

CHAPTER 1

Global supply chains: Turning disruption into opportunity

1.1 Introduction

Global supply chains, complex cross-border organizational structures and industry networks that are necessary to develop, produce, transport and deliver goods or services across the world, can be at high risk in the face of unexpected events and global pressures. In recent years, the global supply chains ecosystem has been disrupted by unprecedented trade turbulence, economic uncertainty, geopolitical events and natural disasters. In many parts of the world, these events have swayed networks of suppliers and buyers that were built over years – if not decades – thus revealing their vulnerability and exposure to unforeseen global shocks. These shocks put businesses at operational and financial risks and triggered systemic volatility and instability within economies. Although African economies are poorly integrated into global supply chains, the disruptive effects of unforeseen global events on supply chains can pose significant challenges to African businesses and traders in their ability to procure, manufacture, sell or export certain goods and services.

This leads to the following key policy questions:

- Is there opportunity in crisis? Can reshoring and nearshoring¹ offer an opportunity to build more diversified and resilient global supply chains?
- What are the prospects for African countries to integrate into and attract higher-value knowledge and technology-intensive supply chain activities?
- Can the bountiful natural resources in Africa, which hold promise for a low-carbon future, abundant labour and green infrastructure, be incentives for creating a cascade of sustainable supply chains?
- How can mineral abundance be better leveraged? What enabling factors are necessary to fulfil these opportunities?
- Which policies (industrial, investment, technology, skills and knowledge) can help strengthen incentives for supply chain diversification and expansion into Africa?
- How can regional integration and initiatives enable the participation of African firms in next-generation regional and global supply chains?

The Economic Development in Africa Report 2023 brings together contemporary knowledge on supply chain resilience and describes how new strategies, policies and technological innovations can enable disruption-proofing of supply chains in Africa, while boosting productivity and manufacturing capacity. This report aims to provide strategic guidance to decision-makers and policymakers in Africa in leveraging the potential of national and regional markets and businesses to foster domestic supply chains and create a trusted and reliable supplier marketplace for global supply chains, thus helping expand the involvement of Africa in global trade and growth. It demonstrates the potential of African countries for integrating technology-intensive supply chains, such as automotive, electronics, machinery and pharmaceuticals, as suppliers of inputs (raw materials and intermediate goods) or sources of other factors that can contribute to making supply chains more resilient to external shocks. As recent supply chain disruptions put enormous pressure on both suppliers and firms, and financial institutions, limiting the scope for debt in financing supply chains, the

¹ Reshoring is when a company transfers part or all of its business operations and supply chains back to its home country. Nearshoring is when a company relocates part or all of its business operations and supply chains to a nearby country, often with a shared border. See www.weforum.org

report explores emerging financial and technology solutions to help address such liquidity constraints, while improving operational efficiency and managing supply chain finance.

The report proposes to bring together current knowledge on supply chain diversification and resilience in some of these high-value and technology-intensive sectors. Reliable transport and utilities infrastructure, as well as adequate water and electricity supply, will contribute to increased production of local components, reduced reliance on imports and better opportunities for foreign businesses to establish or scale up operations on the continent. Further, sophisticated legal and regulatory frameworks that enable digital transactions, combined with the liberalization of trade in services that can allow improved access to technologies and other high-intensity services, will help overcome production and supply chain limitations that prevent many African countries from participating fully in regional and global trade. Enhancing access to supply chain finance and other alternative financing solutions, especially by smaller businesses that can play a leading role in the innovation, manufacturing, packaging, branding and distribution of intermediates, will be essential for Africa to position itself as a strategic region and partner in the restructuring of global supply chains.

Chapter 2 examines the comparative and competitive advantages of African countries to capture strategic business value and position themselves more strategically in key global supply chains. Economic, political, trade, investment, social and environmental factors can help African countries position themselves as an attractive destination in their efforts to achieve supply chain diversification and resilience.

Chapter 3 considers recent global and African trends and the outlook for the principal technology-intensive supply chains, for example, those related to the automotive, electronics, renewable energy and medical devices industries. It analyses the region's potential for higher value capture in global and regional supply chains, including research and product design, components manufacturing, assembly or product integration, distribution, marketing and sales, consumption and buyers, and related services. The chapter concludes with a presentation of case studies on the potential of African countries to integrate such supply chains (for example, as suppliers of inputs – raw materials and intermediate goods, or as a source of other factors that make supply chains resilient) and to leverage growth and social development opportunities under improved contracts and local content requirement policies.

