



Implemented by



Kiel Institute Study

# Effects of the AfCFTA for German and European Companies

durch das Kiel Institut für Weltwirtschaft (IfW Kiel)



# Kontakt Daten

Institutsname **Kiel Institut für Weltwirtschaft (IfW Kiel)**

Rechtsform Stiftung des öffentlichen Rechts

Adresse Kiellinie 66

24105 Kiel

Tel: 0431 8814-1

Fax: 0431 8814-500

<https://www.ifw-kiel.de>

Institutsleitung Prof. Dr. Stefan Kooths

[stefan.kooths@ifw-kiel.de](mailto:stefan.kooths@ifw-kiel.de)

Prof. Holger Görg, Ph.D.

[holger.goerg@ifw-kiel.de](mailto:holger.goerg@ifw-kiel.de)

kfm. Geschäftsführerin

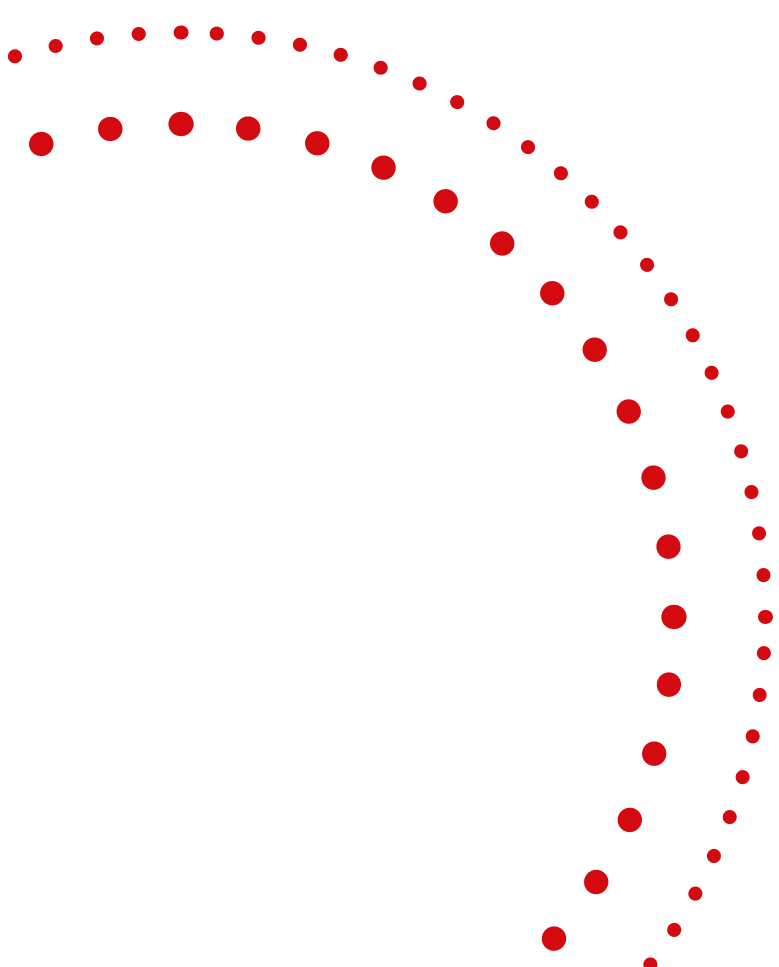
Birgit Austen-Bosy,

Tel: 0431 8814-234

[birgit.austen-bosy@ifw-kiel.de](mailto:birgit.austen-bosy@ifw-kiel.de)

Projektleitung Prof. Dr. Julian Hinz

Projektteam Sonali Chowdhry, Anna Jacobs, Prof. Dr. Rainer Thiele



# Contents

1. Introduction and background on AfCFTA	1
2. Status quo of German and European companies in Africa and relevance of AfCFTA	4
3. Opportunities and risks for German and European companies through AfCFTA	15
3.1. Quantitative analysis of expected export and import dynamics . . . . .	15
3.2. Results of the simulation exercise . . . . .	18
4. Conclusion and main take-aways for private sector support of AfCFTA	21
A. Additional plots	25
B. Technical description of the KITE Model	26

