Mapping Africa's Import Product Dependency Amidst Global Shocks

Socrates Kraido Majune
Department of Economics and Development Studies, University of Nairobi
skmajune@uonbi.ac.ke

Patricia Ssozi Naluwooza
Bank of Uganda
pnaluwooza@bou.or.ug

Abdiaziz Abdikadir Ahmed
School of Economics, University of Cape Town, South Africa
ahmabd016@myuct.ac.za

Victor Stolzenburg
Economic Research and Statistics Division, World Trade Organization
victor.stolzenburg@wto.org

Abstract

This study examines Africa's excessive reliance on imported products using five criteria: market concentration, foreign demand, capacity for domestic substitution, market relevance, and product elasticity of substitution. By analyzing Africa's imports with over 210 partners for 5,384 products between 1995 and 2022, we find that approximately 10% of the products imported into Africa, in terms of value and volume, are dependent or risky. Africa's risky imports mainly consist of machines and electronics, transportation equipment, metals, and textiles and clothing, which are primarily intermediate products. These imports predominantly originate from Asia, especially China, which accounted for 47% of Africa's import value of risky goods in 2022. Risky import products exhibit a lower survival rate than non-risky products, with most industries relying on them being in the automotive and transport sectors. Additionally, risky imports encounter higher tariff and non-tariff barriers than non-risky goods. Regression results suggest that risky goods were more adversely affected by the 2008/2009 global financial crisis and the COVID-19 pandemic than non-risky goods. Regression analysis also indicates that risky goods negatively impact Africa's macroeconomic fundamentals—GDP, GDP per capita, inflation, and exchange rate. Multilateral organizations and African countries may consider establishing a standard definition and list of products classified as risky to regularly monitor their performance. Targeted support for producers of dependent products and countries more likely to suffer from their scarcity should also be supported. Ultimately, African countries can foster strong and diversified trade relationships and commercial partnerships with others to reduce excessive interdependencies.

Keywords: Dependency; Riskiness; Vulnerability; Imports; Africa
JEL Codes: F10, F13, F14, F17

1. Introduction

The COVID-19 pandemic has exposed the world's overreliance on certain countries and products. The containment measures implemented by countries to curb the spread of the virus severely disrupted supply chains, leading to massive shortages of essential health commodities. At the same time, the demand for these commodities surged and far outstripped their global supply. Ultimately, countries with low production capacities were disproportionately affected and were at the mercy of their advanced counterparts. The Russia-Ukraine war has further exacerbated this situation, particularly the severe shortage of wheat and sunflower oil, as the two countries are major exporters of these commodities, creating extreme dependence on them at the onset of the war (WTO, 2023). These catastrophes, alongside those that are environmental, demographic, technological and financial in nature[1], present an opportunity for change and a chance to re-evaluate supply chain resilience among policymakers and scholars.

This study develops a methodology that pinpoints commodities like those named above. These products require increased monitoring as they are deemed economically essential but are vulnerable to global episodes of risk and uncertainty, such as COVID-19. Existing measures of product dependence are threefold: use of indices and cut-off points from indicators of trade concentration and substitutability (Korniyenko *et al*., 2017; Reiter and Stehrer, 2023; Mejean and Rousseaux, 2024; Lefebvre and Wibaux, 2024); network analysis (Amador *et al*., 2018; Piccardi and Tajoli, 2018; Hoang *et al*., 2023; Nicita, 2023); and Input-Output analysis (Borin *et al*., 2021; Baldwin and Freeman, 2022; Baldwin, Freeman and Theodorakopoulos, 2022; Elliott *et al*., 2022; Schwellnus *et al*., 2023)[2]. This study uses the first approach (indices and cut-off points) due to the availability of public data.

Studies along this line have identified vulnerable products by measuring their concentration and degree of foreign outsourcing (see Table 1 for a summary). The Hirschmann-Herfindahl index (HHI) is widely used to proxy market concentration. Regional and country-level studies analyze the degree of foreign outsourcing by establishing the significance of extra-regional imports in a region's total imports. The degree of foreign outsourcing has also been measured by the ability to

[1] For instance, earthquakes, tsunamis, global financial crises, advances in artificial intelligence and mass migration and aging (UNCTAD, 2025). These shocks can be triggered by exogenous factors or deliberate actions by foreign governments or non-governmental organizations (European Commission, 2021).

[2] Refer to Nassar *et al*. (2020), UNCTAD (2023), Braun *et al*. (2023) and Silva *et al*. (2024) for alternative methodologies.

substitute imports with domestic production, often proxied by the ratio of imports to exports. Whereas these measures are plausible in identifying risky products, they could be affected by the failure to consider the value of trade and the elasticity of substitution of products. Therefore, a more holistic perspective is needed.

Hypothetically, a product might meet the criteria of being dependent by being exported by a few countries, meaning it is highly concentrated, primarily sourced from outside a region, and has a low capacity for domestic substitution. However, its share in the total import value in a year might be low, yet it is an important yardstick for measuring market relevance. Assessing product substitutability through the ability of local production and external sourcing might not show the ease of changing one product for another. For these reasons, we extend the existing studies in Table 1 by introducing a cut-off that considers the value of trade and the elasticity of substitution of products.

Again, studies identifying and tracking product dependency in Table 1 mainly concentrate on the world, regions such as the European Union and the Organisation for Economic Co-operation and Development (OECD), and big economies (Canada, Germany, China, the US and France). Africa, our area of focus, has not been covered to the best of our knowledge, yet it is the most susceptible to global crises. Indeed, Figure 1 shows that Africa's level of uncertainty[3] has surpassed that of other regions in the world since 2005. Africa was subject to high levels of uncertainty during the 2008/2009 financial crisis and Brexit in 2016. Africa's level of uncertainty was also high during the COVID-19 pandemic, as was with the rest of the world and spiked in 2024, while that of the rest of the world eased. Overall, Figure 1 implies that Africa is highly interconnected to the rest of the world and, in turn, more disposed to global shocks, warranting our focus on it.

The concept of product riskiness is closely associated with Africa's broader debate on building greater resilience moving into the African Continental Free Trade Area (AfCFTA). For instance, the World Economic Forum (Signé and Munyati, 2023) and International Trade Centre (ITC, 2022) have identified four sectors that will offer the greatest opportunity once the agreement is

[3] The World Uncertainty Index was launched by the International Monetary Fund in 2020 to measure and compare quarterly the level of uncertainty across 143 countries. The index is constructed by text-mining the country reports from the Economist Intelligence Unit and counting the frequency of the word "uncertain" (or its variant) in its quarterly country reports. The index is computed by normalizing the total count of the word "uncertain" (or its variant) according to the total number of words in each report and then rescaled by multiplying by 1,000. A higher number means higher uncertainty. For example, an index of 200 corresponds to the word "uncertainty", accounting for 0.02% of all words. Refer to https://worlduncertaintyindex.com/ (Ahir, Bloom and Furceri, 2022) for more information on the index.

operational: automotive, agriculture and agro-processing, pharmaceuticals, transport, and logistics. The current research shows what the continent is most reliant on, with the intention that domestic capacity can be boosted to turn this dependency into opportunity in future. Ideally, dependent products bear substantial risks in the event of sudden disruptions and identifying them is the first step towards building Africa's de-risking strategy, which informs the industrial policy.

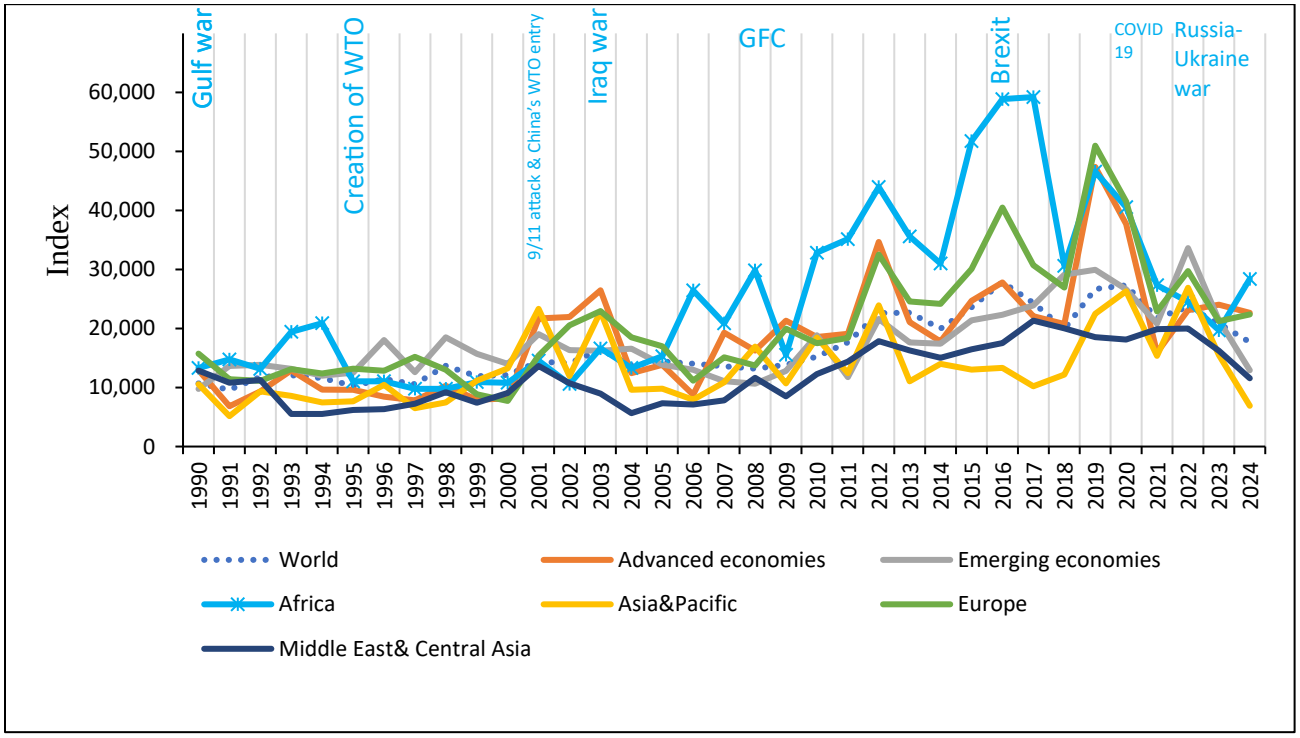


Figure 1: Uncertainty index across world regions (averages, 1990–2024)

Note: This is a time series of the uncertainty index averages for Africa and the rest of the world from the first quarter of 1990 to the first quarter of 2024. A higher number means higher uncertainty. GFC stands for global financial crisis, while WTO stands for World Trade Organization.

Source: Authors' computation using the World Uncertainty Index (Ahir *et al*., 2022) for 2024

We also address the dynamics of global value chains (GVCs) in Africa. Over half of Africa's international trade is embodied in GVCs (Montfaucon *et al*., 2023). At the same time, GVCs have continued to expand, fostering interdependence on a few key players and making the transmission of negative shocks of crises on trade inevitable (Curran and Eckhardt, 2023). This suggests a need to understand the mitigation mechanism of the GVC trade to protect the supply of potentially risky

products. Additionally, concentrations of national imports have grown more quickly than national exports, necessitating a debate on import dependencies (Arriola *et al*., 2024). Overall, risky imports can disrupt economic stability and development within sectors by breaking supply chains, increasing costs, degrading a country's national security, and lowering the quality of goods and services[4]. For instance, nearly 90% of fertilizer used in sub-Saharan Africa is imported, posing a threat to the continent's food security given the recent increases and volatility in fertilizer prices and supply disruptions from key producing countries (Odjo *et al*., 2024).

We identify Africa's import product dependency for nearly three decades (1995–2022). Several key global and national events and policies have significantly influenced the evolution of product dependency over this period as shown in Figure 1. One of the most pivotal events was the establishment of the World Trade Organization (WTO) in 1995, which aimed to promote international trade by reducing tariffs and trade barriers. While this led to an increase in global trade, it also inadvertently facilitated the rise of risky imports as the rapid expansion of global supply chains outpaced the capacity of many countries to enforce stringent quality and safety standards (Bacchetta *et al*., 2024).

The 2008/2009 global financial crisis also fueled product dependence. The crisis caused many governments to implement austerity measures and reduce funding for regulatory bodies monitoring and controlling imports (Karanikolos *et al*., 2013). This resulted in a temporary increase in the flow of substandard goods into many markets as weakened regulatory frameworks struggled to keep pace with the influx of cheaper, often lower-quality, products. China's accession to the WTO in 2001 made it the world's workhorse and, in turn, has driven most countries to depend on Chinese products. China has been Africa's largest import partner since 2010, accounting for around 36% of imports in countries like Ethiopia (Onyango, Majune and Naluwooza, 2025). The 1995–2022 period also experienced the COVID-19 pandemic and geopolitical wars, which, as explained before, have bred product dependence on a select number of suppliers.

We find that roughly 10% of products imported into Africa by value and volume are dependent. Africa's dependent imports are mainly machines and electronics, transportation equipment, metals, and textiles and clothing, and are primarily intermediate in nature. These products are mainly

[4] Import dependency has some positives, such that it enhances specialization and productivity, resulting from cost-reducing outsourcing decisions, and it could cushion a country from domestic shocks (Gehringer, 2023; Arriola *et al*., 2024).

sourced from Asia, whose share of risky imports in Africa has nearly tripled over the past three decades. China is currently the main source of Africa's risky imports, while the Republic of Korea's, India's, the UAE's and Turkey's roles in supplying these products have soared in the past decade. Risky import products have a lower import survival rate than non-risky products, and most industries that rely on them are in the automotive sector. Further analysis reveals that risky goods face more tariff and non-tariff barriers than non-risky goods; they were negatively affected by the 2008/2009 global financial crisis and the COVID-19 pandemic; and they adversely affect Africa's macroeconomic fundamentals—GDP, GDP per capita, inflation, and exchange rate.

The rest of this paper is organized as follows: Section 2 reviews the literature, Section 3 describes the methodology, Section 4 presents the results, Section 5 presents additional analyses while Section 6 concludes the study by recommending policies to multilateral organizations and African governments.

2. Related Literature

This section discusses the findings of studies that identify potential bottleneck products through indices and cut-off points from trade concentration, substitutability, centrality, and complexity indicators[5].