Chapter 4 discusses the enablers and incentives needed to optimize supply chain opportunities for African countries. Designers, manufacturers, distributors, sellers and buyers can have a common constraint when entering and operating in a supply chain: their access to liquidity and working capital. Recent supply chain disruptions and challenges have put pressure on suppliers or companies and financial institutions and have narrowed the scope of supply chain financing. Emerging financial and technology solutions can help address liquidity constraints, while improving operational efficiency and managing supply chain finance. Investing in a growing pool of skills and technologies that can digitize and facilitate smart manufacturing and services will also help achieve resilience and sustainability in supply chains. In conclusion, the report will summarize the contribution of Africa to global growth and its potential for making valuable inputs to global supply chains. It will also provide strategic recommendations for transforming and upgrading African economies, while leveraging the potential of their national and regional markets and businesses. In addition, the successful implementation of the African Continental Free Trade Area will provide a major impetus to the integration of African economies in high-value global supply chains.

Ultimately, the improved integration of Africa into high-value global supply chains will contribute to economic growth and sustainable development through the associated benefits of productivity gains, specialization, knowledge and technology spillovers, value added exports, and employment generation (Research Network Sustainable Global Supply Chains, 2022). The report recommends strategic and actionable policies that various stakeholders in Africa – Governments, the private sector, regional institutions and trading and business partners – can apply to better integrate African countries in the new disruptive landscapes of global trade, business and finance.

1.2 Global supply chains

Given that global supply chains are composed of innovators, companies, suppliers and service providers from around the world that interact through complex dynamic systems and networks, many factors can affect the stability or robustness of these interwoven relationships, thus creating shortages of certain goods, increasing the cost of certain processes or reducing responsiveness to consumers' demand. To counter supply chain risks and vulnerabilities, a holistic approach that involves diversified

sourcing and sustainable practices, such as production, distribution, inventory and investment, could be considered. Some of these measures could represent opportunities for African countries to integrate higher-value global supply chains and position themselves to better accommodate the potential impact of unexpected events on global supply chains.

However, showcasing the instrumentality of Africa in global supply chains will require rethinking the continent's position in global trade and examining its potential role in principal industries that could especially benefit from supply chain diversification and resilience. For instance, in their quest to diversify their network of suppliers and thus mitigate supply chain risk, leading companies could begin to target Africa as a new region with supply chain assets in resource-intensive, high-knowledge and technology-enabled industries, for example, in the automotive, electronics, renewable energy and medical devices sectors. Essential goods, such as mobile phones, are used globally on a daily basis. They involve a multitude of inputs and processes that will not work without the participation of Africa, where many of the critical materials are mined and sourced and where a growing consumer market can be delivered the final goods.

Understanding the types of global events that affect these industries and their supply chains and identifying the untapped market opportunities present in many African economies will be prerequisites for devising strategies or measures aimed at diversifying supply chains and building more reliable and resilient networks of suppliers and buyers across regions. The high geographic and sectoral concentration of global supply chains can involve risks, especially when it exposes companies to economic instability, price volatility, trade disputes, natural disasters and other exogenous effects in a specific country or region upon which they rely heavily for their supply chains.

To ensure effective supply chain risk management, companies participating in global supply chains will need to reduce supply chain concentration risks by broadening their geographic footprint and be in a better position to meet supply and demand needs by shifting and tapping into numerous networks across many regions, including Africa.

This report profiles opportunities for African economies and businesses to join global supply chains relating to technology-intensive industries. Therefore, it is important to distinguish between a supply chain and a value chain. Box 1 provides a brief analysis of that distinction.

Box 1

Distinguishing between supply chains and value chains

A value chain is commonly acknowledged as effectively contributing to trade dynamism and competitiveness. The University of Cambridge (2021) defines a supply chain as the system and resources required to move a good or service from a supplier to a customer, while the value chain concept builds on this approach to consider the way value is added along the chain to the good or service and the actors involved. SustainAbility et al. (2008) defines a supply chain in terms of the chain of suppliers making inputs to a final product, while a value chain focuses on the value created by the chain. According to ShipBob (2022) and Wallstreetmojo Team (2021), a supply chain refers to the network of vendors, resources, suppliers, customers, businesses, individuals, activities and technologies involved in every step of the chain, from sourcing raw materials to producing finished goods and ensuring timely delivery of their goods and services to customers. By contrast, a value chain refers to the same steps and network as those of a supply chain but emphasizes value addition or creation at each step. The table below summarizes the key differences between the two chains.