## List of Abbreviations

<b>AfCFTA</b>	African Continental Free Trade Area
<b>BMW</b>	Bayerische Motoren Werke
<b>CETA</b>	Comprehensive Economic and Trade Agreement
<b>CPTPP</b>	Comprehensive and Progressive Agreement for Trans-Pacific Partnership
<b>DESTA</b>	Design of Trade Agreements
<b>EBA</b>	Everything-But-Arms
<b>EPA</b>	Economic Partnership Agreement
<b>EU</b>	European Union
<b>FDI</b>	Foreign Direct Investment
<b>FTA</b>	Free Trade Agreement
<b>GDP</b>	Gross Domestic Product
<b>GTAP</b>	Global Trade Analysis Project
<b>GVC</b>	Global Value Chain
<b>KITE</b>	Kiel Institute Trade Policy Evaluation
<b>LDC</b>	Least Developed Country
<b>MERCOSUR</b>	Mercado Común del Sur (Southern Common Market)
<b>MFN</b>	Most Favored Nation
<b>NTB</b>	Non-Tariff Barrier
<b>OEM</b>	Original Equipment Manufacturer
<b>RCA</b>	Revealed Comparative Advantage
<b>RCEP</b>	Regional Comprehensive Economic Partnership
<b>ROW</b>	Rest of the World
<b>SDGs</b>	Sustainable Development Goals
<b>SPS</b>	Sanitary and Phyto-Sanitary measures
<b>TBT</b>	Technical Barrier to Trade
<b>UN</b>	United Nations
<b>USD</b>	United States Dollar
<b>WITS</b>	World Integrated Trade Solutions
<b>WTO</b>	World Trade Organization

# 1. Introduction and background on AfCFTA

In May 2019, the African Continental Free Trade Area (AfCFTA) agreement entered into force. In numerous respects, this agreement can be considered a historic milestone towards trade liberalization on the African continent. Following ten rounds of official negotiations beginning in June 2015, the agreement now spans 55 African Union Member States of which 43 have already deposited their instruments of ratification.<sup>1</sup> By connecting these economies, AfCFTA has become the largest trading bloc in the world in terms of market size, covering more than 1.3 billion consumers with combined GDP of USD 2.5 trillion. It is expected to support African economies achieve rapid industrial development, diversify their export baskets and make progress towards the UN Sustainable Development Goals (SDGs). These ambitions are reflected in the African Union's Agenda 2063 as well as recent statements from the Secretary-General of the AfCFTA Secretariat.<sup>2</sup>

As emphasized in the treaty text, the AfCFTA's core objective is to deepen the economic integration of the African continent by creating a single market for the movement of goods, services, capital and natural persons. Therefore, the AfCFTA seeks to address a wide range of policy frictions that keep intra-African trade at persistently low levels. AfCFTA members' goods exports to other African economies is less than 25% of their total goods exports. This stands in sharp contrast to the continent's share of goods exports directed towards Europe (34%) or Asia (33%).<sup>3</sup> The severe economic fragmentation of the African continent becomes even more apparent when comparing the share of intra-continental trade to other regions. Figure 1 shows the African continent to have the lowest share of intra-continental trade, both in terms of imports and exports, aside from Oceania. In fact, the share of internal trade on the European continent is almost seven times as high as on the African continent, and still only a quarter of intra-American trade. Furthermore, no clear upward trend is visible.

