	Outdegree	Indegree
Sierra Leone	10	7	12	4	5	2	10	2	10	1	17	1
Somalia	14	0	6	0	9	1	7	0	5	0	4	0
South Sudan	15	0	14	0	14	0	14	0	15	0	14	0
Sao Tome and Principe	22	5	2	0	15	0	1	0	14	2	3	0
Sudan	16	0	6	0	15	1	9	0	16	0	20	0
Togo	12	10	15	7	9	7	9	6	7	5	8	6
Tunisia	4	16	4	14	4	10	5	15	4	14	4	23
Uganda	8	1	8	2	8	1	7	1	5	2	5	3
United Republic of Tanzania	8	8	9	1	8	6	9	0	6	5	6	0
Zambia	7	17	8	9	7	15	5	8	6	12	5	8
Zimbabwe	37	20	36	0	37	19	36	0	37	14	36	0

Source: UNCTAD, based on data from the UNCTAD–Eora Global Value Chain database.

Note: The intra-African trade network threshold used is 0.05 per cent. Outdegree centrality reflects the number of trade ties from a node (country) to its trading partners, while indegree centrality is the number of trade ties directed to the node from its trading partners.

At the 0.1 per cent threshold of the foreign value added content of exported manufacturing value added, meaning that when exports of manufacturing goods include more than 0.1 per cent of value added from the source country, generally, a marginal reduction in import sources and export destinations is observed in about 18 countries between 2012 and 2022 (figure III.3 (a and b)), along with improvements of comparable magnitudes in most countries. However, drastic changes in countries such as Ethiopia and Zimbabwe are concerning, as these countries used to be among those at the network core as value added users in 2012 but lost their centrality in the network in 2022. Zimbabwe was among the most diversified users of foreign value added in 2012, providing a market to over 10 countries, and Ethiopia, to 19 countries. However, Ethiopia and Zimbabwe are currently not utilizing intermediate goods and services from other African countries unless the volume of such imports is less than 0.05 per cent of their exports (table III.1).

The table provides the results for all sectors at the 0.05 per cent threshold, showing that, in 2012, Ethiopia and Zimbabwe used to provide a market to over 28 and 20 countries, respectively, at that reduced threshold. Consequently, prolonged political or economic instability in countries such as Ethiopia and Zimbabwe can make regional trade and private sector activity riskier and less attractive (Khafaga and Albagoury, 2022; Masiyandima and Edwards, 2018; Siyum, 2021; World Bank, 2021). Thus, issues such as currency volatility, political instability and inconsistent economic policies can be deterrents to intra-African trade.

Extreme changes at the 0.1 per cent threshold between 2012 and 2022 are also observed in countries such as Kenya, Mauritania and South Africa, whose outgoing edges were reduced by more than 50 per cent during that period (figure III.3 (a and b)). Furthermore, only Botswana and Djibouti increased their import network by adding 7 and 28 countries, respectively.



The same trend can be seen when the threshold of analysis is reduced to 0.05 per cent,⁴ with the addition of countries such as Sao Tome and Principe, which used to export to at least 22 countries but currently has only two outgoing edges without any imported inputs in its exports at this threshold (table III.1). Similarly, a few countries, including Burkina Faso, Cabo Verde and Guinea, expanded their array of import sources.

Overall, the assessment shows that, on average, there have been marginal improvements in export destinations. Yet changes in input sources, particularly for the countries at the core of the network, have a negative impact on overall trade intensity. The relevance of some countries in connecting at least two other countries also waned between 2012 and 2022. This trend, as shown by the centralization variables in figure III.2, is somewhat retrogressive to the development of value chains in the African Continental Free Trade Area. This illustrates the growing fragility of most of the existing value chains to socioeconomic shocks through the supply and market demand channels. However, there is a modest level of exploitation of complementarities between countries at different levels of development in the value chains, as highlighted by the negative assortativity coefficient in figure III.2. It is a positive attribute worth leveraging for countries in Africa to strengthen existing value chains and explore other viable areas for developing new value chains in the African Continental Free Trade Area. Notably, these complementarities indicate a growing potential for profitable integration into regional value chains for developing countries to enhance their competitiveness and growth, encouraging opportunities for growth in African trade.

The relatively high concentration level in the networks is another area of concern in the current structure of intra-African trade

in value added networks regarding the effective development of value chains in the African Continental Free Trade Area.

There was a marginal deterioration in overall concentration between 2012 and 2022 (figure III.3 (a and b)). Suppliers at the core of the network with at least 20 outgoing edges decreased from four in 2012 (Burundi, the Gambia, Sao Tome and Principe, Zimbabwe) to two in 2022 (the Gambia, Zimbabwe) without any change in the total number of users (table III.1). The net deterioration in the overall concentration stems mainly from the sharp reduction in the incoming and/or outgoing edges of the countries that used to be at the core in 2012 but are currently either at the periphery or remained at the core but with a significant reduction in their trade flows at the 0.05 per cent threshold. However, at the network core, Djibouti, Seychelles and South Africa feature both as key suppliers and users of value added goods and services, while in the intermediate stages, the only suppliers and users are Burkina Faso, Cabo Verde and Lesotho.⁵ The overall fragility of the network to supply- and-demand-side shocks greatly depends on the risks to which these countries are exposed and the ease of their substitutability in the event of failure as key suppliers and/or users of foreign value added.

Notwithstanding the impact of intermediate goods and services, the centrality of the suppliers in these networks has two key implications. Firstly, the quality and type of inputs imported from these countries have a significant bearing on the overall quality of goods and services produced and, hence, the viability of the value chains in the region. Generally, in value added trade networks, big economies are at the core of value chains as principal suppliers and/or users of intermediate inputs due to their advanced productive capacities and financial capabilities to establish and sustain multiple connections with suppliers (Amador and Cabral, 2016; Flori et al., 2023).

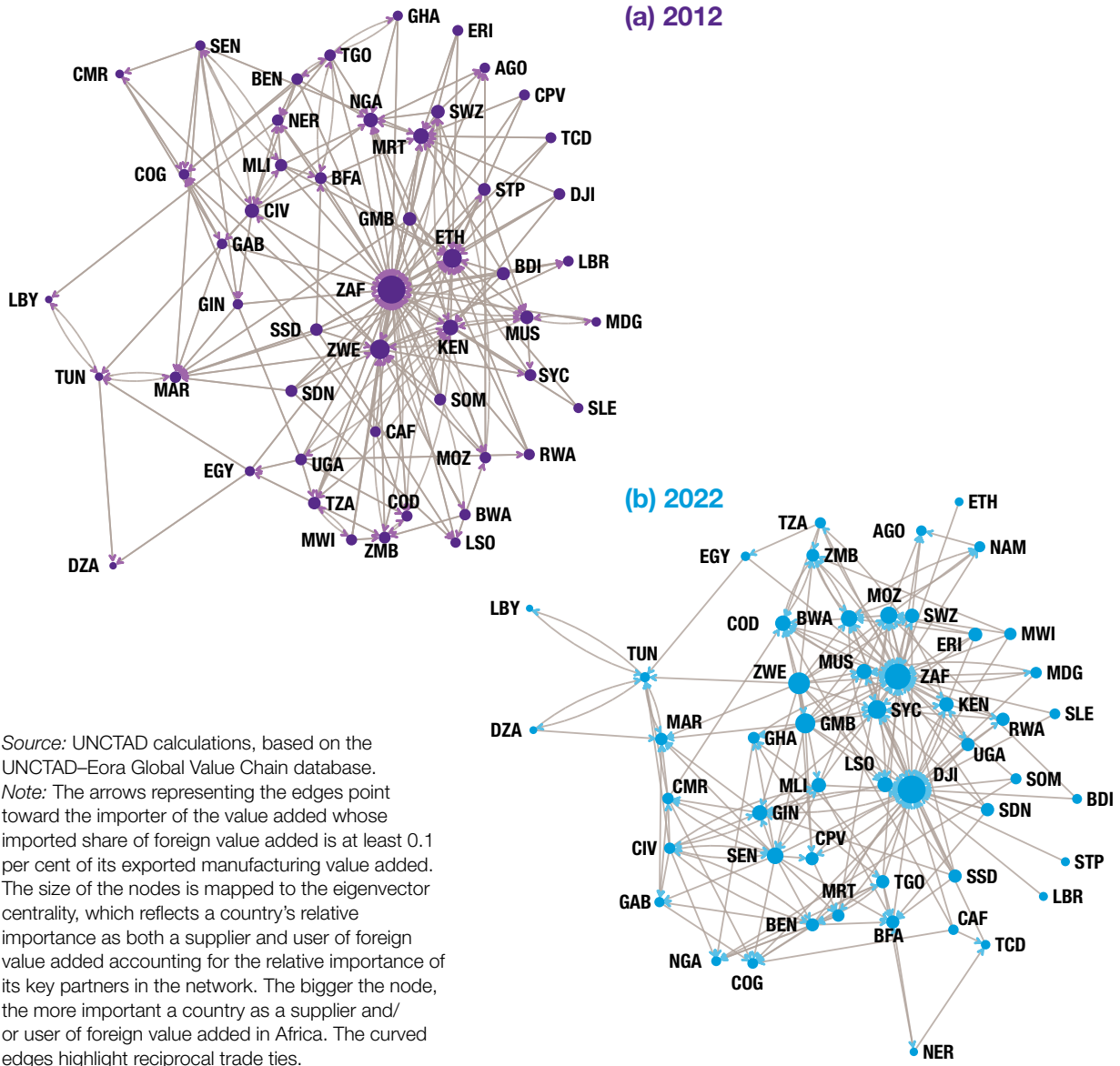
The exploitation of complementarities between countries is worth leveraging for **developing new value chains under the African Continental Free Trade Area**

⁴ The rest of the section focuses on the 0.05 per cent threshold, as it gives a fair representation of the current foreign value added flows at the continental level.

⁵ Details on indegree and outdegree centrality are provided in table III.1.