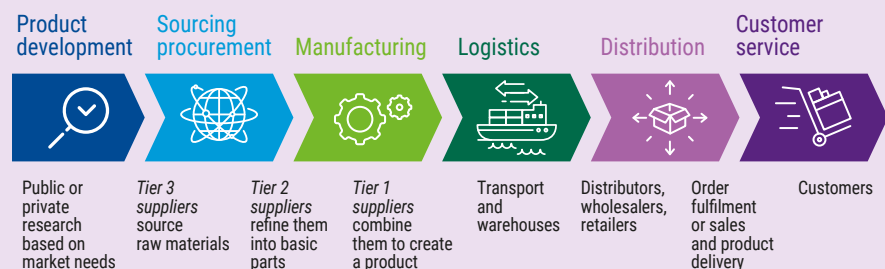
Differences between a supply chain and a value chain

Criteria	Supply chain	Value chain
Definition	Businesses, people and activities involved in the procurement, logistics, transformation and delivery of finished goods	Activities involved in analysing customer needs, planning production and adding value at each step of the process
Goal	To produce and distribute goods so as to increase customer satisfaction	To increase the value of a good so as to create competitive advantage
Process	Operational management	Business management
Main activity	Facilitating production and distribution of a good	Adding value to a good during each step of the process
Stages	Begins with a request from suppliers for a specific good and ends with its delivery	Begins with a customer's request and ends with the development of a specific good

Source: Edrawsoft, 2023; ShipBob, 2022; Tarver, 2022; Wallstreetmojo Team, 2021.

Upon closer examination, a supply chain can be further defined as a network of individuals and companies across various countries and regions. Key steps in a supply chain include the original sourcing by tier 3 suppliers of raw materials, which are refined or manufactured into basic parts by tier 2 suppliers, then assembled into finished products by tier 1 suppliers and sold to end-users or consumers through various delivery and market sale modes. These components are illustrated in the following figure.

Supply chain components



Source: UNCTAD.

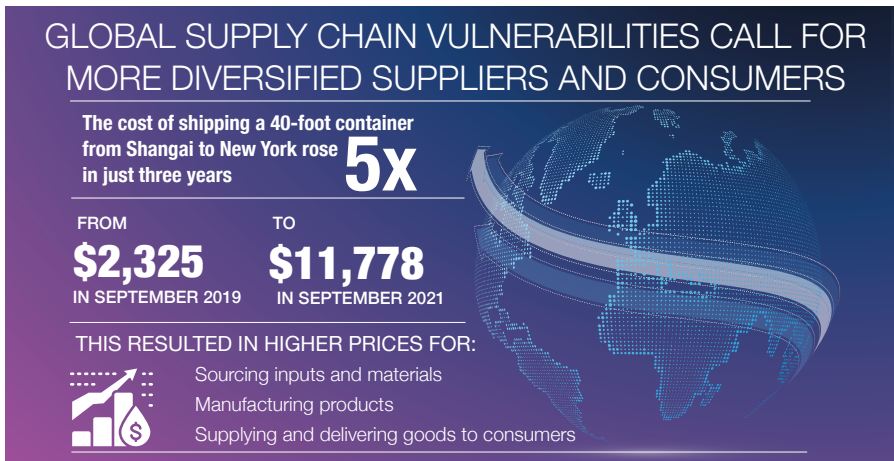
Note: Tier 1 suppliers are lead or anchor firms.

Sources: UNCTAD, based on Edrawsoft (2023), ShipBob (2022), Sustainability et al. (2008), Tarver (2022), University of Cambridge (2021), Wallstreetmojo Team (2021).

1.3 The spectre of the impact of global shocks on supply chains

It is important to understand the nature of recent systemic events and their impact on global supply chains (see table 1). The 2008–2009 global financial and economic crisis, which began with the collapse of large investment banks based in the United States (for example, Lehman Brothers) and an unprecedented deterioration of the world economy, resulted in the tightening of credit and a fall in demand for certain goods and services around the world. The contraction in demand was high in industries such as transportation equipment, metals, machinery and electronics and electronic components. In the United States, for instance, consumer orders for transportation equipment, primary metals and machinery dropped respectively by 42.3 per cent, 40.3 per cent and 31.9 per cent between 2008 and 2009 (Hoberg and Alicke, 2014). Many firms operating in those manufacturing sectors found it difficult to consolidate the losses and decreasing margins incurred from the collapsing demand for their goods and services. Also, as suppliers and buyers of the goods and services affected by the fall in demand, many firms found it difficult to access affordable working capital or credit to finance their production, inventories, logistics and receivables. Most suppliers and buyers were heavily dependent on the banks and securities markets that had experienced liquidity problems in 2008 as a result of the