Korniyenko, Pinat and Dew (2017) identify products that are vulnerable to supply shocks in the world based on three characteristics: the presence of central players, the tendency to cluster, and international substitutability. This methodology is applied to 5,224 products from 223 countries and self-governed territories for the period 2003-2014. A total of 421 products, or 8% of all products, are identified as risky, having appeared across all the years. They mainly belong to machinery, mechanical appliances, transportation equipment, pharmaceuticals, rubber articles, and precision instruments. The study also finds that all countries import potential bottlenecks, with the leading importers of these products in 2014 being: Chad (43.4%), the Republic of Congo (39.4%), Gabon (38.9%), Equatorial Guinea (37.8%), Turkmenistan (37.6%), Mexico (37%), Hungary (36.2%), Romania (34.2%), Slovakia (34%), the Czech Republic (33.9%), Canada (31.5%), Germany (30.8%), and Austria (30.7%). The G8 countries export 59.7% of potential bottlenecks, with the US (13.1%), Germany (13%), Japan (8.6%), and China (7.9%) all leading at the country

[5] We mainly discuss the empirical literature but a discussion of the theoretical literature - resource dependence theory and transaction cost theory – can be found in Zhang, Gu and Zhang (2025).

level. The methodology was robust when tested on the 2011 Japanese earthquake and nuclear disaster and the 2011 Thailand floods.

Reiter and Stehrer (2023) build on the methodology by Korniyenko *et al*. (2017) by constructing a product riskiness index from five components: the outdegree centrality, the tendency to cluster, international substitutability, the Hirschmann-Herfindahl index (HHI) and accounting for non-tariff measures. The authors identify 435 out of 4706 products as risky (9%). Two-thirds of risky products are classified as intermediate such as machinery, mechanical appliances, and electrical machinery and equipment. A third of risky products are final or consumption goods like plastic articles. The share of risky products in world import values is about 26% and 30-32% in EU-27. At country-level, with a focus on European members, the authors find that 35-40% of imports in Czechia, Hungary, Slovakia, Germany, and Austria in 2018 were in risky products. Cyprus and Malta had the least share of imports of risky products (less than 20%). China, Japan, South Korea, the United Kingdom, and the US are the main sources of risky products.

Seong *et al*. (2022) identify concentrated products in the world from a list of 6,000 globally traded products in 2019 using the HHI cutoff point of 3.170. Accordingly, a concentrated product is one whose global supply is accounted for by around three countries. The authors find that potential bottlenecks originate from all sectors and regions of the world and account for less than 10% of the value of global trade. Furthermore, global concentration hotspots exist: around 60% of the total value of concentrated products in each of the textiles and electronics sectors is by China; Asia–Pacific and Latin America are responsible for most of the concentrated minerals; the Americas account for the largest share of concentrated agricultural products while most of the concentrated medical and pharmaceutical products are from Europe.

White *et al*. (2023) study the concentration (global and economy-specific) of trade by setting the HHI benchmark at 3.000 for 6,000 products in 2021. A product is globally concentrated if it has few supplying economies, on which most importers rely, and economy-specific concentrated if it has many suppliers but each importer relies on only a few. Results reveal that the global concentration rate is 15% in terms of trade value, corresponding to cases where the importing economy relies on two or fewer suppliers. Soybeans, palm oil, iron ore, chromium, nickel and rare earths are examples of products in which trade is heavily concentrated. The economy-specific concentration is 40%, such that a country deliberately sources a particular product from at most

three suppliers, irrespective of the product having several suppliers. Memory chips, vaccines, natural gas, airplanes and diamonds are such products.

The European Commission (2021) identifies products which the EU is heavily dependent on from four components: concentration (HHI greater than 0.4), the importance of extra EU imports in total EU imports (ratio of extra EU import value to total EU import value being greater than 0.5), substitutability of extra EU imports with EU production (ratio of extra EU import value to total EU export value being greater than 1), and restriction to sensitive ecosystems such as aerospace and defense, electronics, energy-intensive industries, renewable energy, health, and digital industries. This criteria identifies 137 out of 5,000 products where the EU can be considered highly dependent on imports from other countries. These products account for about 6% of the EU's extra-import value of goods. Around 52% of these goods are from China. In terms of sectors, 57% of these products are intermediate, 16% are raw materials and 27% are final goods.

Vicard and Wibaux (2023) use the methodology of the European Commission (2021), except the criteria for sensitive ecosystems, to identify product dependencies of EU-27 countries between 1996 and 2019. The authors find that the number of dependent products varies over time, from 300 to 420 products. Dependent products are mainly pharmaceuticals, chemicals and electronics. China has been the main source of dependent products in the EU and it has accounted for nearly half of EU's dependent products since 2010. Other source countries of the EU's dependent products are the US, UK, Indonesia, Morocco, the Philippines and India. Mejean and Rousseaux (2024) also map dependent products in the EU-27 countries by identifying products persistently tagged as dependent between 2015 and 2019. They identify 378 products (out of 5,381) using the criteria of the European Commission (2021). An additional 'absorption'[6] criterion reduces the number of dependent products to 228, mainly from the textile, construction, energy and mining, and health sectors. Finally, adding the stickiness criteria[7] identifies 49 products as dependent and they are concentrated within the energy, mining, basic metals and chemicals sectors.

Arjona, Connell, and Herghelegiu (2023) also modified the methodology by the European Commission (2021) in two ways. First, whereas they maintain the original approach – HHI>0.4, the ratio of extra EU import value to total EU import value>0.5, and the ratio of extra EU import

[6] Product markets for which at least 50% of European absorption (output plus imports less exports) is sourced from domestic firms.

[7] Here, ex-post substitution away from disrupted inputs is likely to be difficult.

value to total export value>1 – they identify dependent products over a four-year period. Second, they use data that captures re-exports so as to distinguish between products imported from a given location where the product is domestically produced and those destinations where the product goes in the form of transit. This approach identifies 564 products, which is reduced to 204 when the condition of strategic ecosystems is invoked. Products under the strategic ecosystems are crucial for security and safety, health, and the green and digital transitions. The products are mainly sourced from China (31%), the US (19%) and Russia (7%). The leading sectors of these commodities are Chemicals and allied industries, Mechanical Appliances and electrical equipment, Base metals and their articles, Mineral products, and Precision and medical instruments.

Lefebvre and Wibaux (2024) identify and compare the EU's trade dependencies to those of the major economies. Dependent products are identified from four criteria: i) the level of concentration of imports (HHI>0.4); ii) the level of concentration of world exports (HHI>0.4); iii) the substitutability of exports by domestic supply (ratio of imports over exports>1); and iv) the long-lasting dimension of dependencies (products for which all three criteria hold for at least two years in a three-year window). They found that 107 out of 200 countries imported more than half of their dependent products from one country in 2022. The EU had 122 (4.9% of total import share) dependent products in 2022, while China, the US and Japan had 47 (10.5% of total import share), 117 (11.2% of total import share), and 132 (10.3% of total import share) products respectively in 2022. China is the primary source of dependent products, mainly in four sectors: chemicals, electronics, pharmaceuticals and the steel industry. Guinea and Sharma (2022) identify dependent products in the EU using the criteria that the HHI is at least 0.25 and imports from outside the EU must be equal to or higher than 75% of EU total imports and extra-EU exports. The study identifies 233 out of 9,000 products as dependent and they are mainly sourced from China, the US and Russia. Their key sectors are minerals and fuels, chemical and pharmaceuticals, and machinery and vehicles.

Arriola *et al*. (2024) identify the import dependency of the OECD and major non-OECD economies (MNOE) considering two characteristics: an HHI that is greater than 0.2 and if the share of imports of a product from a specific partner is at least 0.1%. They find that dependent commodities account for 4.9% of all active bilateral import links across the OECD and 4.6% across the MNOES, and, in terms of value, they account for respectively 42% and 45% of the total values of imports of these countries groups. China is the main source of dependent commodities.

Dependent products have also been identified at the country level. For instance, Jiang (2020) identifies products with limited supply in Canada. Vulnerable products are measured using the total number of suppliers and HHI on Canada's 2019 import data at Harmonised Sytem (HS) 10-digit level. Results reveal that 2,315 out of approximately 10,000 products were vulnerable to supply chain disruptions. Vulnerable products are mainly concentrated in the agri-food sector, chemicals and fertilizers, and metals and minerals. The main suppliers were the US, China, Germany, Italy and Mexico.

In an updated version of the study, Jiang (2021) identifies Canada's vulnerable products using the 2019 import data at HS 6-digit level. Dependency is measured from four indicators: the level of import diversification (limited number of import sources), the potential for substituting imports with domestic production (limited domestic production), the end-use category of a product (intermediate and capital goods), and the potential for alternative suppliers (limited number of global suppliers). The analysis identifies 500 out of 5,331 products as vulnerable Canadian imports. Close to 80% of these products are from the US. China, India, Germany, Italy, and Switzerland are other major suppliers. Canada's product vulnerability is mainly in Chemicals and Fertilizers, Metals and Mineral, and Wood and Paper.

Boileau and Sydor (2020) also base their research on Canada. The authors identify industries and stages of the supply chain that are likely to be vulnerable to disruptions. Vulnerability is measured from a supply and demand side. The suppy side identifies the reliance of industries on intermediate inputs and the extent to which those inputs of goods and services are sourced from abroad. The supply index is constructed from five components: reliance on intermediate inputs, imports of intermediate inputs, indirect imports, geographic concentration of imports (HHI), and the number of imported products on the "Imports of Limited Supply List". The demand side establishes the demand for each industry's output and its dependence on demand from the international market. The demand index is constructed from three components: reliance on exports, geographic concentration of exports (HHI), and reliance on indirect exports. The overall result is that Canadian manufacturing sectors are particularly vulnerable to global shocks as they rely on both foreign suppliers for inputs and foreign markets for sales. Furthermore, retail and other service industries may be less vulnerable to disruption because they rely more on domestic markets as well as domestic suppliers.

Bonneau and Nakaa (2020) study France's vulnerability to products from non-European countries using import data for 2018. Vulnerability is measured through the degree of concentration of non-EU-27 supplier countries in the product's imports (HHI>0.5) and the number of suppliers (centrality) of the product. This methodology identifies 121 out of 5,000 products as vulnerable. These products include chemicals and pharmaceuticals such as some antibiotics, metallurgical products including some rare-earth metals, and capital goods such as accumulators and some machine tools. China accounts for almost a quarter of these products followed by the US and Switzerland. Jaravel and Mejean (2021) also map France's vulnerable import products using firm-level customs data for 2017 at the HS-8-digit level. Vulnerability is measured through concentration (HHI>0.5), share of extra-EU imports and granularity of demand (if one French firm represents at least 90% of imports). The first two criteria identify 644 vulnerable products, including the granularity of demand condition shrinks them to 122 products out of 9,334 products. These products are highly concentrated in the chemicals sector, of which about a third are purchased from the US and 15% from China.

Baur and Flach (2022) track Germany's dependence on China based on three indicators: relevance to domestic production (3 most used intermediate goods in the five most important sectors of the economy), concentration (HHI > 0.33), and substitutability by domestic production (ratio imports/ exports > 1). They find that China accounts for 3% of Germany's critical imports while the share of the US and other EU members is 7% and 75%, respectively. Germany's highest dependencies on China are in the chemical, electrical equipment and transportation equipment sectors. Table 1 summarizes the studies mentioned above.

Chimits (2024) developed the MERICS Trade Dependency Database, which contains data about the import dependencies of every country since 2000[8]. The database uses conditions to identify dependent products out of 5,113 products: (i) has a significant trade deficit such that a country's imports of a commodity are twice as high as its exports, (ii) has a significant bilateral supplier as being a country that accounts for more than 30% of all the imports of a particular good, and (iii) a HHI of at least 0.25. Some key results are that China's trade dependencies have oscillated at around 10% of imports for two decades. The trade dependence of the US has risen from 11% in 2000 to 16% in 2022, while that of the EU has grown from 7% in 2000 to 12% in 2022. China's import dependency on the EU and the US has reduced, shifting to commodity-exporting countries like

[8] Refer to Zenglein (2020) for results on the EU using the MERICS database.

Australia, Brazil and Indonesia. Trade dependencies of the EU and US over the last 20 years have been driven mainly by imports from China. Chinese dependencies have shifted from secondary to primary products, specifically agricultural and food products, as trade dependencies of the US and EU have concentrated on machinery and electronic equipment. Garcia and Ho (2025) develop a product-level external vulnerability index, capturing a country's trade dependencies and trade competitive positions. China is found to be less vulnerable than the US and EU.

Table 1: Summary of literature review on measuring the vulnerability of products

Study	Country/region	Criteria for identifying bottlenecks	Key finding
Korniyenko *et al*. (2017)	World	Considers outdegree centrality; tendency to cluster; international substitutability (k-median procedure is used to identify products from the three conditions)	421 out of 5,224 products (2003–2014). Final goods and consumption goods are dropped from the list.
Reiter *et al*. (2023)	World	Considers outdegree centrality; tendency to cluster; international substitutability; HHI; Non-tariff measures (k-mean procedure is used to identify products from the five conditions)	435 out of 4706 products are potential bottlenecks (data from 1996 to 2019)
Seong *et al*. (2022)	World	HHI>0.317	Using 2019 data, all regions and sectors have concentrated products. Major global concentration hotspots are China for textiles and electronics sectors; Asia–Pacific and Latin America for minerals; Australia and Brazil for iron ore; Australia and Chile for lithium; the Americas for agricultural products; and Europe for medical and pharmaceutical products.
White *et al*. (2023)	World	HHI>0.300	Using 2021 data, global concentration is established at 15% and economy-specific concentrated at 40%. Iron ore, laptops and soybeans are examples of globally concentrated goods. Natural gas, vaccines, airplanes and maize (corn) are examples of economy-specific concentrated goods.
Lefebvre and Wibaux (2024)	World and select countries/ regions (EU, China, US and Japan)	At the product-level, consider: HHI>=0.4 for imports; HHI>=0.4 for exports; ratio of imports to exports>1; these criteria hold for at least two years in a three-year window	107 out of 200 countries imported more than half of their dependent products from one country in 2022. The EU, China, US and Japan had 122, 47, 117 and 132 dependent products respectively in 2022

European Commission (2021)	European Union	HHI>0.4; ratio of extra EU imports in total EU imports>0.5; substitutability of extra EU imports with EU production>1; falls in the sensitive ecosystem	137 out of 5,000 products are potential bottlenecks (for 10 years (2010-2019))
Arjona, Connell and Herghelegiu (2023)	European Union	HHI>0.4; ratio of extra EU imports in total EU imports>0.5; substitutability of extra EU imports with EU production>1; falls in the sensitive ecosystem; a product appears in a three out of four years	564 out of 5,400 products are potential bottlenecks (for 4 years (2017-2020)). 204 are categorised under strategic ecosystems
Vicard and Wibaux (2023)	European Union	HHI>0.4; ratio of extra EU imports in total EU imports>0.5; substitutability of extra EU imports with EU production>1	300 to 420 products are potential bottlenecks (1996-2019)
Mejean and Rousseaux (2024)	European Union	HHI>0.4, ratio of extra EU imports in total EU imports>0.5, substitutability of extra EU imports with EU production>1; 'absorption' criterion (output plus imports less exports>50%); stickiness criteria (ex-post substitution away from disrupted inputs is likely to be difficult)	378 products out of 5,381 are potential bottlenecks using the first three conditions. 228 are potential bottlenecks using the first four conditions and 49 are potential bottlenecks when all conditions are considered (2015-2019)
Boileau *et al*. (2020)	Canada	Industries and sectors at stages of the supply chain most vulnerable to disruption: Supply vulnerability index and demand vulnerability index	Industry-level analysis (data for 2016, 2017, and 2019). Manufacturing sectors are most vulnerable. Retail and other service industries are less vulnerable
Jiang (2020)	Canada	Number of existing suppliers (<4); HHI>0.81	2,315 out of 10,000 products at HS 10-digit level (2019 alone)
Jiang (2021)	Canada	Level of import diversification (limited number of import sources); substitutability (export value/import value<1); the end-use category of a product (intermediate and capital goods); and potential for alternative suppliers (limited number of global suppliers)	500 out of 5,331 products at HS 6-digit level (2019 alone)