Figure III. 3
Intra-African value added trade network: Manufacturing sector, selected years



Source: UNCTAD calculations, based on the UNCTAD–Eora Global Value Chain database.
 Note: The arrows representing the edges point toward the importer of the value added whose imported share of foreign value added is at least 0.1 per cent of its exported manufacturing value added. The size of the nodes is mapped to the eigenvector centrality, which reflects a country's relative importance as both a supplier and user of foreign value added accounting for the relative importance of its key partners in the network. The bigger the node, the more important a country as a supplier and/or user of foreign value added in Africa. The curved edges highlight reciprocal trade ties.
 Abbreviations: AGO, Angola; BDI, Burundi; BEN, Benin; BFA, Burkina Faso; BWA, Botswana; CAF, Central African Republic; CIV, Côte d'Ivoire; CMR, Cameroon; COD, Democratic Republic of the Congo; COG, Congo; CPV, Cabo Verde; DJI, Djibouti; DZA, Algeria; EGY, Egypt; ETH, Ethiopia; GAB, Gabon; GHA, Ghana; GIN, Guinea; GMB, Gambia; KEN, Kenya; LBR, Liberia; LBY, Libya; LSO, Lesotho; MAR, Morocco; MDG, Madagascar; MLI, Mali; MOZ, Mozambique; MRT, Mauritania; MUS, Mauritius; MWI, Malawi; NAM, Namibia; NER, Niger; NGA, Nigeria; RWA, Rwanda; SDN, Sudan; SEN, Senegal; SLE, Sierra Leone; SOM, Somalia; STP, Sao Tome and Principe; SWZ, Eswatini; SYC, Seychelles; TCD, Chad; TGO, Togo; TUN, Tunisia; TZA, United Republic of Tanzania; UGA, Uganda; ZAF, South Africa; ZMB, Zambia; ZWE, Zimbabwe.

To this end, of the 20 countries⁶ at the core of this network with at least 10 outgoing edges, 14 are least developed countries. While this reflects their proportion in African countries, most importantly, this highlights possible chokepoints in the network. Owing to their weak productive capacities, most of these countries might find it difficult to increase and/or sustain intermediate inputs outflows and effectively meet market demand (UNCTAD, 2022d). Furthermore, improving the complexity and diversity of their intermediate goods in supporting the development of the value chains in the region might also be an obstacle. Most of these economies are rural based and highly dependent on natural resource-based commodities,⁷ as characterized by their overall low diversification index (see chapters I and II). Moreover, the low level of technology internalization and inadequate productivity-enhancing services in these economies (UNCTAD, 2022b), coupled with generally weak labour productivity (McMillan and Headey, 2014), greatly undermine their odds of effectively supporting the development of viable value chains in the African Continental Free Trade Area.

In addition, the increased concentration of import sources leaves most countries, and hence, overall trade in the value added network, in general, highly exposed to the vulnerabilities emanating from a few countries that are at the core of the network. There are few countries with diversified sources of inputs and, hence, potentially better resilience to external and domestic shocks. However, almost half of the countries in the network rely on intermediate inputs from four or fewer countries at the network core or intermediate levels

(table III.1) and depend heavily on domestic markets, notwithstanding their potential linkages with the rest of the world for intermediate inputs. The risk of failure for these countries in the network is higher, as failure in their suppliers has an increasing potential to undermine their net output with possible negative ripple effects to the rest of the network. Therefore, the gravity of the impact of these shocks on their production and supply processes, and its potential spillovers to the rest of the network will, to a large extent, depend on the flexibility of the affected value chain as to how easy it is to substitute suppliers and their associated costs and also the extent of sunk costs in the event of shutting down operations due to shocks originating from key suppliers.

Of the six countries⁸ at the network core as suppliers and/or users of manufacturing value added in figure III.3 (b), only Seychelles and South Africa, compared with other African countries, have a relatively low level of exposure to most of the key risks that greatly weaken trade and investment flows in Africa. Specifically, Seychelles and South Africa are among the countries that scored lowest on measures of economic, governance and connectivity vulnerability (see figures I.9, I.10 and I.11). Djibouti and Mauritania have a low level of exposure to energy-related risks but a high level of exposure to connectivity-related risks. The Gambia and Zambia are also highly exposed and most vulnerable to economic- and connectivity-related issues (see chapter I). Furthermore, as indicated by the inclusive growth analysis in UNCTAD (2021c), low levels of inclusive per capita GDP growth leave three⁹ of the core suppliers of value added in the network more at risk to internal and external economic shocks.

Almost half of the countries in the network rely on intermediate inputs from four or fewer countries at the network core or intermediate levels

⁶ Benin, Burkina Faso, Burundi, Cabo Verde, Cameroon, Côte d'Ivoire, Djibouti, Eritrea, Gambia, Lesotho, Mali, Mauritania, Rwanda, Senegal, Seychelles, Sierra Leone, South Africa, South Sudan, Togo, Zimbabwe. Except for Cabo Verde, Cameroon, Côte d'Ivoire, Seychelles, South Africa and Zimbabwe, the rest are classified as least developed countries.

⁷ Except for Djibouti, Lesotho and Togo, all the countries with at least 10 outgoing edges are dependent on commodities.

⁸ Djibouti, Gambia, Mauritania, Seychelles, South Africa, Zambia.

⁹ While only Gambia and Mauritania have experienced poverty- and inequality-reducing growth, Djibouti and South Africa have experienced poverty-reducing growth but inequality-increasing growth, and Seychelles and Zambia, poverty- and inequality-increasing growth.



Key suppliers in the intermediate level of the network with an increased level of vulnerability to economic risks include Cameroon, Côte d'Ivoire, Kenya, Uganda and the United Republic of Tanzania. Governance- and/or energy- and social-related issues affect countries such as Angola, Chad and Mozambique. Moreover, most of these countries are equally struggling across different domains of trade facilitation and trade logistics indicators, highlighting the risk of increased transaction costs when trading with them (see section "Resilience in connectivity: The potential of regional integration"). The extent of vulnerability to the identified risks of those that are at the core and intermediate levels of the network, both as suppliers and/or users of value added, combined with the centrality of the intermediate good or service being traded, shows the extent of the potential impact on the affected value chains in the network in figure III.3 (b). For example, the potential failure of Djibouti port due to governance-related risks, which can decrease the efficiency of port logistics, would have a significant impact on the flow of intermediate inputs for most countries, including those that indirectly rely on the port, with a significant impact on most of the value chains in Africa. Nevertheless, the threat of failure of the port of Djibouti due to those risks is low. However, the port has a higher potential of undermining the productivity and growth of the value chains through higher trade costs, as indicated by its weak performance across several domains of the trade facilitation and logistics indicators (see section "Addressing the gaps in trade logistics and facilitation").

There are subtle differences between the primary and service sectors based on the general trends observed in the manufacturing sector. While there were no significant changes in the overall intensity of trade and density of the service value added network between 2012 and 2022 (see table III.1), some countries expanded their network over the 10-year period.

These countries include South Africa, which added 29 new partners (nodes) to its service value added trade network, sourcing value added service inputs from 46 African countries in 2022, compared with 17 countries in 2012. Expansions are also observed in the indegree centralities of Botswana, Djibouti, the Gambia, Ghana and Seychelles. In countries such as Algeria, Gabon and Rwanda, there is a considerable decline in the number of their import sources. For instance, the value of indegree centrality in Rwanda fell to 5 in 2022 from 50 in 2012. This means that Rwanda imported services representing more than 0.05 per cent of value added from only five African countries in 2022. Interestingly, these are among the few countries in Africa whose ICT networks leapfrogged over the period, suggesting that they have an increased potential to be among the key suppliers of high-intensity business services, for instance, if their ICT growth is to be effectively leveraged.

Dynamics of subregional trade networks: Insights from the Common Market for Eastern and Southern Africa

High transitivity coefficients, measuring the extent to which a group of nodes are densely connected within the network, suggest a strong concentration of the traded value added among regional economic communities (see figure III.2), possibly in line with the progress made under the regional economic communities in reducing non-tariff trade costs through improvements in trade logistics and facilitation (see section "Addressing the gaps in trade logistics and facilitation"). Except for the primary sector, where the transitivity coefficient decreased between 2012 and 2022, suggesting that the flow of intermediate inputs in the primary sector is not restricted by trade barriers across the regional economic communities, the marginal increase in the transitivity coefficient for both the manufacturing and service sectors underscores the importance of deeper trade integration.

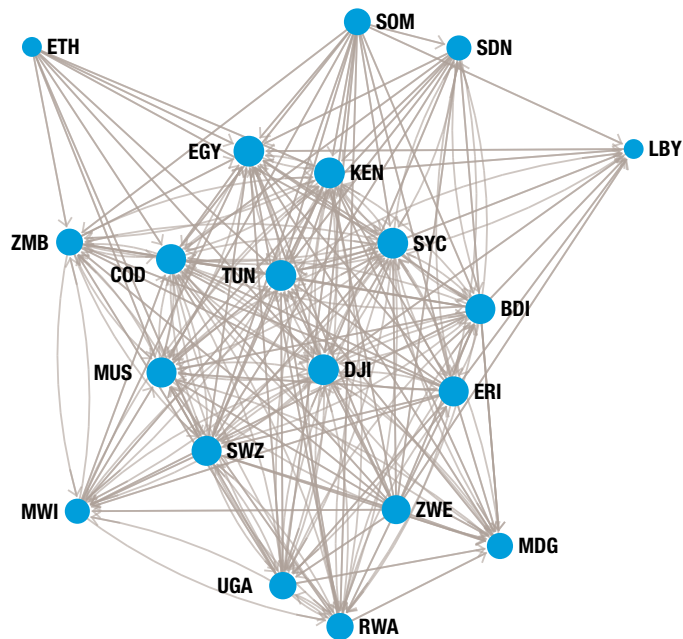
A more resilient network is observed at the level of a regional economic community **due to lower tariff and non-tariff trade costs**



To capture larger numbers of connections, the analysis at the regional economic community level is carried out at a threshold of 0.01 per cent. Comparable sizes of the nodes indicate comparable levels of integration (backward and/or forward) across countries, owing to reduced tariff and non-tariff trade costs relative to the continental level. With regard to the Common Market for Eastern and Southern Africa, five countries (Djibouti, Egypt, Kenya, Seychelles and Tunisia) have the highest centrality scores, about 0.25 (figure III.4). With the exception of Egypt and Tunisia, which are major users of foreign value added, the other three countries hold central positions as key users and suppliers of intermediate inputs.