global financial and economic crisis (Mefford, 2009). The disturbing effects of the crisis were particularly evident for the semiconductor supply chain, which involves hundreds of suppliers and an intricate process of manufacturing microchips and other critical components in the electronics and automotive industries. Because the interbank funds crisis of 2008–2009 brought deep financial distress for some companies and consumers, their respective investments in information technology and purchases of electronic devices or vehicles plummeted, affecting the demand and supply of memory chips, processor chips and silicon wafers. As original equipment manufacturers of electronic devices and vehicles responded to these demand-and-supply shifts by cutting back their orders and pushing inventory onto the market, the price per bit of semiconductors for computers, such as dynamic random-access memory, decreased by almost 50 per cent (Tech Insights, 2023). In the United States, for example, the financial and economic crisis resulted in an 8 per cent decline in demand for consumer electronics, which led to a 20 per cent fall in the demand for memory chips (Mefford, 2009). In China, the crisis affected various industries and supply chains, with about 67,000 factories declaring bankruptcy (Mefford, 2009).



The coronavirus disease (COVID-19) pandemic further disrupted the already complex global supply chains, with significant shifts in logistics and supply chain activities affecting the performance and profit margins of many businesses and industries worldwide. The pandemic-related lockdowns and border closings constrained the supply and delivery of raw materials, critical products and other consumables. These pandemic-related

implications, combined with a labour shortage (for example, in the manufacturing, transportation and warehouse sectors), resulted in manufacturing inefficiency or shutdowns; congestion on maritime, air and terrestrial routes; and a global shortage of key logistics components, such as shipping containers (Subban, 2022). For instance, the effects of COVID-19 restrictions – massive delays and higher air and ocean freight prices – incited some companies to start looking for other ways to build more resilient supply chains and mitigate the risks of future shocks. According to UNCTAD (2022a), the cost of shipping a 40-foot container from Shanghai, China to New York, United States (Asia–North America East Coast route) rose fivefold from \$2,325 in September 2019 to \$11,778 in September 2021. On the route Shanghai–Durban (in South Africa), the cost of shipping a 440-foot container also rose, two-and-a-half-fold, from \$2,521 to \$6,450 between December 2020 and December 2021 (UNCTAD, 2022a). Soaring ocean freight costs, spanning various global supply chain routes, resulted in higher prices of sourcing inputs and materials, manufacturing products, and supplying and delivering goods to consumers. In Europe and the United States, for example, companies in industries mostly affected by the 2021 supply crunch, such as automakers, computer and electronics manufacturers and medical technology innovators, began incurring sales and revenue losses caused by shortages of inputs, high shipping costs and reduced manufacturing capabilities to respond to the backlog of orders from the resurgence of consumer demand for certain products, such as cars, electronics and pharmaceutical goods. Similarly, Apple lost about \$6 billion in potential sales of iPhones and other products partly because of semiconductor supply chain disruptions in 2021 (Siripurapu, 2021).

Global supply chains more recently became subject to additional vulnerabilities with the war in Ukraine, reinforcing the need for companies and countries to rapidly build more resilient and diversified supply chains. The effects of the war on the supply and price of crude oil, natural gas, metals and agricultural commodities contributed to further global supply chain disruptions. In an analysis on the effects of the war in Ukraine on maritime trade logistics, UNCTAD (2022b) found that trade restrictions applied to the Russian Federation, the world's third-largest exporter of crude oil, resulted in higher energy costs (a 64 per cent fuel surcharge during the first quarter of 2022). This led to a spike in maritime shipping rates and caused significant inflationary pressures and an additional 1.6 per cent increase in consumer prices globally. Moreover, the destructive effect of the war on the manufacturing and transportation infrastructure in Ukraine upset operations, not only in that country, but also in other countries that traded with or relied on Ukraine for the supply and delivery of key materials and services. For instance, Ukraine accounts for 50 per cent of the global production of neon gas, a chemical element used to produce semiconductor chips. As a result of the threats posed by the war to the ability of Ukraine to supply this

noble gas, supply chain constraints have been exacerbated in the global semiconductor and chip-making industries (Simchi-Levi and Haren, 2022).