Bonneau *et al*. (2020)	France	Share of extra-EU imports > 50%; HHI>0.5; centrality>2.5	121 out of 5,000 products (2018 data)
Jaravel and Mejean (2021)	France	HHI>0.5; source of imports (most being extra-EU imports); granularity of demand (one French firm represents at least 90% of imports)	644 out of 9,334 products using the first two criteria and 122 products when all conditions are considered (HS 8-digit data for 2017)
Chimits (2024)	China, US and EU	Considers (at product-level) if: imports are 2 times the exports; one supplier has >30% market share; HHI>=0.25; these conditions apply for two consecutive years	Analysis is based on 5,113 products from 2000-2022. 10%, 16% and 12% of China, US and EU imports were dependent in 2022

3. Methodology

This study uses annual Africa-partner-product import data between 1995 and 2022 from the BACI database (Gaulier and Zignago, 2010). This database has an advantage over data sets such as the United Nations (UN) Comtrade Database because it reconciles global trade flows and allows one to compare values of imports and exports of each country (Arjona, Connell and Herghelegiu, 2023)[9]. Products are classified at the 6-digit level HS classification, which is consistent with the 2017 HS revision to ensure consistency across years. The final record has approximately 5,384 manufactured products per year, with the number of exporters (Africa's partner countries) per year ranging from 210 to 226 countries for the study period. Africa's import product dependence is a function of five indicators as follows:

$$Import\ product\ depence = f(concentration, foreign\ demand, domestic\ substitution, market\ relevance, product\ elasticity\ of\ substitution) \quad \ldots\ldots 1$$

Concentration shows the skewness of the number of suppliers of a particular product in Africa (composite). The degree of market concentration for each product in a particular year is expressed as HHI, calculated as follows:

$$HHI_t^k = \sum_{j=1}^{N} S_{jt}^2 \quad \ldots\ldots 2$$

where k is a product imported by Africa from country j in year t. S_{jt}^2 is the share of imports from country j in the total imports of product k. The final HHI is the sum of the squared values of the market share of all countries that export a particular product to Africa. For instance, if 50% of imports of product i are from China, while Russia and Ukraine account for 25% in a specific year, $k's$ HHI is 0.375 (0.5^2+0.25^2+0.25^2). The HHI ranges from 0 to 1, with larger values indicating a high concentration of imports from a few supply countries. Ideally, a market is unconcentrated if the HHI is below 0.15, moderately concentrated if the HHI is between 0.15 and 0.25, and highly concentrated if the HHI is above 0.25 (U.S Department of Justice and the Federal Trade Commission, 2010; European Commission, 2021; Arriola *et al*., 2024). Following this analogy, we classify a product as dependent if its HHI value exceeds 0.25 in a specific year and African country.

[9] Nonetheless, it does not capture re-exports and re-imports which might artificially reduce (or increase) dependency levels of some products in our analysis (Arjona, Connell and Herghelegiu, 2023).

Foreign demand is the ratio of extra-African imports to total African imports. According to related studies (see Table 1), a threshold of 0.5 is used to identify products with high foreign demand. A product is potentially dependent if this ratio is over 0.5, meaning that more than half of it is sourced from outside Africa. Domestic substitution is the ratio of extra-African imports over total African exports. Again, following related studies, a product is considered highly dependent if this ratio is larger than 1. The criteria on foreign demand and domestic substitutability proxy for the existence of production capacities within Africa, as measured by intra-African trade flows and exports from Africa to the rest of the world. These criteria intend to identify vulnerabilities arising from heavy reliance on non-EU imports, highlighting the significance of Africa's production capacities as insurance against shocks affecting imported inputs.

Market relevance is the importance of a product in the African import trade by value[10]. A product is considered relevant if its import value is greater than 0.001% of the overall import value in a specific year. Lastly, the product elasticity of substitution shows the degree of substitutability between products exported by different countries into Africa. A potentially risky product has no or few substitutes that fuel dependence in the case of a crisis. We calculate product-level elasticity of substitution (EoS) scores for Africa following Fontagné, Guimbard, and Orefice (2022a; 2022b)[11] and merge them with our trade data and classify risky products as those with low elasticity of substitution. That is, it is a product whose EoS score is greater than the average EoS in a particular year[12].

This five-point approach has the advantage of data availability compared to the input-output method used in related studies such as Baldwin and Freeman (2022), Baldwin, Freeman, and Theodorakopoulos (2022) and Schwellnus *et al*. (2023). For instance, a recent supply-use database for Africa, compiled by Mensah and de Vries (2024), covers only 11 out of 54 countries on the continent and spans the period from 1990 to 2019. The current study covers a longer period and more countries. Network analysis – which has also been employed by Amador *et al*. (2018) and Nicita (2023) – might have a problem of aggregating data, which can mask vulnerabilities associated with producing and trading products (Arriola *et al*., 2024).

[10] To our knowledge, such an attempt has only been made by Caravella *et al*. (2024), who analyze the dependence of international Photovoltaic Supply Chain.

[11] Raw data and Stata Do-files for application can be found here: Trade Elasticity - Data in Brief - Mendeley Data.

[12] EoS values are negative, hence, values greater than the mean EoS indicate low substitutability.

The threshold of our five-point conditions are somewhat ad hoc but are generally informed by exemplary values of several sample products, such as semiconductors and rare earths[13], which have been identified as risky products by related studies (Korniyenko, Pinat, and Dew, 2017; Reiter and Stehrer, 2023). Table 2 presents the characteristics of rare earth elements, semiconductors, lithium, aluminum, nickel, palladium, soybeans, potash, sunflowers, and wheat imports for Africa in 2019. The second column displays the number of HS categories for each product, and the subsequent columns show their minimum and maximum trade values (in US$ million) and HHI scores. The minimum values of rare earth, semiconductor, lithium, aluminium, nickel and wheat are below the cutoff point of US$ 10.6 million (total import value for 2019 was US$ 1.06 trillion of which 0.001%=US$ 10.6 million), suggesting that not all met the condition of our methodology. However, all the maximum values exceed US$ 10.6 million, showing that this condition was met by at least one product in each category. The condition of HHI>0.25 was only fully filled by product categories under palladium and sunflower, with the minimum values of HHI. On the other hand, the maximum HHI values suggest that this condition was met by most product categories, except those under potash, whose maximum HHI values were less than 0.25.

Table 2: Characteristics of some dependent import products in Africa in 2019

Product	No. of categories	Import value (US$ million)		HHI	
		Minimum	Maximum	Minimum	Maximum
Rare earth	6	0.01	16.89	0.14	0.46
Semiconductor	13	7.52	1,003.61	0.09	0.62
Lithium	9	1.32	504.49	0.12	0.36
Aluminium	43	0.51	594.27	0.08	0.79
Nickel	30	0.01	504.49	0.08	1
Palladium	2	16.21	30.05	0.46	0.81
Soybean	7	12.86	1,777.98	0.09	0.6
Potash	1	14.09	14.09	0.17	0.17
Sunflower	2	357.16	593.46	0.25	0.26
Wheat	11	2.78	9,579.53	0.08	0.57

Notes: HHI is the Hirschman-Herfindahl index. Product categories were identified using the HS codes. The total import value in 2019 was US$ 1.06 trillion of which 0.001%=US$ 10.6 million.

Source: Author's calculations based on UN Comtrade data for 2019.

[13] Commodities that directly or indirectly use semiconductor chips account for two-thirds of all goods exports (Seong *et al*., 2022). China produces more than 80% of rare earth elements and holds over a half of rare earth elements global reserves (Proelss, Schweizer and Seiler, 2018).

4. Descriptive Results

This section describes dependent import productsin three ways. First, by describing their trade flows – volume, countries, and sectors – and then their dynamics – export survival – and source (supply industries) and usage (use industries).

4.1 Trade flows of dependent imports

Following the identification approach described in the methodology section, the number of potentially dependent products was counted out of roughly 5,384 products per year. Figure 2 shows that 656 products were classified as dependent in 1995. Then, the number of dependent products in Africa ranged between 463 and 635 from 1996 to 2008 and consistently increased after the 2008/2009 financial crisis, from 460 in 2009 to a peak of 748 in 2021. Therefore, the continent's vulnerability has worsened over time. As a fraction of all imported products in Africa, the results imply that between 9% and 14% of Africa's imported commodities are risky. Examples of risky products include soybean, wheat, rare earth, nickel, aluminum, lithium, and semiconductor-related goods, which have also been identified in related studies, such as Reiter and Stehrer (2023). A list of 100 of the 392 products that consistently featured as dependent imports in all five years between 2018 and 2022 is shown in Table A.1 in the Appendix.

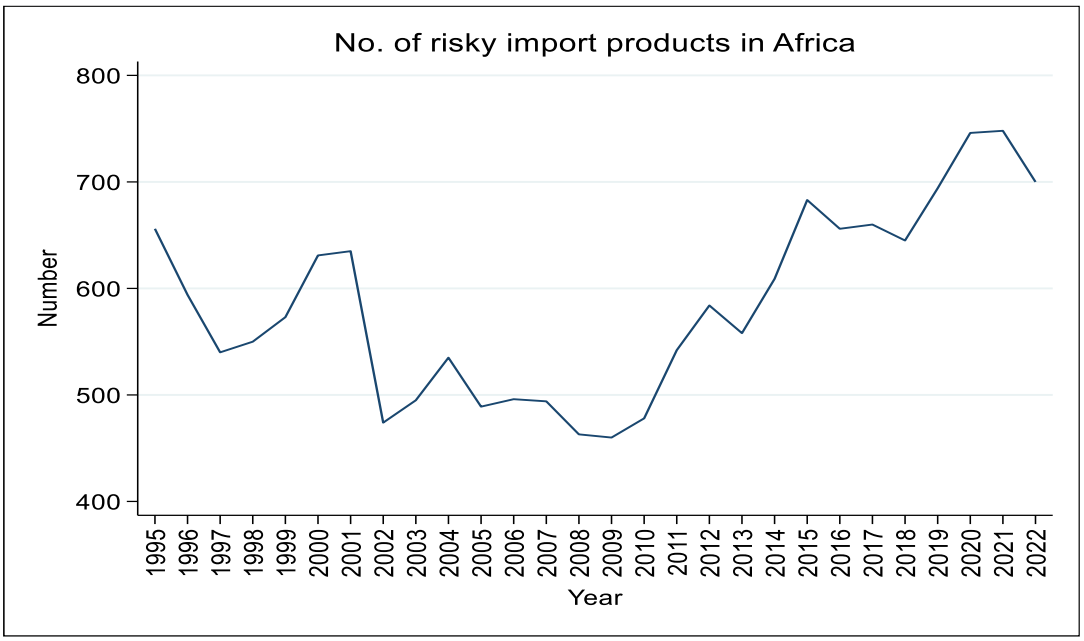


Figure 2: Trend of import-dependent products in Africa (1995-2022)

Source: Author's calculations based on UN Comtrade data for 2023.

Figure 3 plots the import value of risky imports and their respective shares (%) in the total import value in Africa from 1995 to 2022. The import value of dependent products was US$23 billion in 1995. It consistently dropped to US$19.8 billion in 1999 and then jumped to US$22 billion, US$20 billion and US$71 billion in 1998, 1999 and 2000, respectively. The surge was short-lived, as the value of imports of risky products dropped to US$52 billion in 2001 and US$23 billion in 2002. This was followed by a persistent rise to reach US$144 billion in 2022. Risky imports accounted for roughly 11% of Africa's import value in the 1990s and around 9% between 2000 and 2022. Therefore, nearly a tenth of the current African import value is from products originating from a few places.

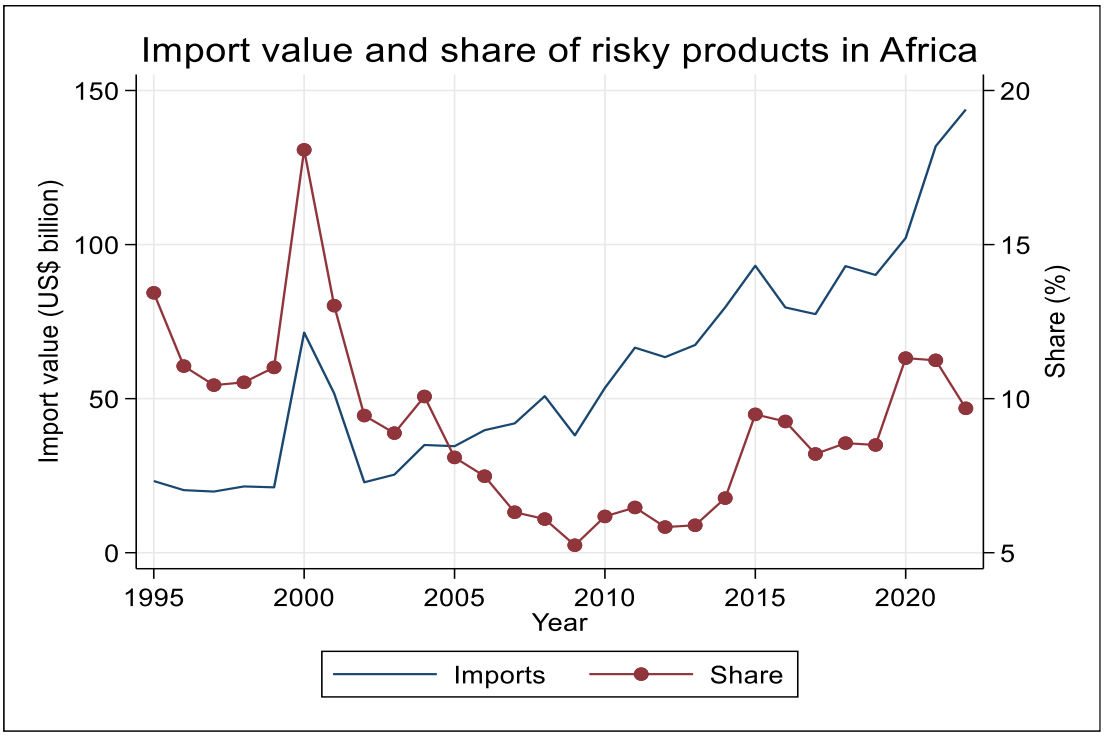


Figure 3: Import value and share of risky products in Africa (1995-2022)

Source: Author's calculations based on UN Comtrade data for 2023.