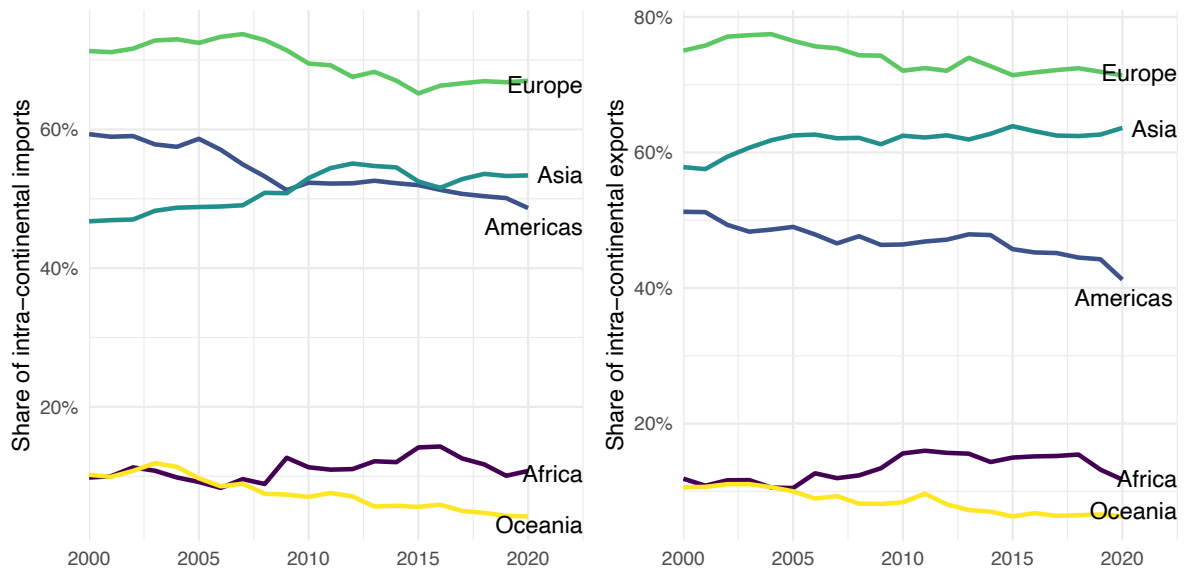
The AfCFTA aims to address this challenge, being an agreement between diverse economies with different production capabilities and domestic priorities. There is substantial variation across AfCFTA economies in their stages of economic development, market structures, institutional quality and regulatory practices. This is evident from examining a subset of economic indicators. Looking at market conditions, there are large differences in the urbanization rates of the population — from highly urbanized countries like Botswana (70%) to the rapidly urbanizing but still largely rural countries like Burundi (13%) and Malawi (17%). Demographic characteristics vary drastically as well with life expectancy at birth reaching 53-54 years in Central African Republic, Chad, Lesotho and Nigeria to

<sup>1</sup> Information as of May 2022.

<sup>2</sup> See Statement by the Secretary-General of the AfCFTA Secretariat, H.E. Wamkele Mene, at the AfCFTA Start of Trading Ceremony Webinar. Link: <https://bit.ly/3nEaCGj>

<sup>3</sup> This 'missing' intra-African trade can be clearly observed in Figure 3 below.

Figure 1: Share of internal imports and exports by continent



more than 75 years in Morocco, Tunisia and Algeria. Economic activity across the AfCFTA members is also driven by different sectors. For instance, manufacturing accounts for more than 15% of GDP in members such as Egypt and Uganda but less than 5% in Sierra Leone, Chad and Liberia. The latter three are the bloc's most agrarian economies with more than 40% of their GDP dependent on this sector. Meanwhile, economies such as Mauritius, South Africa and Seychelles are strongly service-oriented.

Despite such heterogeneity across member states, the AfCFTA is ambitious in its scope. Its provisions extend beyond tariff elimination in goods to trade in services and regulatory issues such as those concerning state-owned enterprises. The agreement is also forward-looking, as it attempts to lay the foundation for a future African Customs Union wherein members would adopt a common external tariff policy.

From the EU's perspective, the AfCFTA offers an opportunity to arrest the gradual decline in its relative importance as export destination and import source for African economies. Though the EU remains the top trading partner for AfCFTA members, these economies have increasingly shifted their trade toward Asian partners. The agreement's successful implementation is therefore a strategic priority in the EU's evolving relationship with Africa. Towards this objective, the EU has offered political, technical and financial support for the AfCFTA. By facilitating intra-African trade and investment through the AfCFTA, the EU aims to improve its own connectivity with African economies and build a comprehensive continent-to-continent free-trade area in the longer term.<sup>4</sup>

<sup>4</sup> See the Joint Communication of the European Commission to the European Parliament and the Council on a

Within the EU, Germany is the second largest exporter and third largest importer from AfCFTA members. Moreover, its trade relationship with African economies is unique. Compared to overall imports from the EU, African economies source industrial goods such as machinery, electrical appliances, vehicles and transport equipment much more intensively from Germany.<sup>5</sup> This pattern is also observable in AfCFTA exports to Germany. Even though these patterns are mainly driven by South African-German trade they provide a good example for potential benefits of deeper trade integration with other African countries. More so, given this sectoral composition of trade baskets, Germany can play a vital role in promoting intra-African trade and building the continent's manufacturing capacity.