Innovations and high-knowledge and technology-intensive industries² are vulnerable to global shocks, disrupting global supply chains. To illustrate this, table 1 ranks the top 10 industries with a high level of exposure to pandemics, geophysical events and trade disputes.

Table 1

Industry exposure to shocks, selected industries

COVID-19 pandemic		Trade disputes		Geophysical events	
Type of industry	Rank	Type of industry	Rank	Type of industry	Rank
Apparel ^a	1	Semiconductors and components ^b	1	Semiconductors and components ^b	1
Aerospace ^b	2	Communication equipment ^b	2	Communication equipment ^b	2
Furniture ^a	3	Medical devices ^b	3	Mining ^c	3
Petroleum products ^c	4	Pharmaceutical ^b	4	Computers and electronics ^b	4
Transportation equipment ^b	5	Aerospace ^b	5	Glass, cement and ceramics ^d	5
Automotive ^b	6	Automotive ^b	6	Chemical ^b	6
Textiles ^a	7	Machinery and equipment ^b	7	Transportation equipment ^b	7
Rubber and plastics ^d	8	Chemical ^b	8	Basic metal ^c	8
Machinery and equipment ^b	9	Computers and electronics ^b	9	Electrical equipment ^b	9
Mining ^c	10	Electrical equipment ^b	10	Petroleum products ^c	10

Sources: UNCTAD calculations, based on the McKinsey Global Institute shock exposure index and data from the INFORM database, Observatory of Economic Complexity database, United Nations International Trade Statistics (United Nations Comtrade) database, World Input-Output database, World Tourism Organization database.

Note: This ranking is based on an index that measures the forward-looking exposures of value and supply chains in 23 key industries to pandemics, large-scale cyberattacks, geophysical events, heat stress, flooding and trade disputes. For instance, vulnerability exposure to pandemics is measured by the industry or value chain's geographic footprint, which is based on a country's share of exports (United Nations Comtrade database), its exposure to pandemics (INFORM data), and people inflows (World Tourism Organization data).

^a Labour-intensive industry

^b Global innovation industry

^c Resource-intensive industry

^d Regional-processing industry

The increased exposure to global shocks and a reduced ability to respond effectively to operational problems and supply chain disruptions led many economies and

² Some high-knowledge and technology-intensive industries will be discussed in this report.

businesses to adopt strategies aimed at stepping up the local manufacturing of certain products to react more quickly to local demand (Simchi-Levi and Haren, 2022).

Some Governments responded to global supply chain pressures by supporting their home-based companies' efforts to reshore or improve supply chain resilience. For instance, in the United States Inflation Reduction Act (2022), such supply chain programmes include a \$110 billion plan to improve roads and bridges, a \$50 billion plan to incentivize domestic semiconductor manufacturing and a \$17 billion budget to upgrade port infrastructure in major cities in the United States (Siripurapu, 2021).

Many industry leaders acknowledge the importance of having multiple supply sources across various regions and the capacity to swiftly activate secondary supplier relationships (Kilpatrick, 2022) as effective mechanisms to mitigate the risks of supply shortages and other repercussions of shocks and vulnerabilities on supply chain efficiency. However, the decision to diversify supply chains by reshoring or expanding supply chain operations into other markets and regions depends on a host of factors. These include costs related to wages, transport and production; access to raw materials and intermediates; access or proximity to emerging markets and growing consumer markets; quality, environmental and regulatory standards; technology and innovation capabilities; and the securing of the supply of key strategic products and services. According to UNCTAD (2020a), reshoring may not necessarily build more resilient supply chains, as it can lead to a higher geographical concentration of value added and reduced investment, especially for higher-technology-intensive industries. In some economies, reshoring may require re-industrializing, calling for significant investment (for example, to build manufacturing and logistics infrastructure) and capacity adjustments (for example, reskilling). (See Simchi-Levi and Haren, 2022). Supply chain diversification, which can broaden the distribution of economic activities and provide opportunities for new companies to integrate supply chains (UNCTAD, 2020a), thus becomes a more viable route for building resilience to global supply chain disruptions.

Companies seeking to diversify their supply chains and build relationships with suppliers and customers in various regions will need to invest heavily in fixed costs, for example, by setting up production plants and related infrastructure. They will also need to ensure that the necessary human capital, skills and technologies are present in those regions and markets.