Figure 4 shows the share of dependent imports by value across regions. Europe was the leading source of Africa's potentially risky imports from the 1990s to the mid-2000s, accounting for between 37% and 63% of the value of Africa's risky imports during this period. Europe's dominance could have been due to its colonial relationship with Africa. However, the proportion of risky imports from Asia surpassed that from Europe in 2006. This was possibly caused by

China's export dominance after joining the WTO in 2001 (Onyango, Majune and Naluwooza, 2025). Asia's share of risky imports to Africa has nearly doubled over the past decade and a half, rising from 41% in 2006 to 71% in 2022. The share of risky imports from Europe has declined since Asia overtook it. The average share between 2006 and 2022 was 11% for the Americas and 25% for Europe. Africa's contribution to its risky imports has slightly increased over time, as the share of risky imports from the region rose from 3% in 1995 to approximately 5% in 2022. The Pacific has contributed the least to Africa's risky imports, as its share has stagnated at around 1.5% over the three decades.

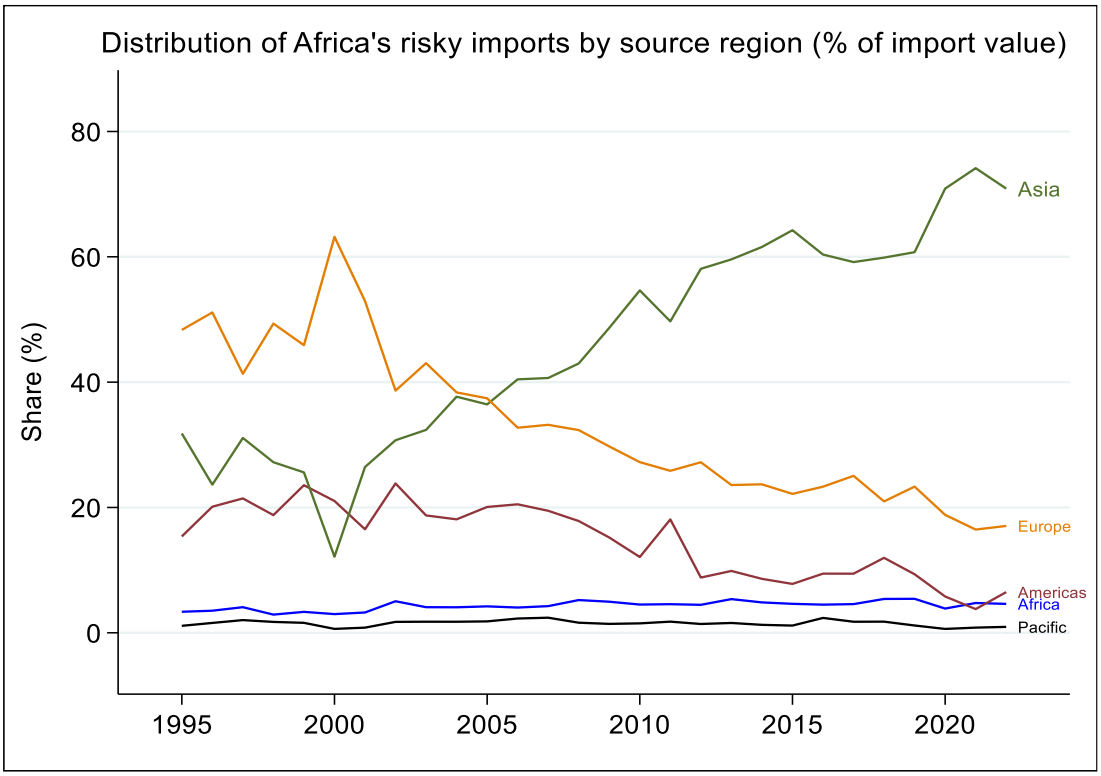


Figure 4: Share of imports of risky products by source region (1995-2022)

Source: Author's calculations based on UN Comtrade data for 2023.

Table 2 presents the share of top ten source countries of dependent import commodities in the overall import value of dependent products in Africa. Approximately 15% of Africa's dependent imports in 1995 originated from France, followed by Japan at 14% and the US at 12%. France and the US have consistently ranked among the top ten source countries of Africa's dependent imports, although their cumulative share has declined from around 24% in 2000 and 2005 to 7% in 2022.

Their loss of influence was overtaken by China, whose share in 1995 was 3% and steadily rose to 23% in 2010, 43% in 2015, and 47% in 2022. The influence of Italy, the UK, Spain and Germany on the top-ten list has also waned over time and could be the reason for the decline in the share of European imports in Figure 4. At the same time, the Republic of Korea has gained prominence on this list, as it has featured among the top ten since 2005. Other countries whose prominence in exporting dependent products to Africa has grown since 2010 are India, the United Arab Emirates (UAE) and Turkey. South Africa is the only African country that has featured in the list of the top ten source countries at some point in 2015. Africa's dependency on South Africa is mainly in transmission apparatus for radio-broadcasting or television, incorporating reception apparatus (HS 852560). On average, the top ten countries account for between 69% and 80% of the import value of risky products in Africa.

Table 3: Top-ten source countries of Africa's risky import products (1995-2022)

1995		**2000**		**2005**		**2010**		**2015**		**2022**	
Country	%	Country	%	Country	%	Country	%	Country	%	Country	%
France	14.6	Denmark	24.3	USA	13.2	China	22.7	China	43.2	China	47.4
Japan	13.9	USA	12.1	France	11.4	Saudi Arabia	9.7	France	5.4	UAE	5.0
USA	11.7	France	11.6	Korea, Rep.	11.3	Korea, Rep.	6.8	USA	5.2	Korea, Rep.	4.8
Germany	7.9	Argentina	8.3	China	9.9	France	6.3	Viet Nam	3.1	France	3.5
Italy	6.7	Germany	7.5	Germany	4.9	Brazil	5.2	India	2.6	India	3.0
Korea, Rep.	5.5	Spain	4.9	UK	4.0	USA	4.9	Germany	2.5	USA	2.9
UK	4.7	China	3.4	Brazil	3.9	Italy	4.4	Korea, Rep.	2.4	Turkey	2.7
China	3.1	Italy	3.4	Japan	3.7	India	3.8	UAE	2.3	Spain	2.1
Spain	2.5	UK	2.5	Italy	3.7	Germany	3.1	South Africa	2.2	Germany	2.0
Netherlands	2.4	Japan	2.4	Spain	3.1	Japan	2.6	Turkey	2.0	UK	1.9
Total	73.0	Total	80.3	Total	69.1	Total	69.7	Total	70.9	Total	75.5

Note: USA is the United States of America, UK is the United Kingdom and UAE is the United Arab Emirates.

Source: Author's calculations based on UN Comtrade data for 2023.

The proportion of dependent imports in Africa across sectors from 1995 to 2022, in terms of value, is shown in Figure 5. Machinery and electronics account for the highest share of Africa's import value of dependent products. Their share has more than doubled, from 12% in 1995 to 37% in

2022. The top three machinery and electronic products in the category of risky products in 2022 were Telephones for cellular networks "mobile telephones" or for other wireless networks (HS 851712); Transmission apparatus for radio-broadcasting or television, incorporating reception apparatus (HS 852560); and Reception apparatus for television, colour, whether or not incorporating radio-broadcast receivers or sound or video recording or reproducing apparatus, designed to incorporate a video display or screen (HS 852872) whose cumulative share in the total import value of risky products was 17.3%. Transportation equipment, with a 41% share, was the sector with the highest proportion of risky products (in terms of import value) in Africa in 1995. The share of transport equipment in Africa's import value of risky goods peaked at 36% in 2006 before it plateaued to 17% in 2007 and 10% in 2022. Other sectors with notable shares of imports in Africa's risky imports include textiles and clothing, vegetables, metals, and chemicals, whose average shares from 1995 to 2022 were 15%, 8.7%, 8.6%, and 7.3%, respectively. The presence of vegetables on this list may be the reason the continent faced an acute shortage of wheat and sunflowers at the onset of the Russia-Ukraine War (WTO, 2023).

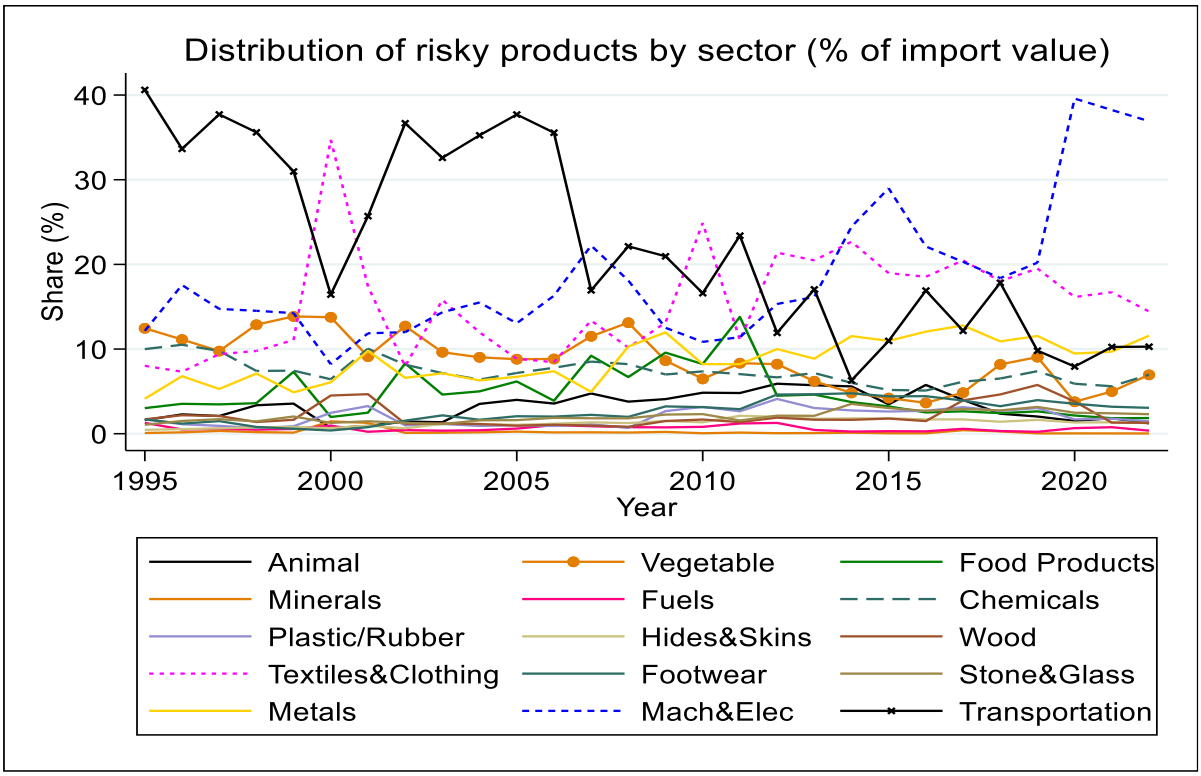


Figure 5: Share of import value of risky imports in Africa by sector (1995-2022)

Source: Author's calculations based on UN Comtrade data for 2023.

Table 4 shows the mapping of Africa's dependent imports by Broad Economic Category (BEC) Revision 5 (United Nations, 2016). Intermediate commodities form the bulk of Africa's risky imports, accounting for between 38.8% and 43.7% of the share of total risky imports between the 1995-1999 period and 2020-2022 period. This category is followed by consumption, whose share of the total import value of risky commodities ranged from 22.3% to 36.6% between the 1995-1999 period and 2020-2022 period. This finding concurs with related studies indicating that risky products fall largely into the categories of consumption and intermediate goods (Korniyenko, Pinat and Dew, 2017; Boileau and Sydor, 2020; European Commission, 2021). Furthermore, the presence of intermediate goods in the category of risky products reflects the growing role of GVC trade in spearheading Africa's product dependence and vulnerability. Capital goods account for the least share of Africa's risky imports. Their share has declined from 38.9% in the 1995-199 period to 22% in the 2020-2022 period.

Table 4: Share of import value of risky imports in Africa by BEC category (5-year average, 1995-2022)

BEC category	1995-99	2000-04	2005-09	2010-14	2015-19	2020-22
Intermediate	38.8%	43.6%	40.8%	41.0%	43.6%	43.7%
Consumption	22.3%	23.8%	29.6%	36.6%	35.0%	34.3%
Capital	38.9%	32.6%	29.6%	22.4%	21.4%	22.0%

Note: BEC categories are based on United Nations (2016)

Source: Author's calculations based on UN Comtrade data for 2023.

4.2 Import survival of potentially risky and non-risky products

Trade survival is the period in which a product is consistently imported or exported to a particular market (Besedeš and Prusa, 2011). The concept of survival in the literature on international trade sprung up in the mid-2000s with the works of Besedeš and Prusa (2006a; 2006b) and Sabuhoro, Larue, and Gervais (2006). These and subsequent studies show that trade relationships are short-lived. For instance, Besedeš and Prusa (2006a) find that transient relationships are far more common, with the median import survival in USA being between 2 two 4 years. Between 39% and 52% of novel export relationships from Kenya die within the first year of trading, while 90% fail by the 13th year (Türkcan, Majune and Moyi, 2022). Stability in trade relationships directly

deepens trade relationships and boosts economic growth (Besedeš and Prusa, 2011). Hence, we assess the survival of risky imports.

Figure 6 displays the Kaplan–Meier (Kaplan and Meier, 1958) plot showing the survival of imports of potentially risky and non-risky products over the study period at the product-country-year level. Non-potentially risky imported products have a higher import survival rate than potentially risky products. Nearly half of non-potentially risky import products survive beyond the first year of trading in an African market, compared to 41% for risky import products. The survival rates of non-potentially risky products were 14% and 8% for potentially risky products in the 10th year. The gap in the survival rate between non-potentially and potentially risky products widens over time; it is 9% for non-potential and 4% for potential products in the 28th year. This reiterates the vulnerability associated with potentially risky import products as they are more prone to exit markets when faced with shocks.