Their central positions are closely followed by Burundi, the Democratic Republic of the Congo, Eritrea, Eswatini and Mauritius, with centrality scores of 0.23. All of these countries have 8–17 incoming or outgoing edges (figure III.4). Of the remaining 10 countries, 8 have centrality scores of about 0.2, and 2 (Libya and Ethiopia) have scores of about 0.1 but still with at least 8 incoming or outgoing edges. The concentration of trade ties in the regional economic communities is observed through the curved edges in figure III.3 (a and b), where visualization at the global level is improved with a threshold of 0.1 per cent. However, minimal benefits are derived from value chain participation for countries such as Ethiopia,

Figure III. 4
Common Market for Eastern and Southern Africa value added trade network: Manufacturing sector, 2022



Source: UNCTAD calculations, based on the UNCTAD–Eora Global Value Chain database.
 Note: The arrows representing the edges point toward the importer of the value added whose imported share of foreign value added is at least 0.01 per cent of its exported value added in the manufacturing sector. The size of the nodes is mapped to the eigenvector centrality, which reflects a country's relative importance as both a supplier and user of foreign value added, accounting for the relative importance of its key partners in the network. The larger the node, the more important a country as a supplier and/or user of foreign value added in Africa. The curved edges highlight reciprocal trade ties.
 Abbreviations: BDI, Burundi; COD, Democratic Republic of the Congo; DJI, Djibouti; EGY, Egypt; ERI, Eritrea; ETH, Ethiopia; KEN, Kenya; LIBY, Libya; MDG, Madagascar; MUS, Mauritius; MWI, Malawi; RWA, Rwanda; SDN, Sudan; SOM, Somalia; SWZ, Eswatini; SYC, Seychelles; TUN, Tunisia; UGA, Uganda; ZMB, Zambia; ZWE, Zimbabwe.

Somalia and Zimbabwe (see table III.1), as these benefits generally grow with backward integration. In other words, most of the value addition – and hence, profits – accrue in the downstream segments of the value chain.

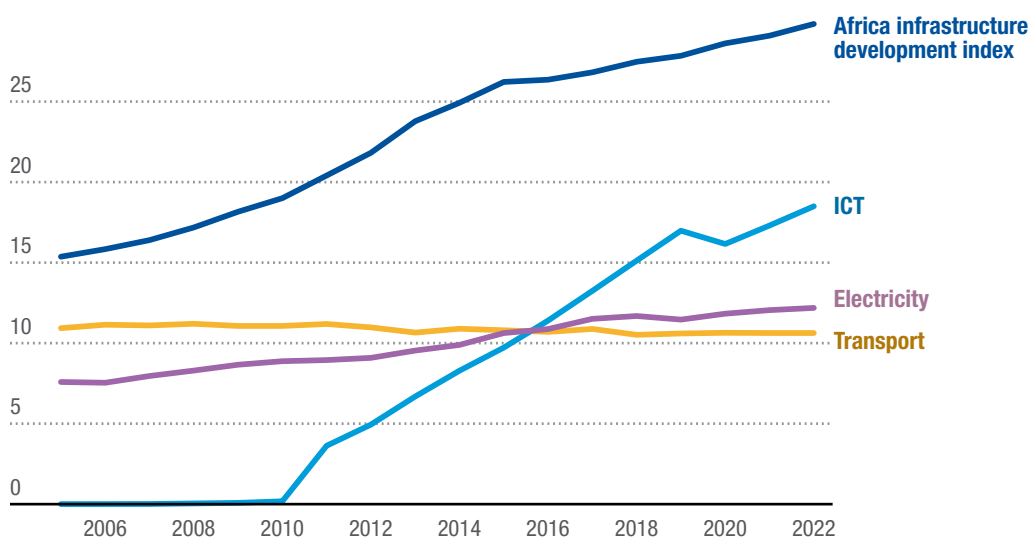
In sum, the analysis shows the need for deeper regional integration to achieve more resilient value chains. Africa has great potential for developing viable value chains, as highlighted by the increased level of trade complementarities within and across economies that are at different levels of income and development. However, the assessment emphasizes that such complementarities can be effectively leveraged when both tariff and non-tariff costs are addressed. A more resilient network is observed at the level of a regional economic community rather than at the continental level, due to higher tariff and non-tariff trade costs. Nevertheless, the traded foreign value added volumes by most countries, even at the regional-economic-community level, are too low to have a significant impact on the quality and diversity of exports.

Resilience in connectivity: The potential of regional integration

This section discusses the increased potential of African countries for enhancing their regional trade and development through intraregional value chains. However, high trade costs imply limited access to competitive intermediate inputs, which has a spiking effect on the overall cost of production and, hence, a dampening effect on industrial productivity and competitiveness. This section aims to quantify the effects of economic and connectivity-related risks on the development of intra-African value chains through their net impact on industrial value added, followed by an assessment of how greater trade connectivity (trade logistics and facilitation) and investments can be leveraged to alleviate these key risks.



Figure III. 5
The evolution of connectivity in Africa, 2005–2022



Source: UNCTAD calculations, based on the Africa Infrastructure Development Index.





Box III. 2
Methodology: Infrastructure–industrial output

To assess the effects of infrastructure on industrial output in the Common Market for Eastern and Southern Africa, the conventional Cobb–Douglas aggregate production function is adopted:

$$Y = K^\alpha (Al)^{1-\alpha} \dots\dots\dots (1)$$

Where Y is industrial value added, K is capital, l is labour and A is the productivity of labour. In this model, capital is proxied by the stock of infrastructure measured by the Africa Infrastructure Development Index of the African Development Bank. The index has four components: transport, ICT, energy and water and sanitation. However, the industrial value added by the World Bank includes energy (electricity, gas, steam and air conditioning), as well as water and sanitation. As such, these two components of the index are not included as regressors in the model.

In log-linear form, (1) becomes:

$$Y_{i,t} = \beta_0 + \beta_1 tpt_{i,t} + \beta_2 ict_{i,t} + \beta_3 l_{i,t} + \beta_4 X_{i,t} + \varepsilon_{i,t} \dots\dots\dots (2)$$

Where i refers to the country, including 16 countries of the Common Market for Eastern and Southern Africa (Burundi, Comoros, the Democratic Republic of the Congo, Djibouti, Egypt, Eswatini, Kenya, Libya, Madagascar, Malawi, Mauritius, Rwanda, the Sudan, Uganda, Zambia, Zimbabwe) and t refers to the period 2005–2022.

All the variables are in natural logs, tpt is the transport composite index, ict is the ICT composite index, l is the labour participation rate and X is a vector of three factors that affect industrial output. These are inflation, which affects the overall cost of production through the general increase in the cost of intermediate inputs; domestic credit to the private sector as a percentage of GDP; and foreign direct investment. Domestic credit is used as a proxy for the private sector's access to credit. ε is the white noise error term.

Assuming that infrastructure development affects industrial output with a lag, the long-run growth relationship is expressed as follows:

$$Y_{it} = \theta_{0i} + \theta_{1i} lY_{it} + \theta_{2i} tpt_{i,t} + \theta_{3i} ict_{i,t} + \theta_{4i} credit_{i,t} + \theta_{5i} \pi_{i,t} + \theta_{6i} fdi_{i,t} + \theta_{7i} l_{i,t} + v_{i,t} \dots\dots\dots (3)$$

Assuming that all variables in equation (3) are $I(1)$ and cointegrated such that the error term is an $I(0)$ for all i , then the following autoregressive distributed lag model (1, 1, 1, 1, 1, 1) holds for equation (3):

$$Y_{it} = \rho_i + \tau Y_{i,t-1} + \beta_{10i} tpt_{it} + \beta_{11i} tpt_{i,t-1} + \beta_{20i} ict_{it} + \beta_{21i} ict_{i,t-1} + \beta_{30i} credit_{it} + \beta_{31i} credit_{i,t-1} + \beta_{40i} \pi_{it} + \beta_{41i} \pi_{i,t-1} + \beta_{50i} fdi_{it} + \beta_{51i} fdi_{i,t-1} + \beta_{60i} l_{it} + \beta_{61i} l_{i,t-1} + \varepsilon_{it} \dots\dots\dots (4)$$

The error collection model can be specified as follows:

$$\Delta Y_{it} = \phi_i [Y_{i,t-1} - \theta_{0i} - \theta_{1i} tpt_{it} - \theta_{2i} ict_{it} - \theta_{3i} credit_{it} - \theta_{4i} \pi_{it} - \theta_{5i} fdi_{it} - \theta_{6i} l_{it}] - \beta_{11i} dY_{it} - \beta_{21i} dtpt_{it} - \beta_{31i} d ict_{it} - \beta_{41i} dcredit_{it} - \beta_{51i} d\pi_{it} - \beta_{61i} dfdi_{it} - \beta_{71i} dl_{it} - \varepsilon_{it} \dots\dots\dots (5)$$



Where:

$$\begin{aligned} \theta_{0i} &= \rho_i / (1 - \tau); \theta_{1i} = (\beta_{10i} + \beta_{11i}) / (1 - \tau); \theta_{2i} = (\beta_{20i} + \beta_{21i}) / (1 - \tau); \\ \theta_{3i} &= (\beta_{30i} + \beta_{31i}) / (1 - \tau); \theta_{4i} = (\beta_{40i} + \beta_{41i}) / (1 - \tau); \\ \theta_{5i} &= (\beta_{50i} + \beta_{51i}) / (1 - \tau); \theta_{6i} = (\beta_{60i} + \beta_{61i}) / (1 - \tau); \\ \theta_{7i} &= (\beta_{70i} + \beta_{71i}) / (1 - \tau); \Phi_i = -(1 - \tau) \end{aligned}$$

This panel vector autoregressive model is estimated using a pooled mean group estimator. It is augmented with the impulse response function to visualize the nature of the interaction between industrial output and the infrastructure variables of interest and to ascertain the nature of the interaction between the different components of infrastructure.