Notwithstanding such costs, the risks of concentrating manufacturing and supply chains in a few markets or sourcing materials and supplying sector-specific intermediate goods from a few locations can increase exposure to shocks and disruptions in production networks and supply chains and can threaten a company's survival.

Although the current globalization of supply chains occurred when companies sought to lower production costs, for example by relocating to lower-cost markets, the heightening risk of global shocks and disruptions that can lead to greater material shortages, raise shipment costs or delay fulfilment and orders, are major concerns for companies that are now aiming to cut costs by shortening their supply chains and sourcing at home or closer to home.

The renewed paths towards supply chain diversification as strategies for building resilience to global shocks can create opportunities for African countries. For example, high value added and capital-intensive supply chains in the automotive and electronics industries can explore broader geographic footprints, including Africa, and restructure their supplier ecosystems to reduce vulnerability and strengthen resilience. By diversifying to or relocating some of their supply chain components to Africa, companies in technology-intensive sectors, for instance, can source some of the inputs (raw materials and intermediate goods) from the continent, while diminishing the costs of transportation and logistics and minimizing the risks related to supplier delivery delays and other challenges.

Moreover, the growing African consumer markets, characterized by a swelling demand for electronics goods and financial technology services, can provide incentives for market proximity. However, to become attractive options for companies seeking to diversify their supply chains, African countries will need to demonstrate reliable manufacturing, transport and logistics capabilities if firms are to relocate some of their supply chain components to the continent. Further, African countries will need to facilitate enabling policy and regulatory incentives to develop regional supply chains that can build the foundation for the full participation of African companies in global supply chains. A first step would be to better understand the importance of supply chain diversification and the potential benefits stemming from the continent's resilience to global shocks and other related disruptions.

1.4 Principles of supply chain diversification

The diversification of supply chains, which is based on diversification in all the components of the supply chain, includes supply base diversification (number of suppliers), customer base diversification (number of customers), supply chain flexibility and diversification of the goods and services produced. The suppliers and customers of a firm represent its relationships. Yin and Ran (2022) divide supply chain diversification into supply base diversification and customer base diversification,

while Lin et al. (2021) conceptualize supply chain diversification (concentration) in terms of whether a firm concentrates its sourcing (sales) on a few large suppliers and customers. The first component of supply chain diversification is the firm's supply base diversification. In the supply chain, a supplier is a firm that provides goods and services to other organizations. A supplier can participate in business-to-business or business-to-consumer relationships in a supply chain. Supply base diversification can help firms avoid production shutdowns caused by supply interruptions (Adobor and McMullen, 2007; Yin and Ran, 2022). Firms that participate in non-diversified supply chains are particularly vulnerable to external and internal shocks.

Another important component of supply chain diversification is customer base diversification. As mentioned previously, in a supply chain, customers are firms that purchase goods and services from other organizations. Customers depend on producers, distributors and retailers to meet their needs for goods and services. Customers play an essential role in creating supply chains, as their needs, values and opinions affect the supplier's decisions throughout the supply chain (Achilles, 2014). A supplier of a firm can be a customer of another firm, and vice versa. For example, a customer may be a producer that purchases inputs to make goods and provide services for other customers.

The concept of supply chain diversification also includes supply chain flexibility. This concerns a supply chain's responsiveness to changes in customers' needs (Kaur and Kau, 2022) and the ability to easily adjust production levels, raw material purchases and transport capacity (Wolters Kluwer, 2021). Further, flexibility in the supply chain means a firm can scale to meet the needs of its consumers and adapt to meet the natural ebb and flow of its business, rather than wasting resources due to the inability to make immediate changes (Wolters Kluwer, 2021). Also, supply chain flexibility allows a supply chain to function by accommodating the day-to-day changes that occur naturally. The number of a company's facilities, including manufacturing, distribution, research and administrative facilities, could provide flexibility in a supply chain.