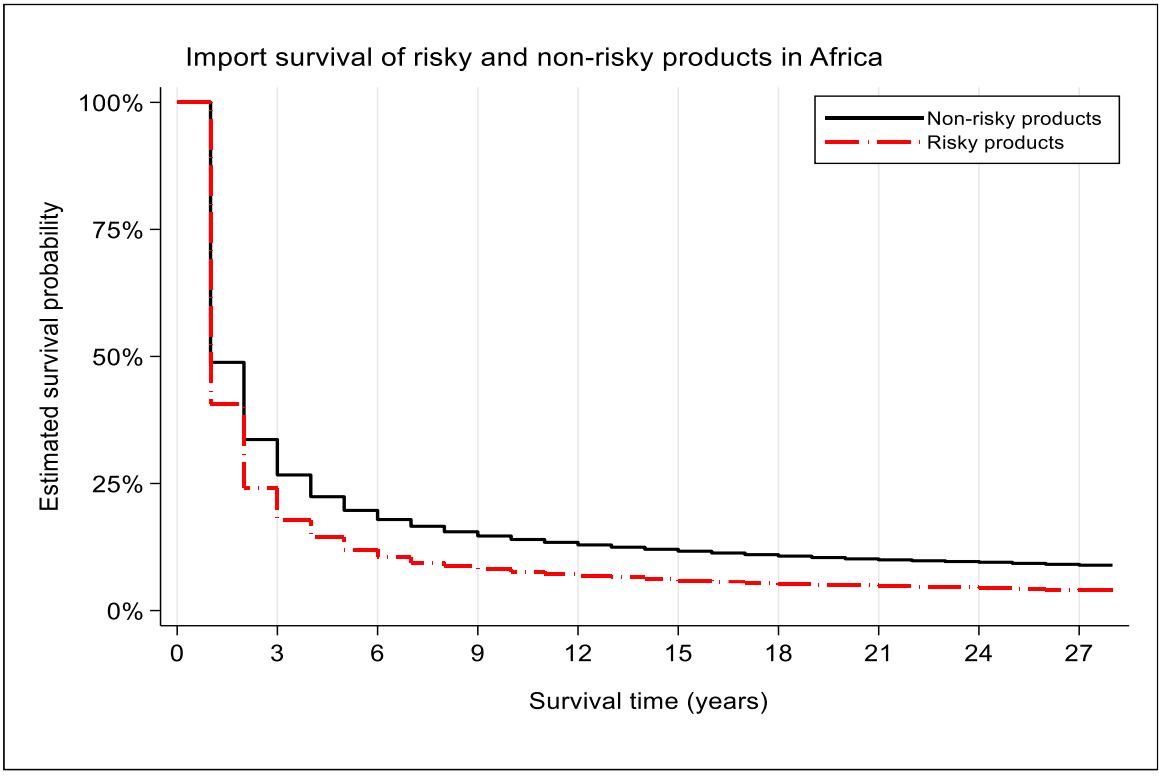


Figure 6: Import survival of potentially risky and non-potentially risky products (1995-2022)

Source: Author's calculations based on UN Comtrade data for 2023.

4.3 Supply and usage industries of potentially risky import products

This section identifies the supply and use industries of potentially risky imported products. This is done by matching the 392 products that were identified as potentially risky imports in Africa between 2018 and 2022 (these products consistently appeared on the list of potentially risky products for all five years) with the input-output (I-O) table in a three-step procedure. Given the difficulty of finding an I-O table for all countries in the world[14], 392 products are mapped to supply industries and use industries from the Bureau of Economic Analysis (BEA) I-O accounts. The I-O database contains detailed use-table data on a supply use framework for 2007 and 2012[15]. Using the 2012 version of the database, we first calculated the share of supply/usage in the total industry output for each supply use matrix. Next, the industries were converted into an HS-6 digit-level classification. Industries were initially defined according to the 2012 North American Industry Classification System (NAICS). Given that there is no direct correspondence between NAICS and HS, these industries were first converted to the fourth revision of the International Standard Industrial Classification (ISIC). Then, they were converted to the Central Product Classification (CPC) version 2.1 and later into the HS 2017 version[16]. The industries are then matched with the list of potential bottleneck products using the HS code. Lastly, the shares were aggregated using industries to identify the level of usage or supply of potential bottlenecks.

Table 5 shows Africa's top-15 upstream and downstream industries of risky import products. The first column shows the position in descending order, the second is the name of the upstream industry based on NAICS (2012), and the third column provides more details on the upstream sectors (identified through a Google search of supply industries). The names of the top-15 downstream industries (based on NAICS 2012) and their respective sectors (identified through a Google search of use-industries) are shown in the fourth and fifth columns, respectively.

Furniture manufacturing and electronics are prominently featured among the sectors that produce the most products in industries that are prone to be risky. Nonferrous Metal, mining, and overall manufacturing also catalyze the production of Africa's risky products. Nearly half of the top 15 downstream sectors that rely on Africa's risky products are in the automotive sector. This ranges from motor vehicle electrical to electronic equipment manufacturing and fabricated metal

[14] For instance, the world I-O database by Timmer *et al.* (2015) only covers 43 countries and 56 sectors. A recent supply-use database for Africa, compiled by Mensah and de Vries (2024), covers only 11 out of 54 countries.

[15] Refer to https://www.bea.gov/industry/input-output-accounts-data for data.

[16] Conversion tables can be found here: https://unstats.un.org/unsd/classifications/Econ.

manufacturing. The transport sector is also susceptible to global shocks, given that aircraft manufacturing and shipbuilding appear among the top 15 downstream industries that use risky commodities. Other sectors likely to be affected by risky products are defense, food and beverage, and construction.

Table 5: Top-15 supply-industries and use-industries of potentially risky imports in Africa

No.	Upstream industry	Upstream sector	Downstream industry	Downstream sector
1	Upholstered household furniture manufacturing	Furniture manufacturing	Military armored vehicle, tank, and tank component manufacturing	Defense
2	Nonupholstered wood household furniture manufacturing	Furniture manufacturing	Other fabricated metal manufacturing	Construction, automotive
3	Household refrigerator and home freezer manufacturing	Manufacturing	Manufacturing and reproducing magnetic and optical media	Machinery and electrical equipment
4	Power, distribution, and specialty transformer manufacturing	Electronics and Electrical Equipment	Aircraft manufacturing	Transport
5	Scrap	Electronics, metal, construction, plastic, textile, automotive	Motor vehicle seating and interior trim manufacturing	Automotive
6	Sawmills and wood preservation	Furniture manufacturing	Ship building and repairing	Transport
7	Household cooking appliance manufacturing	Electronics and Electrical Equipment	Air and gas compressor manufacturing	Automotive, health, oli & gas, manufactuirng
8	Special tool, die, jig, and fixture manufacturing	Manufacturing	Speed changer, industrial high-speed drive, and gear manufacturing	Automotive, energy
9	Abrasive product manufacturing	Nonmetallic Mineral Product Manufacturing	Motor vehicle electrical and electronic equipment manufacturing	Automotive
10	Other nonmetallic mineral mining and quarrying	Mining, quarrying	Millwork	Construction
11	Mineral wool manufacturing	Mineral Wool Manufacturing	Material handling equipment manufacturing	Automotive
12	Mechanical power transmission equipment manufacturing	Mechanical power transmission	Pump and pumping equipment manufacturing	Agriculture, water, oil & gas, mining

13	Textile and fabric finishing and fabric coating mills	Textile and Clothing	Packaging machinery manufacturing	Food & Beverage; Pharmaceutical; Cosmetics
14	All other transportation equipment manufacturing	Manufacturing	Mechanical power transmission equipment manufacturing	Automotive
15	Nonferrous Metal (except Aluminum) Smelting and Refining	Mining	Other engine equipment manufacturing	Transport

Source: Authors' compilation based on UN Comtrade data, BEA data, and Google.

5. Additional Analyses

This section presents additional analyses. First, we test the sensitivity of our methodology to different specifications. Second, we analyze the effect of major crises – the 2008/2009 global financial crisis (GFC) and the COVID-19 pandemic - on risky imports. Third, we assess the effects of trade barriers (non-tariff measures (NTMs) and tariffs) on risky imports in Africa. Fourth, we analyze the impact of risky imports on Africa's macroeconomic fundamentals—GDP, GDP per capita, inflation, and exchange rate.

5.1 Sensitivity Analysis

Three sets of sensitivity analyses are conducted to check the reaction of the number of dependent products to changes in cut-off conditions. First, we check how our condition in section 3 reacts to different criteria. The first bar of Figure 7 shows that the average number of dependent products between 1995 and 2022 was 1,130 when the conditions of concentration (HHI), foreign demand, and domestic substitution were considered. This represents approximately 21% of the average number of products imported into Africa between 1995 and 2022. The second bar introduces the condition of market relevance to these three conditions. That is, we also consider whether the import value of a product is greater than 0.001% of the overall import value in a specific year. We find that the average number of dependent products between 1995 and 2022 was 772, equivalent to 14% of the number of products imported during that period. Alternatively, the condition of elasticity of substitution is also added to the three original conditions – HHI, foreign demand, and domestic substitution - in the third bar. On average, 904 products were considered dependent under this condition between 1995 and 2022. This is equivalent to 17% of the products imported during that period. Overall, these conditions tend to overestimate the number of dependent products, which, according to related studies in Table 1, range between 121 and 644.

Therefore, we adopted the result in line with our methodology - concentration, foreign demand, domestic substitution, market relevance and elasticity of substitution - of which the fourth bar of Figure 6 shows that, on average, 585 products were considered dependent between 1995 and 2022. The second segment of Figure 6 checks how the number of products reacts to different samples of time periods when our methodology is considered. The first bar shows that 36 products consistently featured as dependent imports for the entire period of our study (1995-2022). The second bar indicates that 392 products consistently appeared as dependent year-after-year between

2018 and 2022. This is equivalent to 7% of the average number of products imported into Africa in that period. The number of products under this condition (392) falls within the range of products identified by related studies.

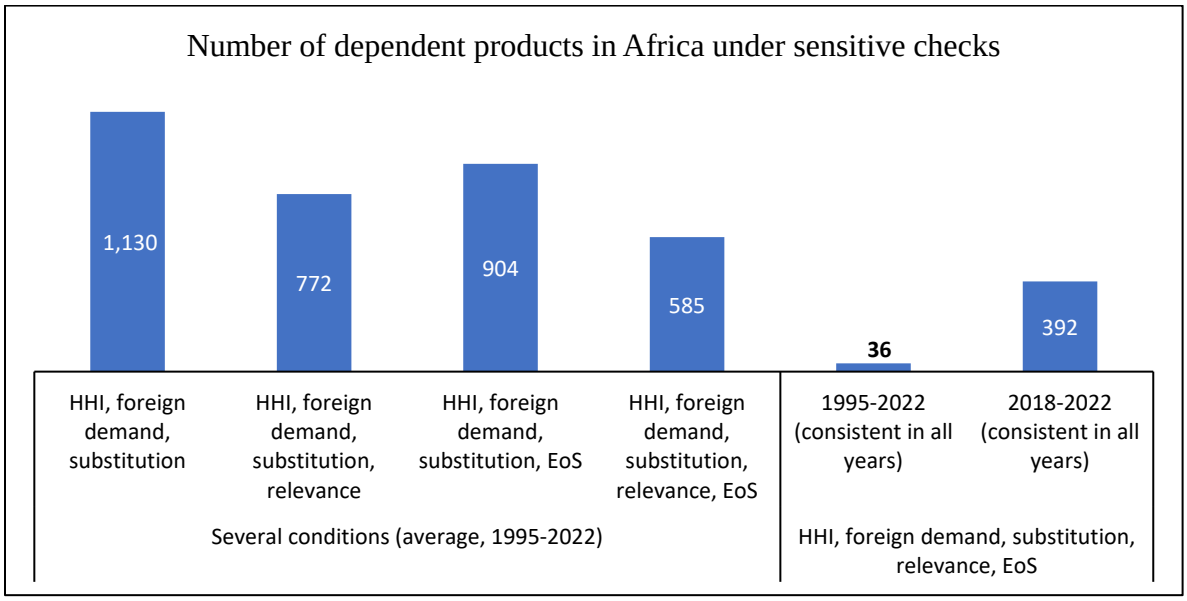


Figure 7: Number of dependent products in Africa (1995-2022) under sensitivity checks

Source: Author's calculations based on UN Comtrade data for 2023.

5.2 A case study of the impact of the 2008/2009 global financial crisis and COVID-19 on risky imports in Africa

This section analyses the effect of major crises – the 2008/2009 GFC and the COVID-19 pandemic - on risky imports using the following model:

$$Imports_{ijkt} = \alpha + \beta * Risky_{kt} + \lambda * Crisis_t + \delta * Risky_{kt} * Crisis_t + \varphi_i + \varphi_j + \varphi_k + \varepsilon_{ijkt} \quad \ldots\ldots 3$$

where $Imports_{ijkt}$ is the natural logarithm of the value of import of commodity k in year t from country i to an African country j[17]. $Risky_{kt}$ is a dummy variable indicating whether a product was risky in a year or not using the criteria in section 3. $Crisis_t$ is a dummy variable categorized into three – whether a year is 2009 and 2020 and whether these years are separate, indicating the

[17] An arbitrary value of 1 is added to the import value before the transformation.

GFC and COVID-19 crises. We control for product (φ_k), source-country (φ_i) and importer (φ_j) fixed effects and cluster standard errors at the product-source country-importer level (ε_{ijkt}). The coefficient of the interaction term between risky products and the crisis in Table 6 indicates a negative and significant effect of risky products on Africa's imports during both crises. The first model shows that relative to non-risky imports, risky imports were 0.091 percentage points less during both crises. This confirms our assumption that risky products are more susceptible to shocks than non-risky products. Models 2 and 3 reveal that Africa's risky imports declined by 0.042 and 0.047 percentage points during the GFC and COVID-19 pandemic, respectively, compared to non-risky imports. Given that the magnitude of the coefficient is slightly larger under COVID-19 than GFC, we affirm the results of studies such as Majune and Türkcan (2025), which show that African imports were more adversely affected during the pandemic than during the financial crisis.