Thus, it is assumed that on one hand, good infrastructure is expected to promote industrial growth, albeit with a lag. On the other hand, the growth of industries could also stimulate the development and maintenance of economic infrastructure. Although a potential endogeneity bias cannot be verified completely, endogeneity from reverse causality is addressed in the first lag of all the independent variables. The estimated panel vector autoregressive model is specified as follows:

$$Y_{it} = \beta_0 + \sum_{i=1}^n \beta_1 Y_{i,t-1} + \varepsilon_{it} \dots\dots\dots (6)$$

Where Y is a five-vector variable: industrial growth, transport infrastructure, ICT, credit to the private sector and labour participation rate. This is estimated using a panel vector autoregressive model estimator. The stability of the model is confirmed before proceeding with the estimation of the orthogonalized impulse response function, which estimates and maps the response path of, for example, variable X to a standard deviation change in, for example, variable j , while holding the responses of all other variables constant. In other words, the orthogonalized impulse response function is preferred to isolate the unique response path of industrial growth to a standard deviation change in, for example, transport infrastructure, such that the response of X to a standard deviation in j at time i is specified as follows:

$$IRF_{x,j}(i) = \psi_{x,j}(i) \dots\dots\dots (7)$$

The Im–Pesaran–Shin and augmented Dickey Fuller unit root tests are used to ascertain the independence of the panels and the Akaike information criterion for optimal lag selection.

Source: UNCTAD.

Both ICT and transport infrastructure remain underdeveloped in Africa, notwithstanding significant improvements in ICT infrastructure since 2010

Mitigating regional connectivity-related risks

Good infrastructure, generally perceived as the stock and quality of transport, energy, ICT and water and sanitation, lays a robust foundation for enhanced efficiency in production and distribution (Gondwe and Mbonigaba, 2023) and boosts the ability of countries to leverage their comparative advantage and, in general, exploit regional economies of scale (Azolibe and Okonkwo, 2020; Fontagné et al., 2023; Hummels, 2007). Therefore, it remains central to the geographical patterns in investment and production and, hence, in the advancement of regional value chains in the African Continental Free Trade Area.

However, all components of the Africa Infrastructure Development Index of the African Development Bank are low in most African countries, forming deterrents to industrial productivity and growth (figure III.5). Notwithstanding the turnaround and steady improvements in the ICT network and utilization since 2010, aggregate scores of less than 20 indicate persistent gaps in most countries. Minimal improvements can be observed for net energy generation per capita; on average, the road transport network has been deteriorating in some countries.

This section empirically evaluates the extent to which these infrastructure gaps affect industrial value added using data on countries from the Common Market for Eastern and Southern Africa and draws relevant inferences for Africa as a whole, with a focus on transport and ICT infrastructure (figure III.6). The methodology used for the analysis is provided in box III.2.

Transport

Although well-functioning transport networks and corridors are essential for countries' trade, economic growth and employment creation, transport infrastructure is extensively highlighted in the literature as

a key driver of trade costs (UNCTAD and Islamic Development Bank, 2022). These are generally characterized by higher and sometimes comparable impacts, with tariffs in facilitating trade and enhancing the productivity and competitiveness of firms (Anderson and van Wincoop, 2004; Baier and Bergstrand, 2001; Fontagné et al., 2023). UNCTAD research also shows that the potential benefits of tariff reductions in the context of the African Continental Free Trade Area are by far outweighed by the elimination of non-tariff barriers (Vanzetti et al., 2018).

Developing countries must do twice as much transport work (calculated as multiplying the weight of the goods by the distance they need to be shipped) as developed countries (UNCTAD, 2024i). Moreover, in landlocked countries, transport costs are estimated to be generally higher by up to 50 per cent, compared with in countries on the coast, losing up to 40 per cent of the export value in transport costs (Economic Commission for Africa, 2004; Economic Commission for Africa et al., 2010; Naudé and Matthee, 2007; Piermartini, 2021; World Trade Organization, 2021). This is mainly because of their remoteness from the main global markets, the impact of which on trade costs, in most cases, is further compounded by underdeveloped transport infrastructure and inefficient transport and logistics systems. Notably, these differences in the net transport costs between countries and regions significantly contribute to the viability of the comparative advantage that underlies the productivity of industries and, hence, the mapping of investments and production hubs and the overall value chains within and across regions.

Africa has 16 landlocked countries¹⁰ – more than any other region – and is among the continents with the least developed transport infrastructure. Notwithstanding various efforts at the national and regional levels to improve transport and logistics

¹⁰ Botswana, Burkina Faso, Burundi, Central African Republic, Chad, Eswatini, Ethiopia, Lesotho, Malawi, Mali, Niger, Rwanda, South Sudan, Uganda, Zambia, Zimbabwe.



infrastructure, missing links persist within and across different modes of transport. For example, focusing on road transport, which accounts for the bulk of African trade and distribution costs, only Botswana, Cabo Verde, Egypt, Libya, Mauritius, Seychelles and South Africa have well-integrated road networks (figure III.6). According to the World Trade Organization (2021), transport costs in Africa are three times higher than in the United States. In addition, UNCTAD (2021c) shows that intra-African transport costs, measured as the share of trade value per 10,000 km, are much higher than extra-African transport costs, undermining the development of intra-African value chains.

Transport costs constitute the lion's share of trade and marginal costs of production and are thus key in influencing the direction of industrial productivity and competitiveness. Countries in Africa with good quality roads – Egypt, Mauritius and South Africa, for example – are also more advanced in other transport and logistics infrastructure, such as railways, ports and airports, as well as in the development of economic infrastructure, such as energy and ICT (figure III.6). This suggests an increased skewness of potential investments and a high concentration of value chain components in these few countries because of better connectivity and lower trade and production costs.

A well-developed transport infrastructure, as in Egypt (figure III.6), has a positive influence on industrial productivity, which may be a contributing factor to the effective development of intra-African value chains in the African Continental Free Trade Area, particularly regarding the essential role of the geographical footprint of the value chain in minimizing the impact of country-specific risks. Most importantly, this underscores the extent to which connectivity-related benefits can improve the ability of African countries to effectively participate in regional value chains. A lack of infrastructure, in particular reliable transport connectivity, compounds the difficulties of establishing well-integrated production and supply networks across the continent (UNCTAD, 2023a).

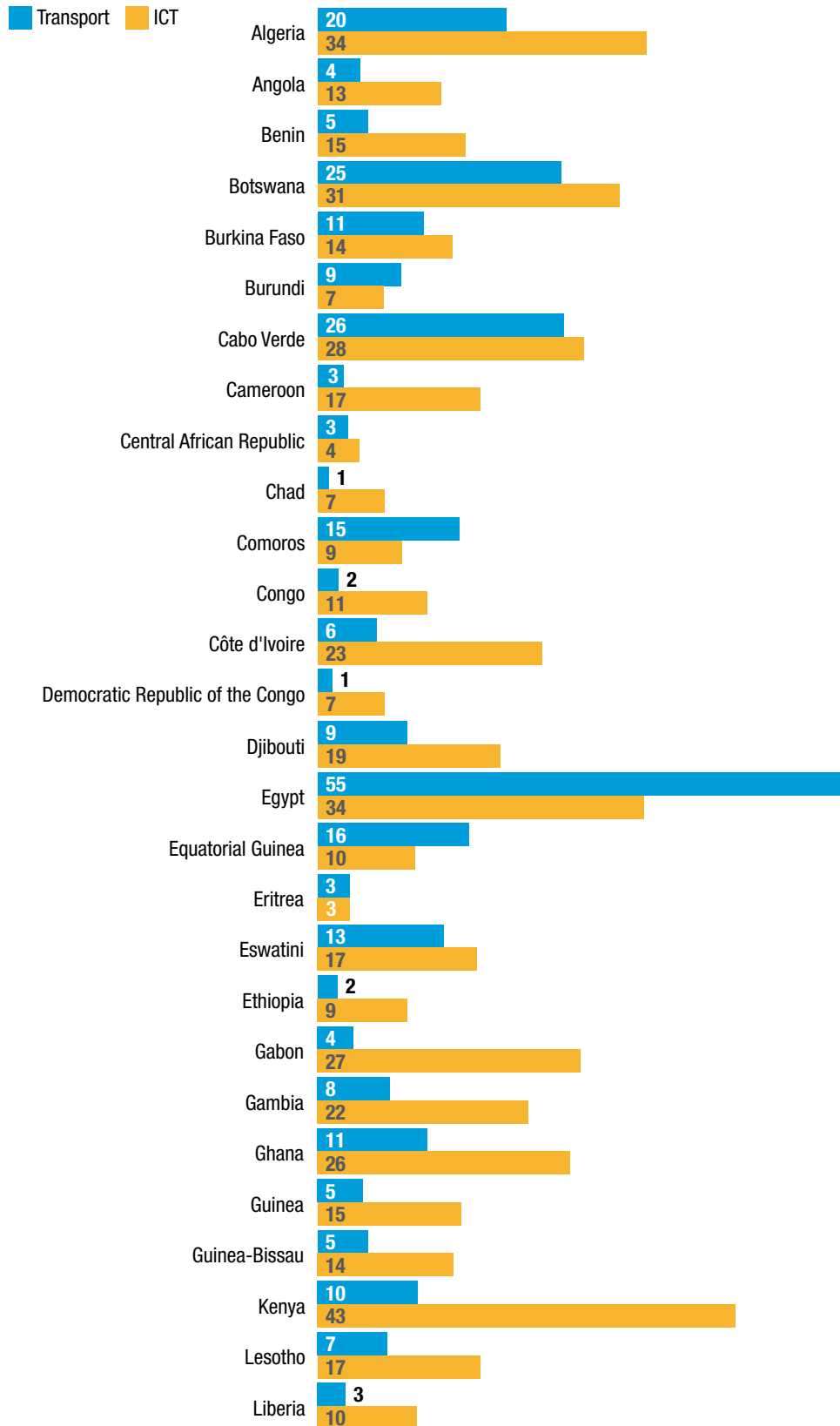
Estimates for the Common Market for Eastern and Southern Africa show that well-established transport infrastructure stimulates industrial growth positively at the regional level (box III.2 and figure III.7). While this could be an impact of the good network in a few countries, along with other factors, the small value of the transport coefficient further emphasizes a low positive impact, if any, on industrial growth in several countries in the long term. This is further highlighted in figure III.7, which indicates an initial negative response of industrial output to improvements in transport infrastructure, albeit with marginal improvements over the projected 10-year horizon. Thus, while improvements in road transport networks are effective in stimulating growth from the second or third year, their positive influence is marginal before becoming constant in the medium term. While this might suggest that the value addition of an additional stock of quality road networks to industrial output diminishes over time, in most countries, deterioration of the road network, for instance, through lack of proper maintenance or overload of heavy trucks, could be the most plausible reason for this trend (UNCTAD and Islamic Development Bank, 2022). Fontagné et al. (2023) suggest that complementing the implementation of the African Continental Free Trade Area with substantial investments in transport and logistics to reduce associated monetary and time costs could expand exports from Africa by 11.5 per cent, compared with the 3.4 per cent gains in the African Continental Free Trade Area but without cutting transportation costs. Moreover, Tandrayen-Ragoobur et al. (2022) found that paving all roads in the West African Economic and Monetary Union would increase its trade flows by 3.5 per cent. Thus, the reduction of net transportation and logistics costs across countries is bound to boost the productivity of industries and the overall trade competitiveness of most countries in the region.