Supply chain flexibility also allows the successful integration of just-in-time and just-in-case supply chain inventory systems to achieve efficient operational processes. A just-in-time supply chain, also called the pull system of a supply chain, is a management strategy that aims to minimize inventory and increase efficiency. When adopting a just-in-time supply chain strategy, a company will order parts or services from suppliers solely on an as-needed basis or will manufacture specific units of products only when it receives an order from a buyer or customer. A just-in-case supply chain, or the push system in a supply chain, is an inventory strategy in which a company orders more goods or services than required from suppliers and produces

more goods or services than they are expected to sell (United We Care, 2022). This management strategy aims to minimize the risk for a company to run out of stock of a specific product and be in a position to respond to consumer demand, even during unpredictable times, such as during shocks or supply chain disruptions. As both strategies present advantages and risks, it is important to adopt a balanced approach. For example, in a hybrid push-pull inventory system, some of the supply chain processes employ a just-in-time strategy, while others operate under a just-in-case system. This can be conducive to building a more flexible supply chain and optimizing inventories, that is, having a more accurate demand forecast than a just-in-case system but not aiming to keep standing inventory at zero, as in just-in-case systems (Jenkins, 2021).

Supply chain diversification has proven an effective means of strengthening supply chain resilience while overcoming supply chain disruption and improving company profitability and demand flows. Supply chain resilience can be defined as follows: the ability of a supply chain to return to its original state or move to a more desirable state after being disrupted (Barroso et al., 2010; Brandon-Jones et al., 2014; Carvalho et al., 2011; Christopher and Peck, 2004; Christopher and Rutherford, 2004), the ability of the production and distribution system to meet each customer demand for each product on time and to quantity (Priya Datta et al., 2007) and the ability to quickly adapt and respond to changes (Erol et al., 2010). These definitions and others are recapitulated in Tukamuhabwa et al. (2015).

With regard to supply chain resilience, the diversification of a supply chain allows firms to mitigate supply chain disruption. Diversification, through flexibility in activities, makes it possible to surmount the adverse effects of shocks and thus enable a supply chain to

Figure 1

Features of supply chain diversification



Source: UNCTAD.

return to its original state after a disruptive event. By diversifying suppliers, and goods and services, firms can readily absorb shocks such as the shortage of entrants and soaring prices of a product, overcoming the complete disruption of activities (figure 1).

1.5 What does supply chain diversification mean for Africa?

Global supply chains were designed to operate with high reliability and at the lowest possible cost (Gandhi, 2022). Yet the impact of global shocks and other geopolitical dynamics – the global financial and economic crisis, the pandemic and the war in Ukraine – on the reliability, cost-effectiveness and resilience of supply chains resulted in many companies and Governments adopting measures aimed at securing the supply of components in critical industries and reducing their dependence on a few suppliers and source markets. Some of these measures include support programmes and incentives deployed by the United States and the European Union to reshore the manufacturing supply chains for semiconductors, vaccines and medical equipment to ensure reliability, control and security. The increased interest in bringing back components of supply chains to home or closer to home by switching to or expanding relationships with suppliers closer to the market served or suppliers located in regions and countries with shared values, can open up opportunities for African economies and local firms to participate effectively in global supply chains (Gandhi, 2022). Moreover, some of the emerging trends that are reshaping global supply chains, such as the growing economic power of China and its transition to knowledge-intensive sectors, advances in global technologies and the raising of global environmental sustainability standards and compliance (Research Network Sustainable Global Supply Chains, 2022) can offer new paths for African countries to integrate global supply chains. For example, critical mineral and metal-based supply chains could leverage the potential of technology-enabling domestic firms and suppliers in lower-cost, higher-value and more transparent supply chains, and capitalize on the vast green hydrogen potential of Africa to attract sustainable supply chains to the region.

The potential benefits of regional integration and the African Continental Free Trade Area provide an added advantage for African countries to develop and strengthen regional supply chains, which can help foster their competitive position in global supply chains with enhanced opportunities for higher value capture and specialization. Zhang (2021) showed that the African Continental Free Trade Area had the potential to bolster regional supply chains in Africa and allow them to engage more effectively

in global supply chains. The African Continental Free Trade Area will not only help address many of the cross-border trade issues but will also create opportunities to enhance supply chain agility by embracing digitization and enabling innovations in supply chains. A host of other factors – demand, spatial, economic, political, trade, investment, social and environmental – can help African countries position themselves and become attractive destinations and supply partners in the drive to achieve supply chain diversification and resilience.

Addressing supply chain vulnerabilities

However, an important precondition for Africa to play a more impactful role in global supply chains and build resilience to the disruptive nature of shocks will be to address its supply chain vulnerabilities. Key barriers to logistics and supply chains in Africa include poor infrastructure (transport, warehouse and other facilities), informality, weak institutions and regulations, fragmented markets, limited sources of capital, low levels of technology and political risks. These barriers can increase the cost of doing business and trade in many African countries, especially those that rely heavily on foreign imports of goods and services. For example, a country such as Nigeria, which has a population exceeding 200 million, is one of the biggest economies in the region (United Nations, 2022). Yet it remains highly dependent on the import of goods, such as refined petroleum oils, cars, smartphones, cereals and pharmaceuticals, to satisfy its consumers (Observatory of Economic Complexity, 2022; Statista, 2023).