Table 6: The effect of crises on risky imports in Africa

	(1)	(2)	(3)
	GFC&COVID-19	**GFC**	**COVID-19**
Risky products	-0.035***	-0.042***	-0.034***
	(0.002)	(0.002)	(0.002)
Crisis	-0.044***	0.074***	-0.160***
	(0.001)	(0.002)	(0.002)
Risky products*crisis	-0.091***	-0.042***	-0.047***
	(0.004)	(0.007)	(0.005)
Constant	8.650***	8.643***	8.653***
	(0.001)	(0.001)	(0.001)
Exporter, Importer, Product fixed effects	Yes	Yes	Yes
Observations	33,284,217	33,284,217	33,284,217
R-Squared	0.267	0.267	0.267

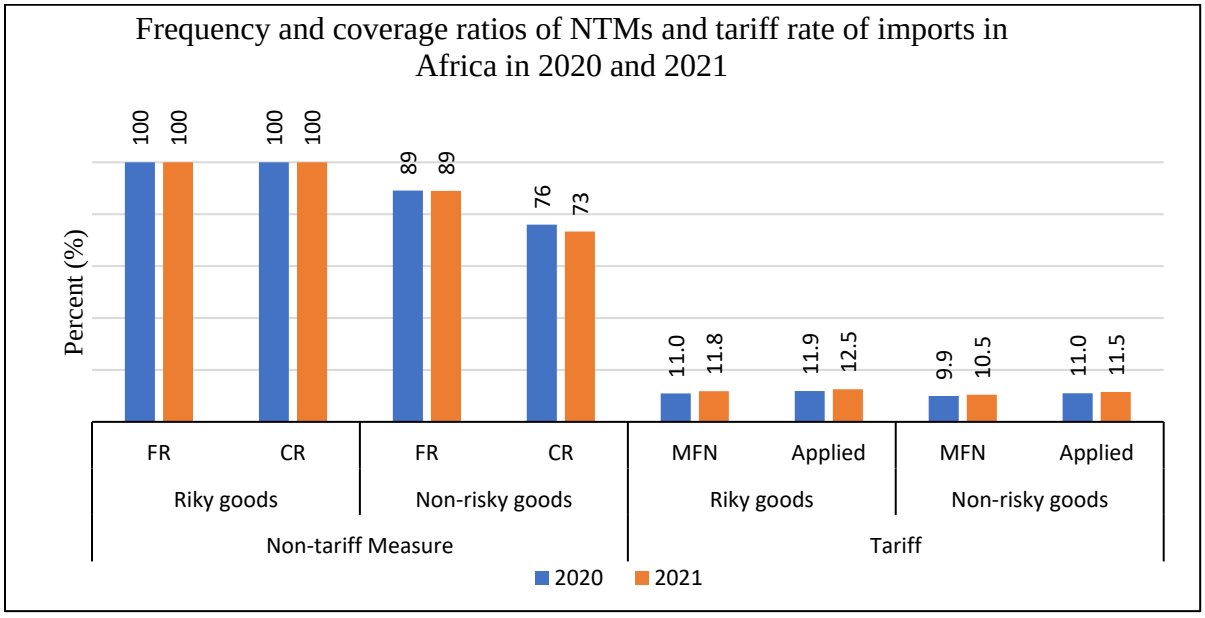
Note: Standard errors, clustered at the product-source country level, are reported in parentheses. *, **, and *** indicate statistical significance at the 10%, 5%, and 1% levels, respectively.

5.3 Assessing barriers to Africa's risky import goods

This section assesses the trade barriers to risky imports by considering non-tariff measures (NTMs) and tariffs applied by African countries on imports in 2020 and 2021. NTMs are divided into frequency and coverage ratios, with the former showing the share of products that were exposed to at least one NTM, while the latter indicates the share of import value that was subject to NTMs.

We also consider the Most Favoured Nation (MFN) and applied tariffs, showing the effect of tariff and non-tariff barriers on risky goods. Data for NTMs and tariffs is from the UNCTAD TRAINS Database (https://trainsonline.unctad.org/bulkDataDownload) and it is merged with our list of risky goods (used in section 4) and their import data to calculate the ratios.

Figure 8 shows that risky goods were more exposed to NTMs than non-risky goods in 2020 and 2021[18]. Indeed, all risky goods were subject to at least one NTM, compared to a frequency ratio of 89% and a coverage ratio of around 75% for non-risky goods in the two years. Some of the NTMs that were applied to risky goods with high frequency and coverage ratios during the two years were: technical barriers to trade (TBT); pre-shipment inspections and other formalities; non-automatic licensing, quotas, prohibitions and quantity-control measures; price-control measures, including additional taxes and charges; and sanitary and phytosanitary (SPS) measures. The level of tariffs applied to risky goods is higher than that of non-risky goods, suggesting that risky goods are more exposed to trade barriers in Africa.



Note: FR is frequency ratio, CR is coverage ratio and MFN is Most Favoured Nation

Figure 8: Frequency and coverage ratios of NTMs and tariff rate of risky and non-risky imports in Africa in 2020 and 2021

[18] Here, the coverage and frequency ratios are calculated separately for risky and non-risky goods.

5.4 Assessing the effect of risky imports on Africa's key macroeconomic indicators

Africa's macroeconomic fundamentals—Gross Domestic Product (GDP), GDP per capita, inflation, and exchange rate—are known to be affected by global shocks, as evidenced by the GFC (Allen and Giovannetti, 2011; Aryeetey and Ackah, 2011), COVID-19 pandemic (Zeufack *et al*., 2020; Anyanwu and Salami, 2021) and most recently, the Russia-Ukraine war (Raga *et al*., 2024; Anyanwu and Salami, 2025). For this reason, we test the effect of risky imports on Africa's GDP, GDP per capita, inflation, and exchange rate in line with Equation 4:

$$Y_{jkt}^{m} = \alpha + \beta * Risky_{kt} + \lambda * Imports_{jkt} + \delta * Risky_{kt} * Imports_{jkt} + \varphi_j + \varphi_k + \varphi_t + \varepsilon_{jkt} \quad \text{..... 4}$$

Where Y_{jkt}^{m} is an indicator m (natural log of GDP (current US$), GDP per capita (current US$), official exchange rate and inflation (GDP deflator)) in an African country j in product k and time t (1995-2022). $Risky_{kt}$ is a dummy variable indicating whether a product was risky in a year or not using the criteria in section 3. $Imports_{jkt}$ is the natural log of the value of imports (an arbitrary value of 1 is added to the import value before the transformation). We control for product (φ_k), African country (φ_j) and time (φ_t) fixed effects and cluster standard errors at the product-African country level (ε_{jkt}).

Table 7 indicates that a one-unit increase in the value of risky imports reduces GDP and GDP per capita by 0.001%. This suggests that Africa's GDP shrinks when risky goods increase, possibly because they directly affect production and have limited domestic substitutes. A one-unit increase in the value of risky imports raises Africa's inflation by 0.165%, possibly because of the surge in the price of inputs, low level of competition or price spikes in global markets that transcend into African economies. We also find that a one-unit increase in the value of risky imports depreciates the exchange rate of African economies by 0.003%.

Table 7: Effects of risky imports on Africa's GDP, GDP per capita, exchange rate and inflation

	(1)	(2)	(3)	(4)
Dependent variable	**GDP**	**GDP per capita**	**Inflation**	**Exchange rate**
Import value	0.010***	0.008***	-1.746***	-0.002***

	(0.000)	(0.000)	(0.045)	(0.000)
Risky	0.010***	0.002	-1.789*	-0.044***
	(0.002)	(0.002)	(0.959)	(0.008)
Risky*Import value	-0.001***	-0.001***	0.165**	0.003***
	(0.000)	(0.000)	(0.082)	(0.001)
Constant	23.024***	7.010***	36.836***	4.288***
	(0.001)	(0.001)	(0.507)	(0.004)
Year, Product, Country fixed effects	Yes	Yes	Yes	Yes
Observations	4538589	4538589	4495260	4494181
R-Squared	0.974	0.951	0.107	0.841

Note: Standard errors, clustered at the product-source country level, are reported in parentheses.

*, **, and *** indicate statistical significance at the 10%, 5%, and 1% levels, respectively.

6. Conclusion

This study tracks Africa's excessive reliance on imported products based on five criteria: market concentration, foreign demand, capacity for domestic substitution, market relevance and product elasticity of substitution. Dependent products are susceptible to shocks such as COVID-19, making Africa heavily reliant on them and their sellers. Using Africa-partner-product import data for 5,384 products between 1995 and 2022, we find that roughly 10% of products imported into Africa by value and volume are dependent. Africa's risky imports are primarily machines and electronics, transportation equipment, metals, and textiles and clothing. Risky imports are used as intermediate goods, implying that they are crucial to Africa's GVC trade. These products are mainly sourced from Asia, whose share of risky imports in Africa has nearly tripled over the past three decades. China is currently the main source of Africa's risky imports, while the Republic of Korea's, India's, the UAE's and Turkey's roles in supplying these products have soared in the past decade. We also find that risky import products have a lower import survival rate than non-potentially risky products, and the automotive, transport, defense, food and beverage, and construction are the sectors that are most dependent on risky imports.

Further analyses reveal that Africa's risky imports face more tariff and non-tariff barriers than non-risky goods. Some of the leading non-tariff measures are technical barriers to trade and sanitary and phytosanitary measures. Regression analysis confirms that risky goods were negatively affected by the 2008-2009 global financial crisis and the COVID-19 pandemic. Regression results also show that risky imports adversely affect Africa's macroeconomic fundamentals—GDP, GDP per capita, inflation, and exchange rate.

Addressing Africa's vulnerabilities from risky import products requires a multifaceted approach at both multilateral and country levels. At the multilateral level, organizations such as the AfCFTA can collaborate to develop a standard definition and a list of products deemed risky for Africa. The list in Table A.1 of the Appendix can serve as a starting point. Multilateral organizations can prioritize expanding access to current data to conduct regular stress tests on dependent products across various regions and countries. Targeted support for producers of risky products and for countries more likely to face scarcity could be another approach, possibly through programs that enhance domestic production and promote market and product diversification. Additionally, multilateral organizations can extend and deepen critical areas affecting the production of dependent products, such as logistics services, ICT and digital trade, and export controls. They can also find ways to support and foster the development of regional agreements for countries vulnerable to dependent imports, such as the ongoing AfCFTA.

African countries can consider applying this study's methodology to identify risky imports. This will be crucial in contextualizing the dependencies. African governments can also provide targeted support to industries that are more likely to be affected by risky imports, yet they have a high chance of acquiring regional/world leadership in the near future. This could be done by reducing tariff and non-tariff barriers on risky commodities. For instance, China's industrial policies have contributed to an over 80 percent cost decline in the Solar Photovoltaics (PV) sector, making it the main player in the PV supply chain in the world in the last decade (International Energy Agency, 2022). Supporting research and development could be a viable path towards boosting innovation and capacity for local substitutes of risky goods. African countries can also pursue strong and diversified trade relationships and commercial partnerships with other countries to reduce internal dependencies. Lastly, regular stress testing of dependent import products to track their vulnerability is crucial. This also entails availing updated data to monitor these products.

Nonetheless, implementing the above proposals might face challenges ranging from logistics to tariff and non-tariff barriers (as shown in the study). Therefore, it might be important for African countries to invest in strengthening their regulatory frameworks by ensuring that laws and regulations governing import quality and safety are comprehensive, up-to-date, and aligned with international standards. Enhancing international cooperation to harmonize standards and facilitate coordinated responses to emerging risks might also be important. Countries can also adopt risk-based import control systems that prioritize inspections and testing based on the potential risk

associated with specific products or countries of origin. Lastly, countries can leverage on advanced technologies, such as artificial intelligence, data analytics, and blockchain, to enhance monitoring, compliance, and traceability in the import process. These technologies can help identify patterns of automated inspections and real-time data on the movement and quality of goods across borders.

Competing interests

The authors have no relevant financial or non-financial interests to disclose.

Funding

No funding was received for conducting this study.

References

Ahir, H., Bloom, N., & Furceri, D. (2022). *The world uncertainty index (Working Paper 29763).* Cambridge: National Bureau of Economic Research. Retrieved from https://www.aeaweb.org/conference/2023/program/paper/RkheFFTi

Allen, F., & Giovannetti, G. (2011). The effects of the financial crisis on Sub-Saharan Africa. *Review of Development Finance, 1*(1), 1-27. doi:10520/EJC89960

Amador, J., Cabral, S., Mastrandrea, R., & Ruzzenenti, F. (2018). Who's who in global value chains? A weighted network approach. *Open Economies Review, 29*, 1039-1059. doi:10.1007/s11079-018-9499-7

Anyanwu, J., & Salami, A. (2021). The impact of COVID-19 on African economies: An introduction. *African Development Review, 33*(1), S1-S16. doi:10.1111/1467-8268.12531

Anyanwu, J., & Salami, A. (2025). The Impact of Russia–Ukraine Conflict on African Economies: An Introduction. *African Development Review, 36*(S1), S1-S9. doi:10.1111/1467-8268.12791

Arjona, R., Connell, W., & Herghelegiu, C. (2023). *An enhanced methodology to monitor the EU's strategic dependencies and vulnerabilities (Working Paper No. 14).* Brussels: European Commission. Retrieved from https://ideas.repec.org/p/bda/wpsmep/wp2023-14.html

Arriola, C., Cai, M., Kowalski, P., Miroudot, S., & van Tongeren, F. (2024). *Towards demystifying trade dependencies: At what point do trade linkages become a concern? (Trade Policy Paper No. 280).* Paris: OECD. Retrieved from https://www.oecd.org/en/publications/towards-demystifying-trade-dependencies_2a1a2bb9-en.html

Aryeetey, E., & Ackah, C. (2011). The global financial crisis and African economies: Impact and transmission channels. *African Development Review, 23*(4), 407-420. doi:10.1111/j.1467-8268.2011.00295.x

Bacchetta, M., Bekkers, E., Piermartini, R., Rubinova, S., Stolzenburg, V., & Xu, A. (2024). COVID-19 and global value chains: A discussion of arguments on value chain organisation and the role of the WTO. *The World Economy*. doi:10.1111/twec.13603

Baldwin, R., & Freeman, R. (2022). Risks and global supply chains: What we know and what we need to know. *Annual Review of Economics, 14*, 153-180. doi:10.1146/annurev-economics-051420-113737

Baldwin, R., Freeman, R., & Theodorakopoulos, A. (2022). *Horses for Courses: Measuring Foreign Supply Chain Exposure (Working Paper No. 30525).* Cambridge: National Bureau of Economic Research.