Coming to the AfCFTA's institutional arrangements, the entry into force of the agreement did not conclude the negotiation process between member states. While Phase I of the negotiations on trade in goods and services has officially ended, schedules of tariff concessions, rules of origin and commitments in services are yet to be finalised. In addition, Phase II negotiations are currently ongoing. These focus on regulatory cooperation in important 'behind-the-border' issues such as competition policy, intellectual property rights and investment standards. The decision to launch Phase III of the negotiations focusing on e-commerce was also communicated in February 2020. Therefore, the process of deepening the AfCFTA is still underway.

Focusing on the AfCFTA's Protocol for Goods, the agreement mandates the progressive removal of tariffs on at least 97% of tariff lines. Breaking this down further, 90% of tariff lines are expected to be completely eliminated over a period of 10 years for Least Developed Countries (LDCs), over 5 years for non-LDCs and over 15 years for a separate group of six nations<sup>6</sup>. These long transition periods for LDCs underline the importance of tariff revenues for government budgets in African states, unlike advanced economies such as the EU. Gradual tariff elimination on the additional 7% of tariff lines for relatively sensitive products will begin only after five years. Finally, the remaining 3% of tariff lines are entirely excluded from the agreement's scope.

Concerning Non-Tariff Barriers (NTBs), the AfCFTA's Protocol for Goods incorporates several Annexes dedicated to trade facilitation, Technical Barriers to Trade (TBTs), Sanitary and Phyto-Sanitary measures (SPS), trade remedies and transit facilitation. On TBT and SPS measures, AfCFTA reaffirms members' obligations under the WTO's TBT and SPS Agreements and encourages them to cooperate in the development of standards and conformity assessment procedures. On trade facilitation, AfCFTA members commit to establishing electronic payments, maintaining a single window system for document submission, instituting Authorised Operators and arranging for pre-arrival processing of goods amongst others. Such improvements in trade facilitation will benefit even

---

comprehensive Strategy with Africa. Link: <https://bit.ly/3HskKue>

<sup>5</sup> See Figure 6 and a more detailed discussed below.

<sup>6</sup> These include Ethiopia, Madagascar, Malawi, Sudan, Zambia, Zimbabwe

those countries trading with African economies which are not directly party to the AfCFTA. These provisions can therefore be viewed as delivering ‘multilateralized’ NTB reductions.

The aim of this study is to provide a detailed quantitative assessment of the trade and income effects from the implementation of the AfCFTA. Given that the agreement’s clauses are still being developed, especially in services, our focus rests on liberalization in goods trade and related reductions in NTBs. Instead of short-run adjustment, the analysis provides the impact of the FTA over the long-run when tariff schedules are presumed to be fully implemented. The remainder of this study is structured as follows. Section 2 provides an overview of the depths of trade integration within the African continent and the structure of trade flows with the EU and Germany. Section 3 gives a quantitative assessment of the opportunities provided by AfCFTA for its member states as well as the EU and Germany. Section 4 concludes.

## 2. Status quo of German and European companies in Africa and relevance of AfCFTA

To evaluate the impact of this comprehensive and deep trade agreement, we first analyse the status quo of economic integration within the African continent and its trade relationship with the EU and Germany.