Africa has 16 landlocked countries – more than any other region – and is among the continents with the least developed transport infrastructure

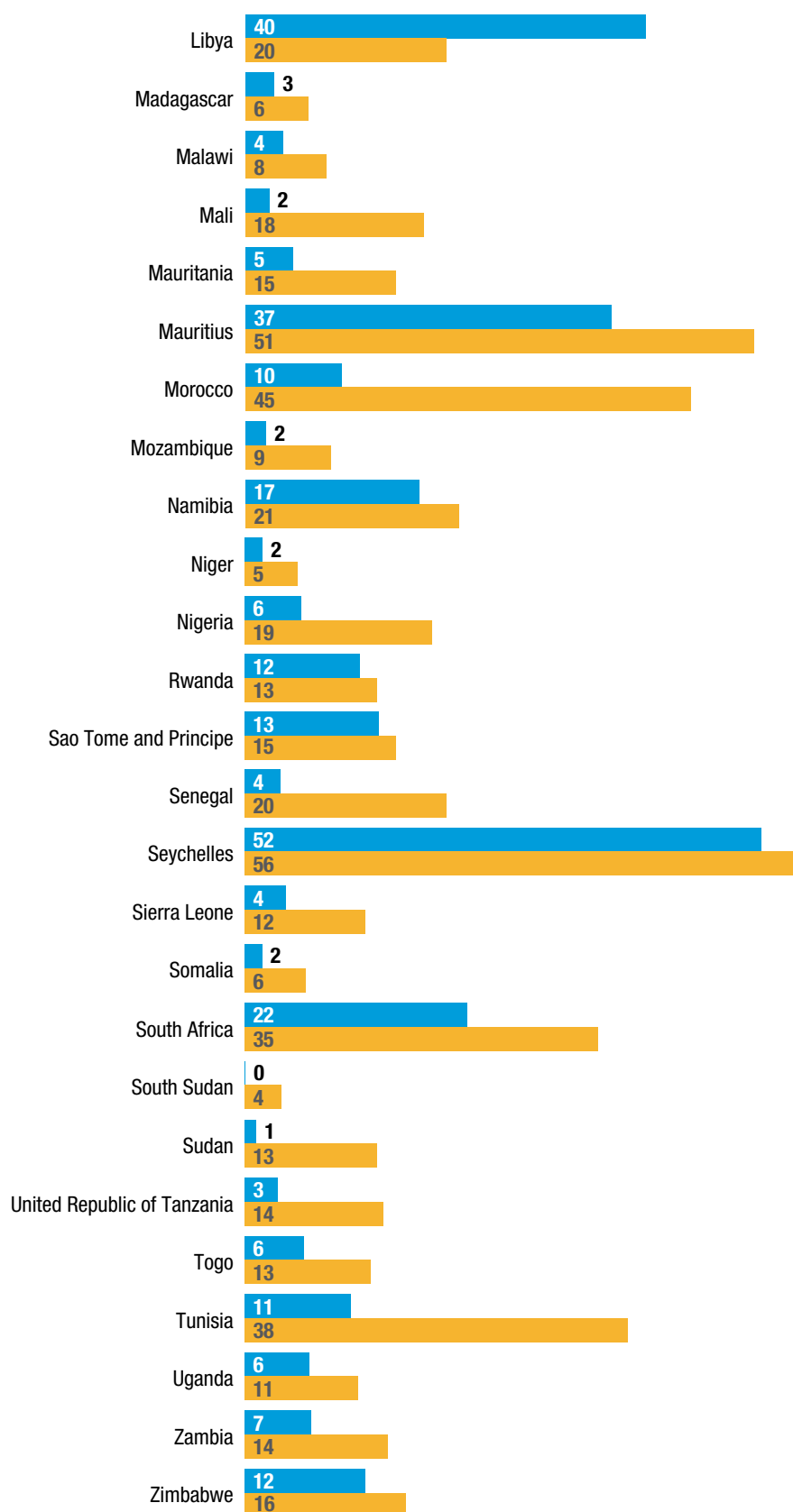


Figure III. 6
Transport and information and communications technology infrastructure composite indices, 2022



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Source: UNCTAD, based on data from the Africa Infrastructure Development Index.



Information and communications technology

Digital technologies will be key to strengthening supply chain resilience (UNCTAD, 2024i). The interaction between transport and ICT infrastructure development is important. Figure III.7 shows potentially divergent (non-complementary) development efforts in the two infrastructure components. On aggregate, each infrastructure component has a somewhat insignificant response to improvements in the other component, potentially highlighting non-complementary prioritization in the development planning of infrastructure in the region. Notably, this undermines the importance of a good road network, including in remote areas, to enhance access to intermediate goods and services that are necessary for higher industrial productivity. For example, in Africa, a resource-rich continent, the internalization of technology in essential sectors such as agriculture to raise industrial output requires good access roads for both the movement of machinery and human skills. Thus, in addition to the direct reduction of marginal production costs, the enhancement of transport and logistics infrastructure is also relevant in stimulating development in other pivotal areas with a direct and/or indirect bearing on overall industrial output and growth.

Notwithstanding the steady growth of ICT infrastructure and utilization of its services from 2010, the aggregate score of the index remains below 20 (figure III.5). This indicates significant gaps in ICT goods and services from within the continent for most countries. Only nine countries in Africa¹¹ have compact ICT networks with countries that are developing ICT potential, including Cabo Verde, Côte d'Ivoire, the Gambia and Namibia. This is equally reflected in

the composition of the region's exports where, for example, ICT goods and services accounted for only 5.2 per cent of its total services exports in 2019 (UNCTAD, 2022b). Thus, on aggregate, most African countries that have a relatively higher level of internalization of technology and other pertinent ICT-related goods and services do so at relatively higher costs than comparable countries in other regions, owing to limited accessibility from within the continent.

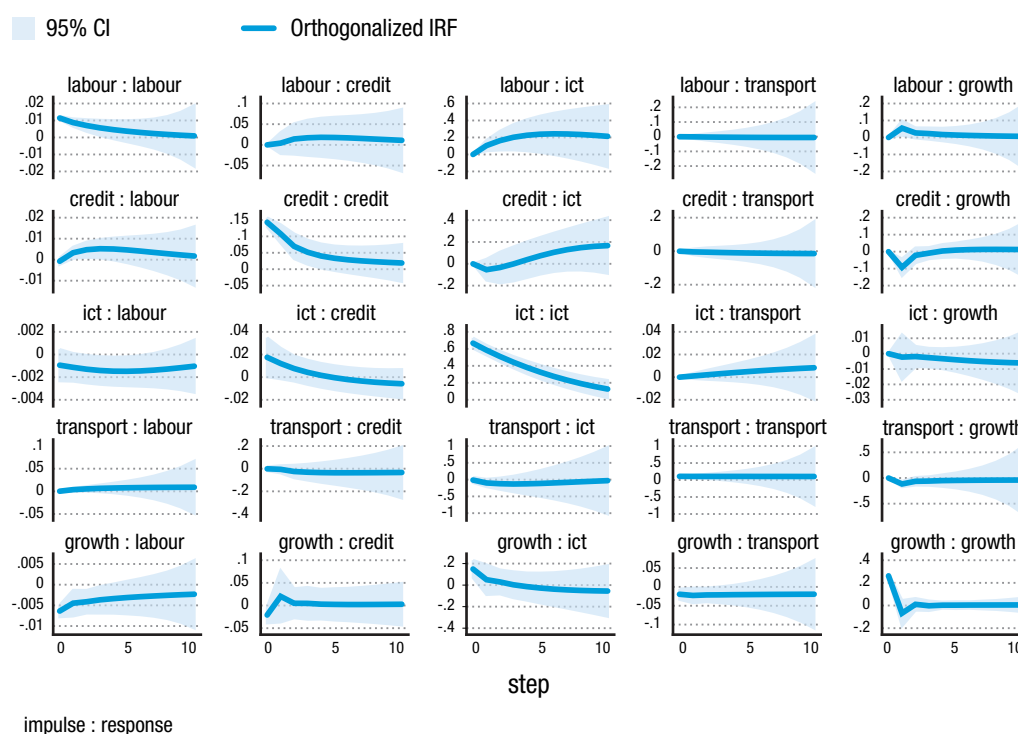
In some countries in the Common Market for Eastern and Southern Africa, the net impact of ICT on industrial value added and growth is negligible and sometimes negative (figure III.7). For instance, while short-term estimates show that ICT positively influences industrial growth in countries such as the Comoros, Kenya and Rwanda, significant negative outcomes are observed for others, such as Zambia. Of interest in these results are the positive outcomes in countries such as the Comoros, which is among the 12 countries having the least developed and accessible ICT goods and services from domestic markets, suggesting the importance of regional and international markets in closing domestic ICT gaps. Overall, the growing ICT sector has yet to unleash the expected positive transformation in the industrial sector, notwithstanding the marginal favourable impact on industrial growth between 2005 and 2022. This is reflected in figure III.7, where the response in industrial output to changes in the ICT sector remains negligible. However, the current pace of development in the ICT sector across Africa has contributed to reducing the digital divide between Africa and the rest of the world and in effectively supporting smart manufacturing and spurring industrial growth, particularly when it translates into the increased internalization of innovative technologies in industrial production and processes.