Baur, A., & Flach, L. (2022). *German-Chinese Trade Relations: How Dependent is the German Economy on China? (Policy Report No. 38, Vol 6).* Munich: ifo Institute-Leibniz Institute for Economic Research at the University of Munich. Retrieved from https://ideas.repec.org/p/ces/econpr/_38.html

Besedeš, T., & Prusa, T. (2006a). Ins, Outs, and the Duration of Trade. *The Canadian Journal of Economics, 39*(1), 266-295. doi:10.1111/j.0008-4085.2006.00347.x

Besedeš, T., & Prusa, T. J. (2006b). Product differentiation and duration of US import trade. *Journal of International Economics, 70*(2), 339-358. doi:10.1016/j.jinteco.2005.12.005

Besedeš, T., & Prusa, T. J. (2011). The role of extensive and intensive margins and export growth. *Journal of Development Economics, 96*(2), 371-379. doi:10.1016/j.jdeveco.2010.08.013

Boileau, D., & Sydor, A. (2020). *Vulnerability of Canadian industries to disruptions in global supply chains.* Government of Canada. Retrieved from https://www.international.gc.ca/trade-commerce/economist-economiste/analysis-analyse/supply-chain-vulnerability.aspx?lang=eng

Bonneau, C., & Nakaa, M. (2020). *Vulnerability of French and European imports (No. 274).* Tresor-Economics. Retrieved from https://www.tresor.economie.gouv.fr/Articles/9ca1aa95-fd2a-4dec-9e76-b65a68c3fe29/files/e7566b5e-a5ae-4304-be42-917dd26651ff

Borin, A., Mancini, M., & Taglioni, D. (2021). *Measuring exposure to risk in global value chains.* Washington D.C: World Bank Group. Retrieved from https://documents1.worldbank.org/curated/en/476361632831927312/pdf/Countries-and-Sectors-in-Global-Value-Chains.pdf

Braun, E., Braun, E., Gyimesi, A., Iloskics, Z., & Sebestyén, T. (2023). Exposure to trade disruptions in case of the Russia–Ukraine conflict: A product network approach. *The World Economy, 46*(10), 2950-2982. doi:10.1111/twec.13417

Caravella, S., Crespi, F., Cucignatto, G., & Guarascio, D. (2024). Technological sovereignty and strategic dependencies: The case of the photovoltaic supply chain. *Journal of Cleaner Production*, 140222. doi:10.1016/j.jclepro.2023.140222

Chimits, F. (2024). *Growing asymmetry: Mapping the import dependencies in EU and US trade with China.* Berlin: Mercator Institute for China Studies. Retrieved from https://merics.org/en/report/growing-asymmetry-mapping-import-dependencies-eu-and-us-trade-china

Curran, L., & Eckhardt, J. (2023). The EU's COVID-19 policy response and the restructuring of global value chains. *Global Policy, 14*(S3), 30-39. doi:10.1111/1758-5899.13165

Defever, F., & Riaño, A. (2022). Firm-destination heterogeneity and the distribution of export intensity. *Economics Letters, 219*, 110810. doi:10.1016/j.econlet.2022.110810

Elliott, M., Golub, B., & Leduc, M. (2022). Supply network formation and fragility. *American Economic Review, 112*(8), 2701-2747. doi:10.1257/aer.20210220

European Commission. (2021). *Strategic dependencies and capacities (Working Document No. 352).* Brussels: European Commission. Retrieved from https://eur-lex.europa.eu/legal-content/en/TXT/?uri=CELEX:52021SC0352

Fontagné, L., Guimbard, H., & Orefice, G. (2022a). Tariff-based product-level trade elasticities. *Journal of International Economics, 137*, 103593. doi:10.1016/j.jinteco.2022.103593

Fontagné, L., Guimbard, H., & Orefice, G. (2022b). A new dataset on product-level trade elasticities. *Data in Brief*, 108668. doi:10.1016/j.dib.2022.108668

Garcia, W., & Ho, V. (2025). External Vulnerability Index: A Tool to Assess Trade Weaknesses. *Intereconomics: Review of European Economic Policy, 60*(1), 40-45. doi:10.2478/ie-2025-0008

Gaulier, G., & Zignago, S. (2010). *BACI: International Trade Database at the Product-Level. The 1994-2007 Version (Working Paper, No. 2010-23).* Paris: Centre d'Etudes Prospectives et d'Informations Internationales.

Gehringer, A. (2023). Calibrating the EU’s trade dependency. *Survival, 65*(1), 81-96. doi:10.1080/00396338.2023.2172855

Guinea, O., & Sharma, V. (2022). *Should the EU pursue a strategic ginseng policy? Trade dependency in the brave new world of geopolitics (Policy Brief No. 5).* Brussels: European Centre for International Political Economy (ECIPE). Retrieved from https://www.econstor.eu/handle/10419/280803

Hoang, V., Piccardi, C., & Tajoli, L. (2023). Reshaping the structure of the World Trade Network: a pivotal role for China? *Applied Network Science, 8*(35), 1-24. doi:10.1007/s41109-023-00560-9

International Energy Agency. (2022). *Special Report on Solar PV Global Supply Chains.* Paris, France: International Energy Agency.

International Trade Administration. (2022). *Draft list of critical supply chains*. Retrieved from Department of Commerce, United States of America: https://www.trade.gov/data-visualization/draft-list-critical-supply-chains

ITC. (2022). *Made by Africa: Creating value through integration.* Geneva: International Trade Centre. Retrieved from https://knowledge4policy.ec.europa.eu/publication/made-africa-creating-value-through-integration_en

Jiang, K. (2020). *Products with limited international supply for Canada.* Global Affairs Canada, Office of the Chief Economist. Retrieved from https://www.international.gc.ca/trade-commerce/assets/pdfs/economist-economiste/analysis-analyse/products_limited_international_supply-Canada-produits_nombre_limite_internationaux-eng.pdf

Jiang, Y., Khan, M., Zaman, S., & Iqbal, A. (2021). Financial development and trade in services: Perspective from emerging markets of Asia, South and Central America and Africa. *International Journal of Finance & Economics, 26*(3), 3306-3320. doi:10.1002/ijfe.1963

Kaplan, E., & Meier, P. (1958). Nonparametric estimation from incomplete observations. *Journal of the American Statistical Association, 53*(282), 457-481. doi:10.1080/01621459.1958.10501452

Karanikolos, M., Mladovsky, P., Cylus, J., Thomson, S., Basu, S., Stuckler, D., . . . McKee, M. (2013). Financial crisis, austerity, and health in Europe. *The Lancet, 381*(9874), 1323-1331.

Korniyenko, M., Pinat, M., & Dew, B. (2017). *Assessing the fragility of global trade: The impact of localized supply shocks using network analysis (WP/17/30).* International Monetary Fund. Retrieved from https://www.elibrary.imf.org/view/journals/001/2017/030/article-A001-en.xml

Lefebvre, K., & Wibaux, P. (2024). *Import Dependencies: Where Does the EU Stand? (Policy Brief No. 47).* Paris: CEPII. Retrieved from https://www.cepii.fr/CEPII/fr/publications/pb/abstract.asp?NoDoc=14223

Majune, S., & Türkcan, K. (2025). Trade Margins and Firm-Level Responses to Global Shocks: A Comparative Analysis of the 2008 Global Financial Crisis and COVID-19 Pandemic in Kenya. *The World Economy*. doi:10.1111/twec.13691

Mejean, I., & Rousseaux, P. (2024). Identifying European trade dependencies. In J. Pisani-Ferry, B. di Mauro, & J. Zettelmeyer, *Europe's Economic Security* (pp. 49-100). London: Centre

for Economic Policy Research. Retrieved from https://cepr.org/system/files/publication-files/200566-paris_report_2_europe_s_economic_security.pdf#page=60

Mensah, E., & de Vries, G. J. (2024). *The Role of Exports for Income and Job Creation in Sub-Saharan African Countries: New Evidence using the Africa Supply and Use Tables Database (No. 197).* Groningen: Groningen Growth and Development Centre (GGDC). Retrieved from https://www.rug.nl/ggdc/html_publications/memorandum/gd197.pdf

Montfaucon, A. F., Nigatu, N. S., & Majune, S. (2023). An analysis of value chain trade in Africa. *The World Economy, 46*(11), 3208-3230. doi:10.1111/twec.13507

Nassar, N., Brainard, J., Gulley, A., Manley, R., Matos, G., Lederer, G., . . . Fortier, S. (2020). Evaluating the mineral commodity supply riskof the U.S. manufacturing sector. *Science Advances, 6*(8), 1-11. doi:10.1126/sciadv.aay8647

Nicita, A. (2023). *International supply networks: A portrait of global trade patterns in four sectors (Working Paper No. 3).* Geneva: UNCTAD. Retrieved from https://ideas.repec.org/p/unc/wpaper/3.html

Odjo, S., Traoré, F., & Zaki, C. (2024). *Africa Agriculture Trade Monitor 2024.* Kigali and Washington, DC: AKADEMIYA2063 and International Food Policy Research Institute. doi:10.54067/9781737916499

Onyango, W., Majune, S., & Naluwooza, P. (2025). Chinese import dominance and structural transformation in Africa. *Oxford Development Studies, 53*(1), 86-102. doi:10.1080/13600818.2025.2451988

Piccardi, C., & Tajoli, L. (2018). Complexity, centralization, and fragility in economic networks. *PloS one, 13*(11), e0208265. doi:10.1371/journal.pone.0208265

Proelss, J., Schweizer, D., & Seiler, V. (2018). Do announcements of WTO dispute resolution cases matter? Evidence from the rare earth elements market. *Energy Economics*, 1-70. doi:10.1016/j.eneco.2018.05.004

Raga, S., Bohlmann, H., Lemma, A., Ngui, D., Papadavid, P., te Velde, D., & Zaki, C. (2024). *Impact of the Russia–Ukraine war on Africa: policy implications for navigating shocks and building resilience (ODI Synthesis Report).* London: ODI. Retrieved from https://odi.org/en/publications/impact-of-the-russia-ukraine-war-on-africa-policy-implications-for-navigating-shocks-and-building-resilience

Reiter, O., & Stehrer, R. (2023). Assessing the importance of risky products in international trade and global value chains. *Empirica, 50*, 7-33. doi:10.1007/s10663-022-09560-x

Sabuhoro, J. B., Larue, B., & Gervais, Y. (2006). Factors Determining the Success or Failure of Canadian Establishments on Foreign Markets: A Survival Analysis Approach. *The International Trade Journal, 20*(1), 33-73. doi:10.1080/08853900500467974

Schwellnus, C., Haramboure, A., Samek, L., Pechansky, R. C., & Cadestin, C. (2023). *Global value chain dependencies under the magnifying glass.* Paris: OECD Publishing. doi:10.1787/23074957

Seong, J., White, O., Woetzel, J., Smit, S., Devesa, T., Birshan, M., & Samandari, H. (2022). *Global flows: The ties that bind in an interconnected world (Discussion paper).* McKinsey Global Institute. Retrieved from https://www.mckinsey.com/capabilities/strategy-and-corporate-finance/our-insights/global-flows-the-ties-that-bind-in-an-interconnected-world

Signé, L., & Munyati, C. (2023). *AfCFTA: A New Era for Global Business and Investment in Africa.* Geneva: World Economic Forum. Retrieved from https://policycommons.net/artifacts/3373205/wef_friends_of_the_africa_continental_free_trade_area_2023/4172009/

Silva, T., Valença, P., & Tabak, B. (2024). Economic performance of exporting sectors: Evidence for manufacturing in Brazil. *Economic Systems, 48*(2), 101220. doi:10.1016/j.ecosys.2024.101220

Timmer, M., Dietzenbacher, E., Los, B., Stehrer, R., & De Vries, G. (2015). An illustrated user guide to the world input–output database: the case of global automotive production. *Review of International Economics, 23*(3), 575-605. doi:10.1111/roie.12178

Türkcan, K., Majune, S., & Moyi, E. (2022). Export margins and survival: A firm-level analysis using Kenyan data. *South African Journal of Economics, 90*(2), 149-174. doi:10.1111/saje.12314

U.S Department of Justice and the Federal Trade Commission. (2010). *Horizontal Merger Guidelines.* The U.S Department of Justice. Retrieved from Horizontal Merger Guidelines (08/19/2010): https://www.justice.gov/sites/default/files/atr/legacy/2010/08/19/hmg-2010.pdf

UNCTAD. (2023). *Commodities and Development Report 2023: Inclusive Diversification and Energy Transition.* New York: United Nations Publications. Retrieved from https://unctad.org/publication/commodities-and-development-report-2023

UNCTAD. (2025). *2024 Economic development in Africa report: Unlocking Africa's trade potential, boosting regional markets and reducing risks.* New York: United Nations Publications. Retrieved from https://unctad.org/publication/economic-development-africa-report-2024

United Nations. (2016). *Classification by Broad Economic Categories Rev.5.* New York: Department of Economic and Social Affairs, Statistics Division. Retrieved from https://unstats.un.org/unsd/trade/classifications/Manual%20of%20the%20Fifth%20Revision%20of%20the%20BEC%20(Unedited).pdf

Vicard, V., & Wibaux, P. (2023). *EU Strategic Dependencies: A Long View (Policy Brief No. 41).* Paris: CEPII. Retrieved from http://www.cepii.fr/PDF_PUB/pb/2023/pb2023-41.pdf

WTO. (2023). *One year of war in Ukraine: Assessing the impact on global trade and development.* Geneva: World Trade Organization. Retrieved from https://www.wto.org/english/res_e/publications_e/oneyukr_e.htm

Zenglein, M. (2020). *Mapping and recalibrating Europe's economic interdependence with China.* Berlin: Mercator Institute for China Studies. Retrieved from https://merics.org/en/report/mapping-and-recalibrating-europes-economic-interdependence-china

Zeufack, A. G., Calderon, C., Kambou, G., Kubota, M., Cantu Canales, C., & Korman, V. (2020). *An analysis of issues shaping Africa's economic future (Africa's Pulse No. 22).* Washington DC: World Bank Group. doi:10.1596/978-1-4648-1568-3

Zhang, S., Gu, C., & Zhang, P. (2025). Alleviating dependence: High-speed rail opening and firms' supply chain dependence. *Transport Policy, 167*, 116-129. doi:10.1016/j.tranpol.2025.03.029

Appendix

Table A.1: List of Africa's dependent import products (consistently featured,2018-2022)

No.	HS code	Description
1	852872	Reception apparatus for television, colour, whether or not incorporating radio-broadcast receivers or sound or video recording or reproducing apparatus, designed to incorporate a video display or screen
2	890120	Tankers
3	281820	Aluminium oxide (excl. artificial corundum)
4	854140	Photosensitive semiconductor devices, incl. photovoltaic cells whether or not assembled in modules or made up into panels; light emitting diodes (excl. photovoltaic generators)
5	852859	Monitors (excl. with TV receiver, CRT and those designed for computer use)
6	852849	Cathode-ray tube monitors "CRT" (excl. computer monitors, with TV receiver)
7	721070	Flat products of iron or non-alloy steel, of a width of >= 600 mm, hot-rolled or cold-rolled "cold-reduced", painted, varnished or coated with plastics
8	20230	Frozen, boneless meat of bovine animals
9	540752	Woven fabrics of yarn containing >= 85% by weight of textured polyester filaments, incl. monofilament of >= 67 decitex and a maximum diameter of <= 1 mm, dyed
10	151110	Crude palm oil
11	600644	Printed fabrics, knitted or crocheted, of artificial fibres, of a width of > 30 cm (excl. warp knit fabrics "incl. those made on galloon knitting machines", those containing by weight >= 5% of elastomeric yarn or rubber thread, and pile fabrics, incl. "long pile", looped pile fabrics, labels, badges and similar articles, and knitted or crocheted fabrics, impregnated, coated, covered or laminated)
12	600631	Unbleached or bleached fabrics, knitted or crocheted, of synthetic fibres, of a width of > 30 cm (excl. warp knit fabrics "incl. those made on galloon knitting machines", those containing by weight >= 5% of elastomeric yarn or rubber thread, and pile fabrics, incl. "long pile", looped pile fabrics, labels, badges and similar articles, and knitted or crocheted fabrics, impregnated, coated, covered or laminated)
13	600634	Printed fabrics, knitted or crocheted, of synthetic fibres, of a width of > 30 cm (excl. warp knit fabrics "incl. those made on galloon knitting machines", those containing by weight >= 5% of elastomeric yarn or rubber thread, and pile fabrics, incl. "long pile", looped pile fabrics, labels, badges and similar articles, and knitted or crocheted fabrics, impregnated, coated, covered or laminated)
14	600641	Unbleached or bleached fabrics, knitted or crocheted, of artificial fibres, of a width of > 30 cm (excl. warp knit fabrics "incl. those made on galloon knitting machines", those containing by weight >= 5% of elastomeric yarn or rubber thread, and pile fabrics, incl. "long pile", looped pile fabrics, labels, badges and similar articles, and knitted or crocheted fabrics, impregnated, coated, covered or laminated)