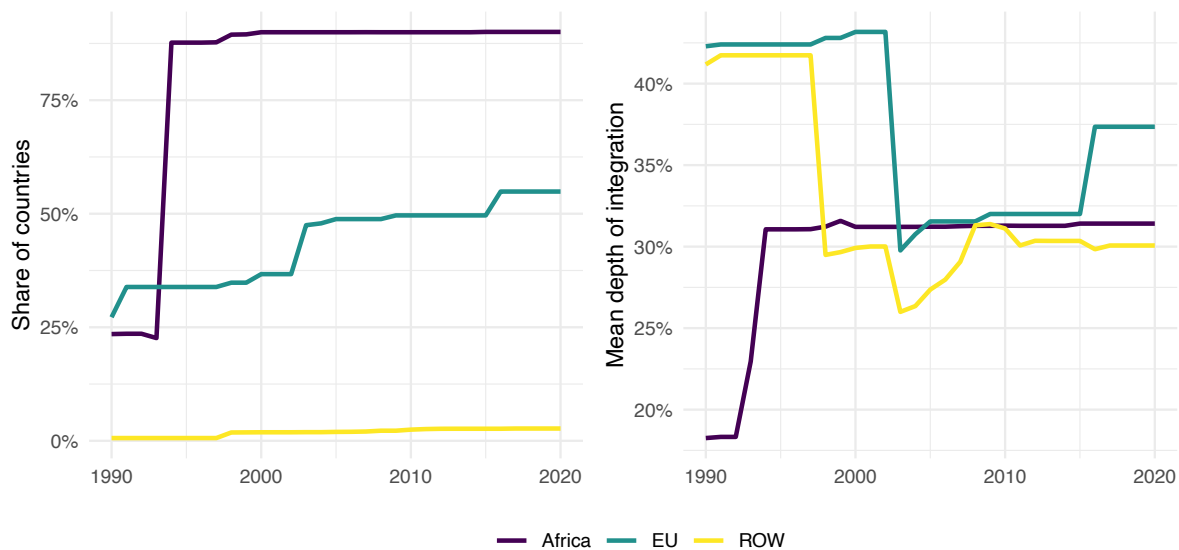
### State of integration among AfCFTA partners

In order to examine changes in trade integration over time, Figure 2 depicts the average degree of economic integration of the African continent with itself, the EU and remaining countries, i.e. the “rest of the world” (ROW). Both charts draw on data from the “Design of Trade Agreements (DESTA) Database” (Dür et al., 2014). The left panel shows what could be called the *extensive margin* of trade integration, i.e. the share of trade partners of African countries with which trade agreements are in place. Here, we observe that trade integration with the EU has increased steadily since the 1990s. In addition, intra-African trade agreements also increased and now cover 75% of all member countries. However, integration of African economies with other countries (ROW) remains limited.

Looking at the mean depth of existing trade agreements in the right panel — an *intensive margin* — reveals that intra-African integration — while existent on paper — is very shallow. Until AfCFTA, average EU-African integration was deeper than intra-African integration when comparing the scope of FTAs in place. These trends provide a strong argument for a potential pro-integration effect of the AfCFTA, both within the African continent but also with the EU and the ROW.



Figure 2: African FTA partners and depth of economic integration



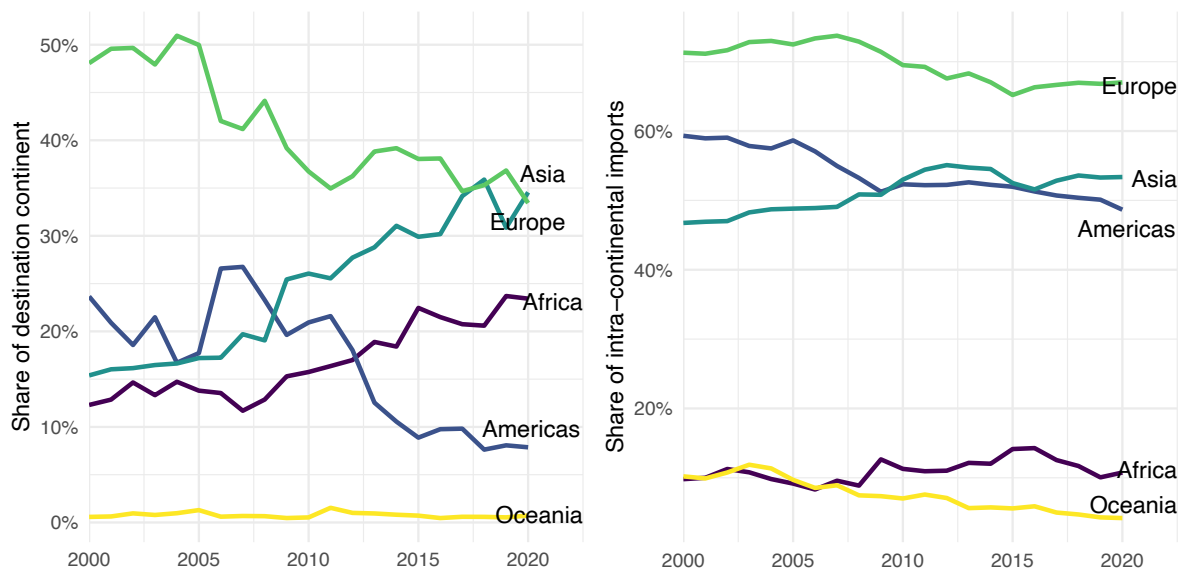
Finally, these graphs also show that the EU has maintained a low-level but fairly stable economic relationship with the African continent and its members over the past 20 years. However, it was primarily based on one-way preferential access to the EU market to support trade-driven development of LDCs. Today, most African countries enjoy duty-free and quota-free access to the EU market via either the Economic Partnership Agreements (EPAs) or the Everything-But-Arms (EBA) scheme.