Notwithstanding the steady growth of ICT infrastructure, **only 9 African countries have reliable and efficient ICT networks**, indicating significant gaps for most countries

¹¹ Algeria, Botswana, Egypt, Kenya, Mauritius, Morocco, Seychelles, South Africa, Tunisia.



Figure III. 7
Common Market for Eastern and Southern Africa: Impulse response function



Source: UNCTAD.
 Note: Credit is the domestic credit available to the private sector as a percentage of GDP. Growth is the industrial value added growth rate. Labour is the total labour participation rate. Transport and ICT are the composite transport infrastructure and ICT indices of the African Development Bank. All variables are in natural logs. The variables are stated as impulses and responses. The first variable in each frame is the impulse; the second is the response. For example, in labour : credit, the frame shows that credit is the response or reaction to the impulse of labour or labour market shocks.

Addressing the gaps in trade logistics and facilitation

While countries in Africa have experienced reduced tariffs owing to bilateral and multilateral trade agreements, non-tariff barriers remain high in the region. Non-tariff barriers generally refer to policy measures other than ordinary customs tariffs, which can potentially have an economic impact on international trade in goods, changing prices traded, quantities or both (UNCTAD, 2019b).

Non-tariff trade costs

The latest trade cost database of the Economic and Social Commission for Asia and the Pacific and the World Bank

indicates that, on average, goods traded between African countries accrue a 292 per cent ad valorem equivalent in non-tariff trade costs, which include all additional costs other than tariff costs involved in trading goods. Figure III.8 depicts several patterns in non-tariff trade costs within regional economic communities. The intraregional and interregional economic community non-tariff trade costs range from about 135 per cent to over 400 per cent, with large variations among regional economic communities. For instance, the average in intra-East African Community non-tariff trade costs from 2016 to 2021 is 135 per cent, indicating that on average, the non-tariff costs of trading all goods within

Intraregional and interregional economic community **non-tariff trade costs range from about 135% to over 400%**, with large variations among regional economic communities

the Community amount to about 135 per cent of the value of goods. Similarly, the average of non-tariff trade costs for the East African Community and the Common Market for Eastern and Southern Africa during the same sample period is 254 per cent, suggesting that traded goods between these regional economic communities are subject to additional ad valorem equivalent trade costs of 119 percentage points, compared with traded goods within the East African Community. Intraregional economic community non-tariff trade costs are sizeably lower than those in an interregional economic community, which can be attributed to more harmonious sanitary and phytosanitary measures, shorter transportation times, fewer border formalities, more consistent licencing and documentation requirements and fewer technical barriers to trade within the regional economic communities. In addition, the data show that non-tariff trade costs are widespread in Africa. Non-tariff trade costs decreased in some regions, for example, within the Common Market for Eastern and Southern Africa, and between the Common Market and the East African Community and the Economic Community of West African States. However, these costs rose within various interregional economic communities, for instance, between the Common Market for Eastern and Southern Africa and the Southern African Development Community, as well as between the East African Community and the Economic Community of West African States. This calls for stronger initiatives at the continental level to reduce non-tariff trade barriers systematically. The online mechanism for reporting, monitoring and eliminating non-tariff barriers under the African Continental Free Trade Area is a key operational instrument to report and resolve perceived non-tariff barriers to trade. According to UNCTAD (2021c), most reported non-tariff barriers relate to rules of origin, lengthy and costly customs procedures, costly road charges and technical barriers to trade and sanitary and phytosanitary measures.

While non-tariff measures are trade rules and regulations introduced to attain legitimate policy objectives such as protecting the environment and ensuring consumer safety, health and well-being, they can affect prices and quantities traded through a range of technical and non-technical requirements such as sanitary and phytosanitary measures (UNCTAD, 2024k).

With the gradual, significant reduction of tariff costs following the successful implementation of various free trade agreements and in 2018, the adoption of the Agreement Establishing the African Continental Free Trade Area, non-tariff measures – not tariffs – are likely to represent a major risk to trading in Africa, with each non-tariff measure estimated to raise trade costs by at least 1.5 per cent on average (UNCTAD, 2018b). UNCTAD (2018b) further suggests that African countries could gain \$20 billion in GDP growth by tackling non-tariff measures at the continental level. Overall, non-tariff measures are estimated to restrict intra-African trade three times more than regular customs tariffs (Sanjuán López et al., 2021; UNCTAD, 2018b). In particular, inadequate transport and logistics infrastructure, inefficient border and port management, costly and lengthy customs procedures and stringent regulatory frameworks are among the main risks that undermine gains from trade across countries and regions. Among other things, they result in border delays and the increased unpredictability of delivery times of intermediate and final goods, with an overall surging effect on transaction costs. This section assesses how and the extent to which the trade logistics and trade facilitation instruments undertaken by African countries have been effective in curbing non-tariff trade costs.



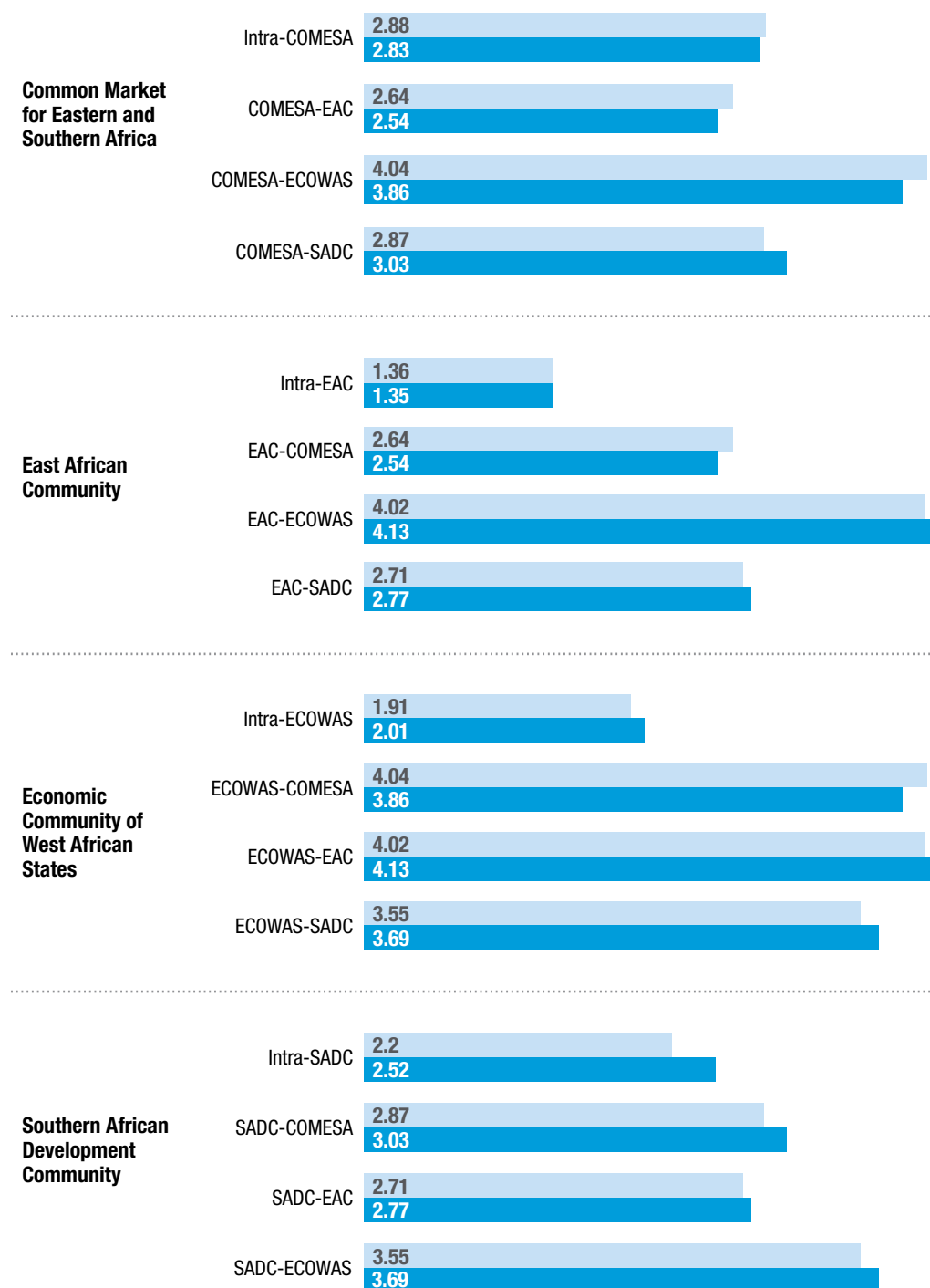


Figure III. 8

Average non-tariff trade costs among and between regional trading blocs in Africa

(Percentage ad valorem equivalent)

2010–2015 2016–2021



Source: UNCTAD calculations, based on data from the trade cost database (Economic and Social Commission for Asia and the Pacific–World Bank).

Note: The non-tariff trade costs capture all additional costs other than tariff costs involved in trading goods bilaterally rather than domestically. These include, but are not limited to, transportation costs, direct and indirect costs associated with currencies and languages and various import and export procedures.