15	600642	Dyed fabrics, knitted or crocheted, of artificial fibres, of a width of > 30 cm (excl. warp knit fabrics "incl. those made on galloon knitting machines", those containing by weight >= 5% of elastomeric yarn or rubber thread, and pile fabrics, incl. "long pile", looped pile fabrics, labels, badges and similar articles, and knitted or crocheted fabrics, impregnated, coated, covered or laminated)
16	600632	Dyed fabrics, knitted or crocheted, of synthetic fibres, of a width of > 30 cm (excl. warp knit fabrics "incl. those made on galloon knitting machines", those containing by weight >= 5% of elastomeric yarn or rubber thread, and pile fabrics, incl. "long pile", looped pile fabrics, labels, badges and similar articles, and knitted or crocheted fabrics, impregnated, coated, covered or laminated)
17	600643	Fabrics, knitted or crocheted, of artificial fibres, of yarns of different colours, of a width of > 30 cm (excl. warp knit fabrics "incl. those made on galloon knitting machines", those containing by weight >= 5% of elastomeric yarn or rubber thread, and pile fabrics, incl. "long pile", looped pile fabrics, labels, badges and similar articles, and knitted or crocheted fabrics, impregnated, coated, covered or laminated)
18	640299	Footwear with outer soles and uppers of rubber or plastics (excl. covering the ankle or with upper straps or thongs assembled to the sole by means of plugs, waterproof footwear of heading 6401, sports footwear, orthopaedic footwear and toy footwear)
19	940540	Electric lamps and lighting fittings, n.e.s.
20	640419	Footwear with outer soles of rubber or plastics and uppers of textile materials (excl. sports footwear, incl. tennis shoes, basketball shoes, gym shoes, training shoes and the like, and toy footwear)
21	851718	Telephone sets (excl. line telephone sets with cordless handsets and telephones for cellular networks or for other wireless networks)
22	854370	Electrical machines and apparatus, having individual functions, n.e.s. in chapter 85
23	392410	Tableware and kitchenware, of plastics
24	420212	Trunks, suitcases, vanity cases, executive-cases, briefcases, school satchels and similar containers, with outer surface of plastics or textile materials
25	851769	Apparatus for the transmission or reception of voice, images or other data, incl. apparatus for communication in a wired or wireless network [such as a local or wide area network] (excl. telephone sets, telephones for cellular networks or for other wireless networks, base stations, apparatus for the reception, conversion and transmission or regeneration of voice, images or other data, and transmission or reception apparatus of heading 8443, 8525, 8527 or 8528)
26	901380	Liquid crystal devices, n.e.s. and other optical appliances and instruments not elsewhere specified in chapter 90
27	200290	Tomatoes, prepared or preserved otherwise than by vinegar or acetic acid (excl. whole or in pieces)
28	691110	Tableware and kitchenware, of porcelain or china (excl. ornamental articles, pots, jars, carboys and similar receptacles for the conveyance or packing of

		goods, and coffee grinders and spice mills with receptacles made of ceramics and working parts of metal)
29	640220	Footwear with outer soles and uppers of rubber or plastics, with upper straps or thongs assembled to the sole by means of plugs (excl. toy footwear)
30	841510	Window or wall air conditioning machines, self-contained or "split-system"
31	600192	Pile fabrics of man-made fibres, knitted or crocheted (excl. "long pile" fabrics)
32	640411	Sports footwear, incl. tennis shoes, basketball shoes, gym shoes, training shoes and the like, with outer soles of rubber or plastics and uppers of textile materials
33	220830	Whiskies
34	691010	Ceramic sinks, washbasins, washbasin pedestals, baths, bidets, water closet pans, flushing cisterns, urinals and similar sanitary fixtures of porcelain or china (excl. soap dishes, sponge holders, tooth-brush holders, towel hooks and toilet paper holders)
35	470321	Semi-bleached or bleached coniferous chemical wood pulp, soda or sulphate (excl. dissolving grades)
36	732393	Table, kitchen or other household articles, and parts thereof, of stainless steel (excl. cans, boxes and similar containers of heading 7310; waste baskets; shovels, corkscrews and other articles of the nature of a work implement; articles of cutlery, spoons, ladles, forks etc. of heading 8211 to 8215; ornamental articles; sanitary ware)
37	840733	Spark-ignition reciprocating piston engine, of a kind used for vehicles of chapter 87, of a cylinder capacity > 250 cm^3 but <= 1.000 cm^3
38	90210	Green tea in immediate packings of <= 3 kg
39	540761	Woven fabrics of yarn containing >= 85% by weight of non-textured polyester filaments, incl. monofilament of >= 67 decitex and a maximum diameter of <= 1 mm
40	284390	Inorganic or organic compounds of precious metals, whether or not chemically defined (excl. silver and gold); amalgams of precious metals
41	860310	Self-propelled railway or tramway coaches, vans and trucks, powered from an external source of electricity (excl. those of heading 8604)
42	940510	Chandeliers and other electric ceiling or wall lighting fittings (excl. for lighting public open spaces or thoroughfares)
43	830241	Base metal mountings and fittings suitable for buildings (excl. locks with keys and hinges)
44	851660	Electric ovens, cookers, cooking plates and boiling rings, electric grillers and roasters, for domestic use (excl. space-heating stoves and microwave ovens)
45	420222	Handbags, whether or not with shoulder straps, incl. those without handles, with outer surface of plastic sheeting or textile materials
46	850220	Generating sets with spark-ignition internal combustion piston engine
47	90220	Green tea in immediate packings of > 3 kg
48	730300	Tubes, pipes and hollow profiles, of cast iron
49	30351	Frozen herrings "Clupea harengus, Clupea pallasii"
50	610432	Women's or girls' jackets and blazers of cotton, knitted or crocheted (excl. wind-jackets and similar articles)

51	732399	Table, kitchen or other household articles, and parts thereof, of iron other than cast iron or steel other than stainless (excl. enamelled articles; cans, boxes and similar containers of heading 7310; waste baskets; shovels and other articles of the nature of a work implement; cutlery, spoons, ladles etc. of heading 8211 to 8215; ornamental articles; sanitary ware)
52	70110	Seed potatoes
53	722530	Flat-rolled products of alloy steel other than stainless, of a width of >= 600 mm, not further worked than hot-rolled, in coils (excl. products of silicon-electrical steel)
54	540772	Woven fabrics of yarn containing >= 85% synthetic filament by weight, incl. monofilament of >= 67 decitex and a maximum diameter of <= 1 mm, dyed (excl. those of polyester, nylon or other polyamide filaments or monofilaments, and of mixtures of textured and non-textured polyester filaments)
55	850940	Domestic food grinders and mixers and fruit or vegetable juice extractors, with self-contained electric motor
56	761010	Doors, windows and their frames and thresholds for door, of aluminium (excl. door furniture)
57	860210	Diesel-electric locomotives
58	570242	Carpets and other floor coverings, of man-made textile materials, woven, not tufted or flocked, of pile construction, made up (excl. Kelem, Schumacks, Karamanie and similar hand-woven rugs)
59	420292	Travelling-bags, insulated food or beverage bags, toilet bags, rucksacks, shopping-bags, map-cases, tool bags, sports bags, jewellery boxes, cutlery cases, binocular cases, camera cases, musical instrument cases, gun cases, holsters and similar containers, with outer surface of plastic sheeting or textile materials (excl. trunks, briefcases, school satchels and similar containers, handbags and articles carried in the pocket or handbag)
60	690490	Ceramic flooring blocks, support or filler tiles and the like (excl. those of siliceous fossil meals or similar siliceous earths, refractory bricks of heading 6902, and flags and pavings, hearth and wall tiles of heading 6907 and 6908, and building bricks)
61	540246	Filament yarn of polyester, incl. monofilament of < 67 decitex, single, untwisted or with a twist of <= 50 turns per metre, partially oriented (excl. elastomeric yarn, sewing thread, yarn put up for retail sale and textured yarn)
62	520812	Plain woven fabrics of cotton, containing >= 85% cotton by weight and weighing > 100 g to 200 g/m², unbleached
63	610462	Women's or girls' trousers, bib and brace overalls, breeches and shorts of cotton, knitted or crocheted (excl. panties and swimwear)
64	610342	Men's or boys' trousers, bib and brace overalls, breeches and shorts of cotton, knitted or crocheted (excl. swimwear and underpants)
65	761410	Stranded wire, cables, plaited bands and the like, of aluminium, with steel core (excl. such products electrically insulated)
66	851679	Electro-thermic appliances, for domestic use (excl. hairdressing appliances and hand dryers, space-heating and soil-heating apparatus, water heaters, immersion heaters, smoothing irons, microwave ovens, ovens, cookers,

		cooking plates, boiling rings, grillers, roasters, coffee makers, tea makers and toasters)
67	940389	Furniture of other mareials, including cane, osier or similar materials (excl. of bamboo, rattan, metal, wood and plastics, and seats and medical, surgical, dental or veterinary furniture)
68	950691	Articles and equipment for general physical exercise, gymnastics or athletics
69	830110	Padlocks of base metal
70	871200	Bicycles and other cycles, incl. delivery tricycles, not motorised
71	620432	Women's or girls' jackets and blazers of cotton (excl. knitted or crocheted, wind-jackets and similar articles)
72	630510	Sacks and bags, for the packing of goods, of jute or other textile bast fibres of heading 5303
73	851830	Headphones and earphones, whether or not combined with microphone, and sets consisting of a microphone and one or more loudspeakers (excl. telephone sets, hearing aids and helmets with built-in headphones, whether or not incorporating a microphone)
74	720917	Flat-rolled products of iron or non-alloy steel, of a width of >= 600 mm, in coils, simply cold-rolled "cold-reduced", not clad, plated or coated, of a thickness of >= 0,5 mm but <= 1 mm
75	940490	Articles of bedding and similar furnishing, fitted with springs or stuffed or internally filled with any material or of cellular rubber or plastics (excl. mattress supports, mattresses, sleeping bags, pneumatic or water mattresses and pillows, blankets and covers)
76	220820	Spirits obtained by distilling grape wine or grape marc
77	440792	Beech "Fagus spp.", sawn or chipped lengthwise, sliced or peeled, whether or not planed, sanded or end-jointed, of a thickness of > 6 mm
78	220410	Sparkling wine of fresh grapes
79	852190	Video recording or reproducing apparatus, whether or not incorporating a video tuner (excl. magnetic tape-type and video camera recorders)
80	930591	Parts and accessories of military weapons of heading 9301, n.e.s.
81	930599	Parts and accessories for weapons and the like of heading 9303 or 9304, n.e.s. (excl. of shotguns or rifles of heading 9303)
82	732591	Grinding balls and similar articles for mills, cast (excl. such articles of non-malleable cast iron)
83	940599	Parts of lamps and lighting fittings, illuminated signs and nameplates and the like, n.e.s.
84	871110	Motorcycles, incl. mopeds, with reciprocating internal combustion piston engine of a cylinder capacity <= 50 cm^3
85	294110	Penicillins and their derivatives with a penicillanic acid structure; salts thereof
86	846729	Electromechanical tools for working in the hand, with self-contained electric motor (excl. saws and drills)
87	282612	Fluoride of aluminium
88	600542	Dyed warp knit fabrics of artificial fibres "incl. those made on galloon knitting machines", of a width of > 30 cm (excl. those containing by weight >= 5% of elastomeric yarn or rubber thread, and pile fabrics, incl. "long

		pile", looped pile fabrics, labels, badges and similar articles, and knitted or crocheted fabrics, impregnated, coated, covered or laminated)
89	600543	Warp knit fabrics of artificial fibres, of yarns of different colours "incl. those made on galloon knitting machines", of a width of > 30 cm (excl. those containing by weight >= 5% of elastomeric yarn or rubber thread, and pile fabrics, incl. "long pile", looped pile fabrics, labels, badges and similar articles, and knitted or crocheted fabrics, impregnated, coated, covered or laminated)
90	600541	Unbleached or bleached warp knit fabrics of artificial fibres "incl. those made on galloon knitting machines", of a width of > 30 cm (excl. those containing by weight >= 5% of elastomeric yarn or rubber thread, and pile fabrics, incl. "long pile", looped pile fabrics, labels, badges and similar articles, and knitted or crocheted fabrics, impregnated, coated, covered or laminated)
91	600544	Printed warp knit fabrics of artificial fibres "incl. those made on galloon knitting machines", of a width of > 30 cm (excl. those containing by weight >= 5% of elastomeric yarn or rubber thread, and pile fabrics, incl. "long pile", looped pile fabrics, labels, badges and similar articles, and knitted or crocheted fabrics, impregnated, coated, covered or laminated)
92	120600	Sunflower seeds, whether or not broken
93	320720	Vitrifiable enamels and glazes, engobes "slips" and similar preparations of the kind used in the ceramic, enamelling or glass industry
94	851822	Multiple loudspeakers, mounted in the same enclosure
95	30559	Fish, dried, even salted but not smoked, n.e.s. (excl. fillets and offal)
96	482010	Registers, account books, notebooks, order books, receipt books, letter pads, memorandum pads, diaries and similar articles, of paper or paperboard
97	722830	Bars and rods of alloy steel other than stainless, not further worked than hot-rolled, hot-drawn or extruded (excl. products of high-speed steel or silico-manganese steel, semi-finished products, flat-rolled products and hot-rolled bars and rods in irregularly wound coils)
98	381700	Mixed alkylbenzenes and mixed alkylnaphthalenes produced by the alkylation of benzene and naphthalene (excl. mixed isomers of cyclic hydrocarbons)
99	851821	Single loudspeakers, mounted in their enclosures
100	540751	Woven fabrics of yarn containing >= 85% by weight of textured polyester filaments, incl. monofilament of >= 67 decitex and a maximum diameter of <= 1 mm, unbleached or bleached

Note: Products are ranked in descending order based on the import value for 2018

Source: Author’s calculations based on UN Comtrade data for 2023.