### Goods trade

We now turn to examining the composition of African economies' goods trade. Figure 3 presents the main partner regions for goods exports to and imports from the African continent between 2000 and 2020. The data is sourced from UN Comtrade.<sup>7</sup> Both, imports and exports of African economies have been dominated by the EU. However, the EU's share in total African exports and imports has decreased steadily over the years. Between 2000 and 2020 the share of African exports to the EU dropped from nearly 50% to 35%. African exports to Asia on the other hand increased by almost 20 percentage points over the period considered, reaching a share of around 30% in 2020. Looking at African imports, this substitution effect becomes even more apparent. In 2013, Asia replaced the EU as the main import partner for the African continent. Its overall share in African imports rose by more than 15 percentage points within the past 20 years. Within-Africa trade has increased over time as well. The share of exports that stay within the continent increased from 12% in 2000 to almost 25% in 2020. The Coronavirus pandemic that hit global trade in 2020 did not impact these long-evolving

<sup>7</sup> To access this data, see <http://comtrade.un.org>.

Figure 3: African export destinations and import origins over time



trends in trade patterns.

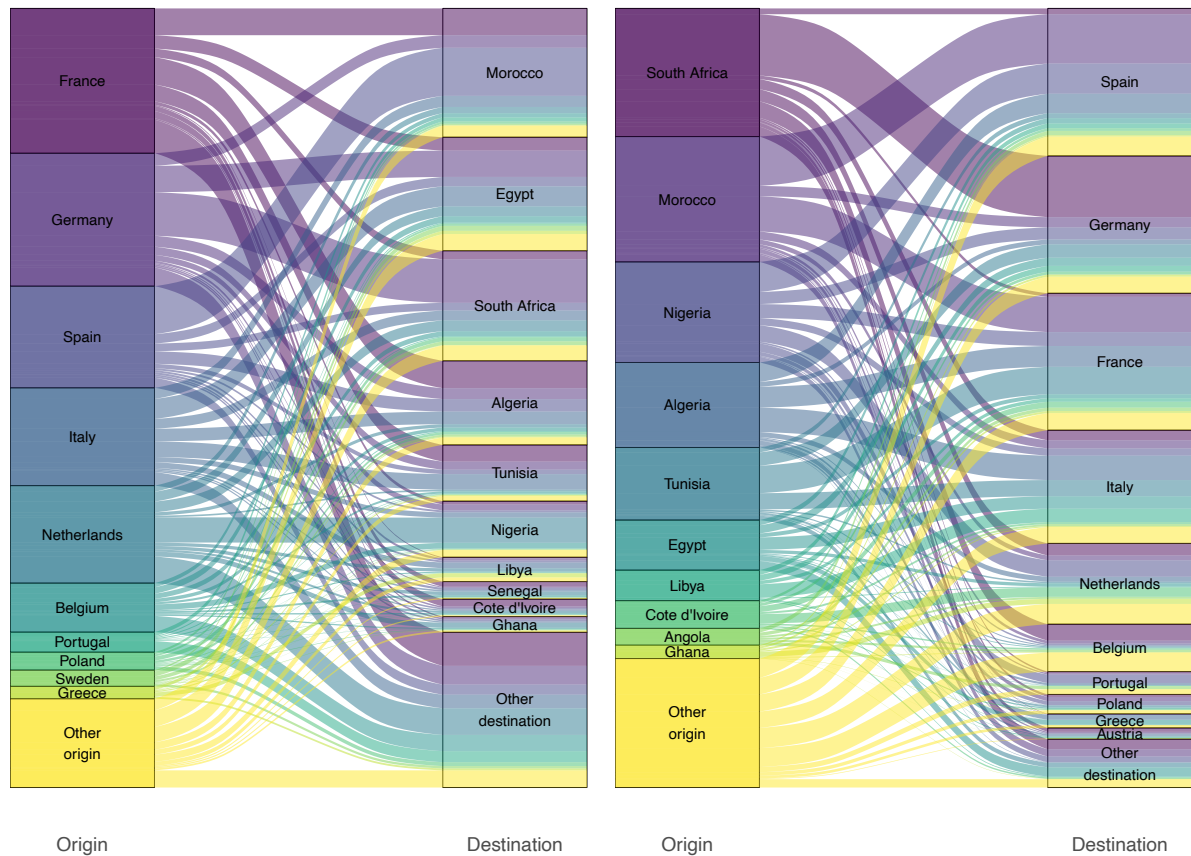
Despite some growth, intra-African trade activity remains at low-levels and falls far behind the levels of internal trade observed in more integrated regions like the EU. Figure 1, as well as Figure 17 in the appendix, show for comparison that intra-EU trade clearly dominates EU's trade with all other partner regions and accounts for 70-75% of total exports of EU countries. This points to the opportunities for significantly deeper integration that can also be achieved on the African continent.

For the EU itself, the African continent is a minor partner. Its share in total exports from the EU persistently stays around 2%.<sup>8</sup> Figure 4 breaks down EU-African trade by destination (left panel) and origin countries (right panel). For both African exports and imports, trade with the EU is concentrated among a few countries in the geographic North of the continent, i.e. Morocco, Tunisia, Algeria, Libya and Egypt, with one exception, South Africa. Germany is the second largest supplier of exports to the African continent within the EU. Its major partners are South Africa, as well as Morocco, Egypt and Algeria. On the import side, Germany mainly sources from South Africa, Libya and Nigeria.