Africa is home to critical minerals and other valuable intermediate goods – refined copper, cobalt oxides and many others – that feed into global value and supply chains. For example, the Democratic Republic of the Congo is the second-largest exporter of copper. According to estimates by the Observatory of Economic Complexity (2022), the country alone holds a share of at least \$11 billion in the copper-mining industry. Among other industries, copper mining feeds into the electric vehicles industry, representing a global market value of \$246.7 billion (Fortune Business Insights, 2020).

Further, high value added and capital-intensive supply chains, such as communication equipment, transportation equipment, computers and electronics, and semiconductors and components, which are strongly concentrated in Asia, can explore broader geographic footprints, including Africa, and restructure their supply ecosystems to reduce vulnerability and strengthen resilience. According to McKinsey and Company (2020a) and various data sources (see table 1), pharmaceutical goods, transportation equipment, computers and electronics, communication equipment,

semiconductors and components, and medical devices ranked among the principal value and supply chains most exposed to shocks and disruptions stemming from the pandemic, geophysical events (for example, earthquakes) and trade disputes. These sectors are categorized as global innovations, meaning that they entail the production of the most intricate and knowledge-intensive goods, and involve highly complex and dynamic commercial, operational, financial, and organizational processes. These are also sectors that are based on high-value, cutting-edge technologies (McKinsey and Company, 2020).



By diversifying or relocating some of the supply chain components to Africa, companies in some of these high-value and technology-intensive sectors can source some of the inputs (raw materials and intermediate goods) from the continent, while reducing the costs of transportation and logistics and minimizing the risks of supplier delivery delays and other challenges. Moreover, expanding African consumer markets, characterized by a rising demand for electronics goods and financial technology services, can provide incentives for market proximity. It is estimated that the constantly growing population of Africa will reach some 2.5 billion by 2050,³ its consumer markets, 1.7 billion consumers (one fifth of the world's consumers) by 2030 and consumer expenditure, \$2.1 trillion by 2025 and

³ Data from the United Nations Population Division Data Portal. Available at <https://population.un.org/dataportal/home> (accessed 18 May 2023).

\$2.5 trillion by 2030, compared with \$1.4 trillion in 2015 (Signé, 2018). These trends point to enhanced business opportunities and growth and prosperity for the world, positioning Africa as a strategic region in the drive for geographically diversified supply chains.

In light of the increasing variations in the global economy and the development dividends that African countries can gain from a deeper integration into high value global supply chains (Research Network Sustainable Global Supply Chains, 2022), opportunities for companies participating in supply chains to expand their reach, improve global competitiveness and become more resilient to shocks or disruptions could chart the path for scaling the sustainable development of African economies. For instance, by sourcing and expanding its procurement activities across multiple suppliers, including in Africa, a supply-chain-participating company can contribute to employment creation through suppliers or by developing business opportunities. It can foster better working conditions by transferring knowledge or observing good labour practices and can also have a positive effect on wages and income, especially in technology-based and high-skilled sectors. As technology-intensive industries tend to offer higher wages and can have a positive job-multiplier effect, facilitating a conducive environment for firms in those industries to establish or build new suppliers' relationships in African countries should be a development target for the Governments of Africa. According to the International Labour Organization (2020), less than 24 per cent of the African workforce (about 32 million employees, one third of which are women) earn the minimum wage. In Africa, this amounts to \$220 per month on average, compared with a world average of \$486 per month, \$668 in the Americas, \$381 in Asia and the Pacific, and \$1,041 in Europe and Central Asia. In the United States, workers in high-technology industries earn on average 101.8 per cent more than workers in non-high-technology industries (Roberts and Wolf, 2018).

The job-multiplier effect of high-technology industries has been clearly demonstrated in some economies. For instance, Moretti and Thulin (2013) found that in the United States, each additional job generated in the high-technology sector increases labour demand in the non-tradable sector, thus creating between four and five new job opportunities. In the United Kingdom, Lee and Clarke (2019) also demonstrated a significant multiplier from the high-technology sector, where for every new 10 jobs in high technology, 7 new jobs are created in non-tradeable sectors.