Progress in trade facilitation

Trade facilitation remains central in the simplification and harmonization of import and export procedures to reduce or eliminate the negative effect of non-tariff measures on total trade costs. It broadly encompasses border policies and procedures, ranging from documentation and inspection requirements to border agency cooperation. Trade facilitation provisions in the regional economic communities and the African Continental Free Trade Area are generally consistent with the provisions in other international agreements (for example, the Agreement on Trade Facilitation of the World Trade Organization) and customs conventions (for instance, the Revised Kyoto Convention of the World Customs Organization). At the national level, most countries have adopted a multidimensional approach to improve their competitiveness and enhance market access, covering regulatory frameworks relating to trade and investment and economic infrastructure. Notably, the measures undertaken by countries are aligned with their commitments at the regional-economic-community level, suggesting consistency with relevant provisions in other international agreements. UNCTAD assists African countries in identifying their trade facilitation needs and supports the implementation of specific facilitation measures. For instance, the implementation of a single window in Rwanda, with assistance by UNCTAD, achieved a reduction of export clearance times from 67 hours to 34 (UNCTAD, 2023h).

Assessing the trade facilitation performance of countries in Africa using the agreed indicators under the aforementioned Agreement on Trade Facilitation, figure III.9 illustrates significant improvements across Africa from 2017 to 2022. The top 10 performers during this period are Benin, the Niger, Mali, Mozambique, the Central

African Republic, Namibia, the Gambia, the Democratic Republic of the Congo and Liberia (in order of performance). However, the figure further shows that notwithstanding these improvements, there remains a mounting need for further progress in most countries in ensuring efficiency and less costly processes in the movement of intermediate inputs, final goods and people within and across African regions. Except for Morocco, South Africa and Tunisia, the average score for most countries in 2022 was considerably below the average global best-practice score. Other countries that made commendable strides in this area are Botswana, Cameroon, Egypt, Kenya, Senegal and Tunisia.

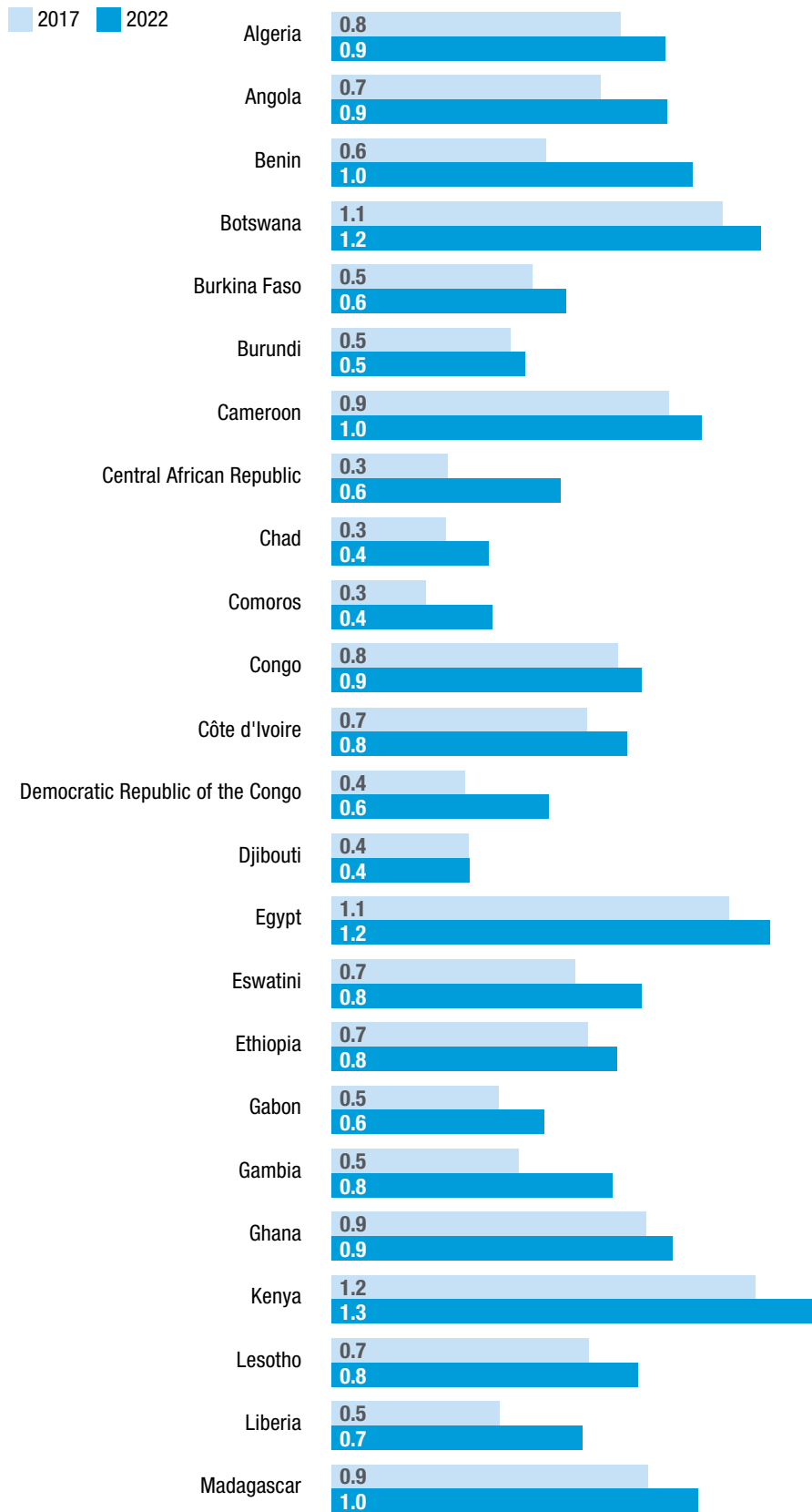
At the regional-economic-community level, trade facilitation programmes include initiatives such as one-stop border posts, which focus on streamlining and facilitating trade and the movement of goods and people between neighbouring countries (UNCTAD, 2021c). Countries in Africa have also collaborated to report and monitor non-tariff barriers jointly. In 2008, the Common Market for Eastern and Southern Africa, the East African Community and the Southern African Development Community set up a freely accessible online platform¹² that enables economic operators to identify, remove and monitor the non-tariff barriers that occur while conducting businesses within these three regional economic communities (World Bank and Horn of Africa Initiative Secretariat, 2023). Within this tripartite non-tariff barrier monitoring system, each regional economic community has established specific regulations that provide the legal foundation for adopting this platform, as follows: Regulations for the Elimination of Non-tariff Barriers, 2014 (Common Market for Eastern and Southern Africa), the Elimination of Non-tariff Barriers Act, 2017 (East African Community) and the Protocol on Trade (Southern African Development Community).

The implementation of a single window in Rwanda, with assistance by UNCTAD, achieved a reduction of export clearance times from 67 hours to 34

¹² See www.tradebarriers.org/.

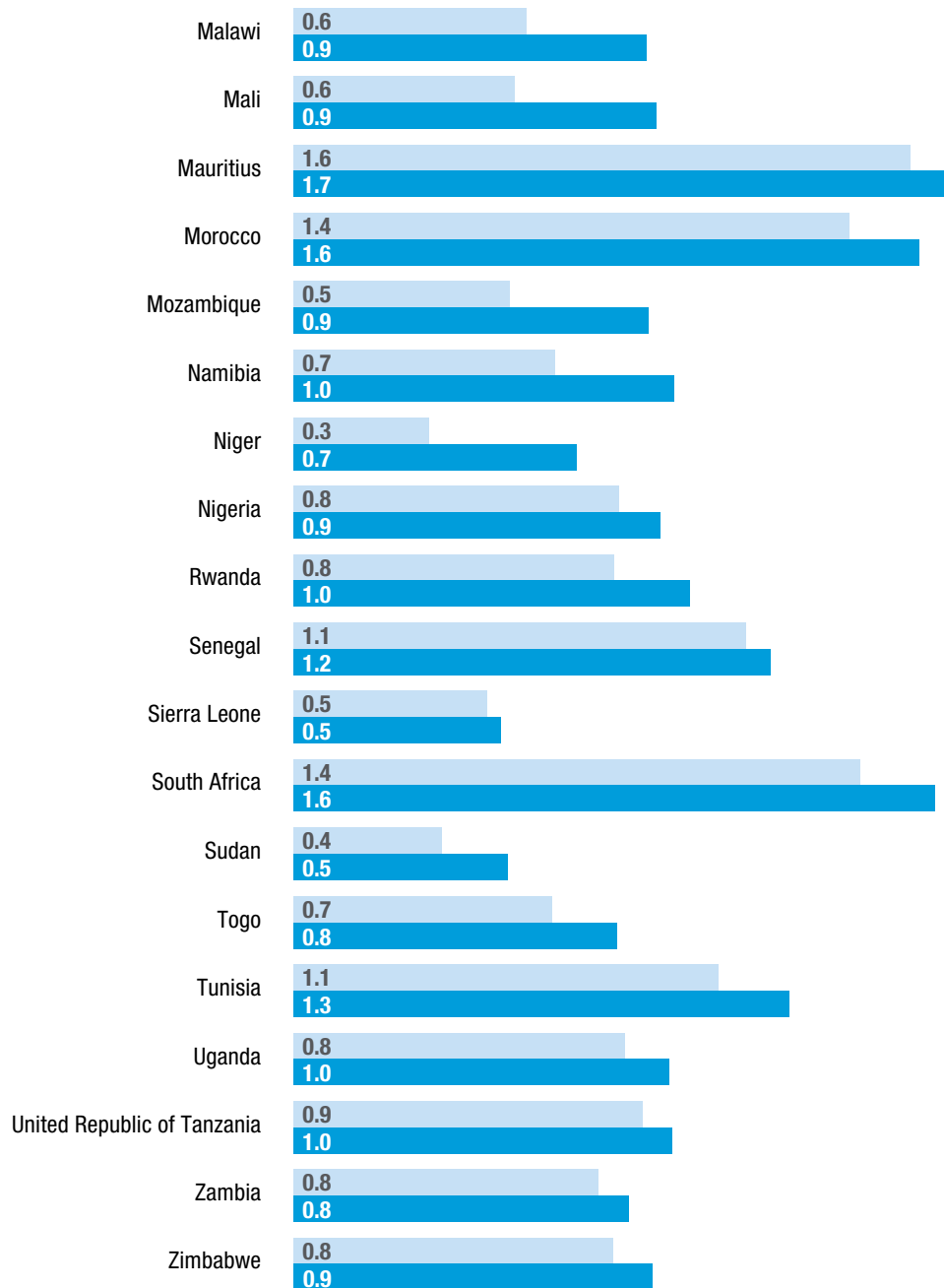


Figure III. 9
Average trade facilitation performance, 2017 and 2022



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Source: UNCTAD calculations, based on data from the Trade Facilitation Indicators database (OECD).

The Southern African Development Community Business Council (2023) mentions six deficiencies regarding non-tariff barrier resolutions in the region, including an opaque resolution process, ineffective national monitoring committees and underprepared national focal points. Moreover, poor trade logistics and glaring trade facilitation gaps in most countries

compound non-tariff trade costs in Africa.

Other key trade facilitation instruments in Africa include the Regional Customs Transit Guarantee scheme, a customs bond guarantee transit programme that facilitates the smooth movement of goods in the Common Market for Eastern and Southern Africa.



Among other things, the scheme ensures recovery of taxes by respective Governments from their guarantors in the event of the illegal disposition of goods for domestic use in the transit country. The Common Market for Eastern and Southern Africa also has a virtual trade facilitation system, which monitors consignments along its corridors, providing real-time full visibility of goods with a Common Market for Eastern and Southern Africa seal. The online system further integrates other key trade facilitation instruments in the region, including a “yellow card” insurance scheme for motor vehicles, a transit data transfer module and a customs declaration document (Common Market for Eastern and Southern Africa, 2024). Other regional online monitoring and resolution systems include the Economic Community of West African States trade obstacles alert mechanism and the West African Economic and Monetary Union Observatory of Abnormal Practices. At the continental level, the Guided Trade Initiative of the African Continental Free Trade Area, regulatory audits and online non-tariff barriers reporting, monitoring and eliminating mechanisms help to further reduce non-tariff barriers in intraregional economic communities and most importantly, in interregional economic communities, to facilitate the development and strengthening of trade and investment ties across regions.

Persistent gaps in trade logistics

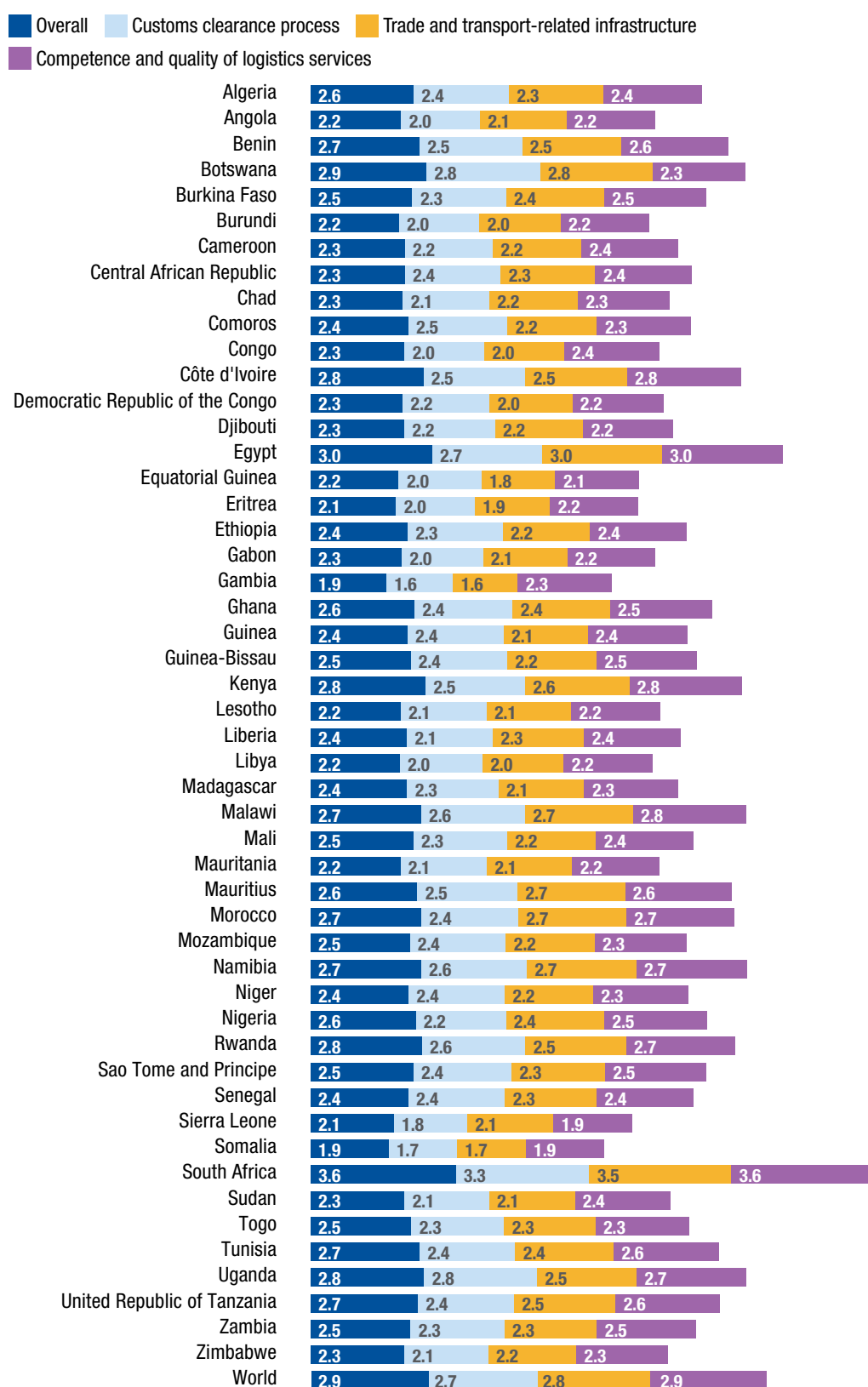
Trade logistics, understood as the management process that includes the entire flow of goods and information between suppliers, producers and consumers, remains an indispensable component of supply chains. This process has a significant implication on the mobility and timely delivery of intermediate and final products. Gaps across key logistical components across Africa compromise the potential for supply chain diversification and pose a major risk to building resilience.

In the overall logistics performance index, only Egypt and South Africa exceeded the global average score (figure III.10). With regard to specific indicators, the performance of Botswana, South Africa and Uganda surpasses the global average score on customs clearance and processes; only Egypt and South Africa score higher on trade and transport-related infrastructure and the quality of logistics. In line with the centrality scores under trade in value added networks, the logistics performance of the countries holding these networks (Djibouti, the Gambia, Mauritania, Seychelles, South Africa, Zambia) is notable. Increased transaction costs are a potential deterrent to the effective development of the supply and value chains in the African Continental Free Trade Area. For instance, Zimbabwe stands out in 2022 as one of the principal suppliers of intermediate inputs in all three sectors (manufacturing, the primary sector and services). With an overall score of 2.3 against the global average of 2.9, Zimbabwe performs better than many other African countries (figure III.10), but the deficiencies in its logistics-related infrastructure and services still pose risks to supply chains in Africa. Moreover, the Gambia, which is also at the core of the manufacturing and primary sector networks as a supplier, ranks lowest in the logistics performance index. In particular, it has the lowest score in customs clearance processes and is third from the bottom after Sierra Leone and Somalia in competence and quality of logistics services. This suggests significant delays and increased uncertainty in the delivery of intermediate inputs originating from the Gambia and/or passing through it. With a large proportion of countries participating in the value chains in Africa through forward integration (as suppliers of raw and/or semi-processed intermediate goods), the weak performance of most of these countries in the index is a potential deterrent to the development of supply and viable value chains in the African Continental Free Trade Area.

Gaps across key logistical components across Africa compromise the potential for supply chain diversification and pose a major risk to building resilience



Figure III. 10
Logistics performance, by country, 2012–2022



Key challenges in logistics performance across countries are observed in border-agency management and, **mostly, process automation**

Source: UNCTAD calculations, based on data from the World Development Indicators database (World Bank).
Note: Index scores range from 1 (low) to 5 (high).

Conclusion

Within the context of regional integration and the African Continental Free Trade Area, this chapter assesses opportunities for effective participation in regional value chains and highlights potential risks. Through network analysis, the chapter provides an overview of the structural changes in intra-African trade in value added from 2012 to 2022, outlining the roles and importance of the respective countries in the trade in value added networks. In addition, the chapter also empirically evaluates the extent to which the potential risks for the regional value chains are undermining the development of viable value chains in Africa through impacts on industrial productivity and growth. Lastly, the chapter discusses avenues for minimizing potential trade and investment risks.

The assessments underscore the heightened potential that countries in Africa have for enhancing their regional trade and development through intraregional value chains. However, the high concentration of intermediate input markets, strong

dependence on a limited range of primary export commodities and poor economic infrastructure limit their capabilities in exploiting comparative advantages for profitable participation in regional and global value chains. Moreover, non-tariff trade costs remain a daunting hurdle in the movement of people and goods within and across regional economic communities. On average, non-tariff trade costs account for nearly three times the value of traded goods in Africa, potentially weakening the capabilities of most countries to take part effectively in regional value chains.

Transport, ICT and energy are also necessary for growth and development in the region. However, these sectors remain underdeveloped in most countries, restraining industrial output and growth. This is likely to hinder the development of viable value chains. Although Africa is using less than 10 per cent of its power-generation capacity, it has the potential to fully meet its energy needs with renewable and non-renewable energy sources (see chapter IV).



Well-established transport, ICT and energy infrastructure is crucial to de-risk trade opportunities