Figures 5 and 6 give a more precise overview of the distribution of trade across sectors and main destinations and origins, respectively. Generally, African exports are dominated by commodities and raw materials. Exports to the EU also include processed food, as well as vehicles, aircraft, vessels and machinery, appliances, electrical equipment. The former two, however, appear to be dominated by trade with Germany. Exports of vehicles, aircraft, vessels make up more than 37% of all African

<sup>8</sup> See figure 17 in the appendix

Figure 4: Top destinations and origins for EU in Africa in 2020



exports to Germany, compared to the overall EU average of 9%. This figure is driven almost exclusively by automotive exports from South Africa. Box 1 explores the background behind this unique sectoral link between Germany and South Africa.

The distribution of African imports across sectors looks similar compared to its exports, which suggests that most bilateral trade between African countries and its partners occurs within the same industry. Given the sectoral decomposition of trade within Africa vs Africa-EU, EU exports to Africa, and, even more so German exports are unlikely to be replaced by intra-African trade as a result of deepening integration through AfCFTA.

This result is underlined by Figure 7. It illustrates the “revealed comparative advantage” (RCA) of the AfCFTA members on the one hand, and Germany and other EU members, respectively, on the other hand in producing goods from a certain industry. The indicator calculates the relative competitiveness of a certain country (or country group) in a certain class of goods or services using their current trade flows as evidence. A value larger than one indicates a revealed comparative advantage. The figure displays the African RCA for each sector (points) and maps it against the measure for the EU (purple)

Figure 5: Top African export sectors in 2020

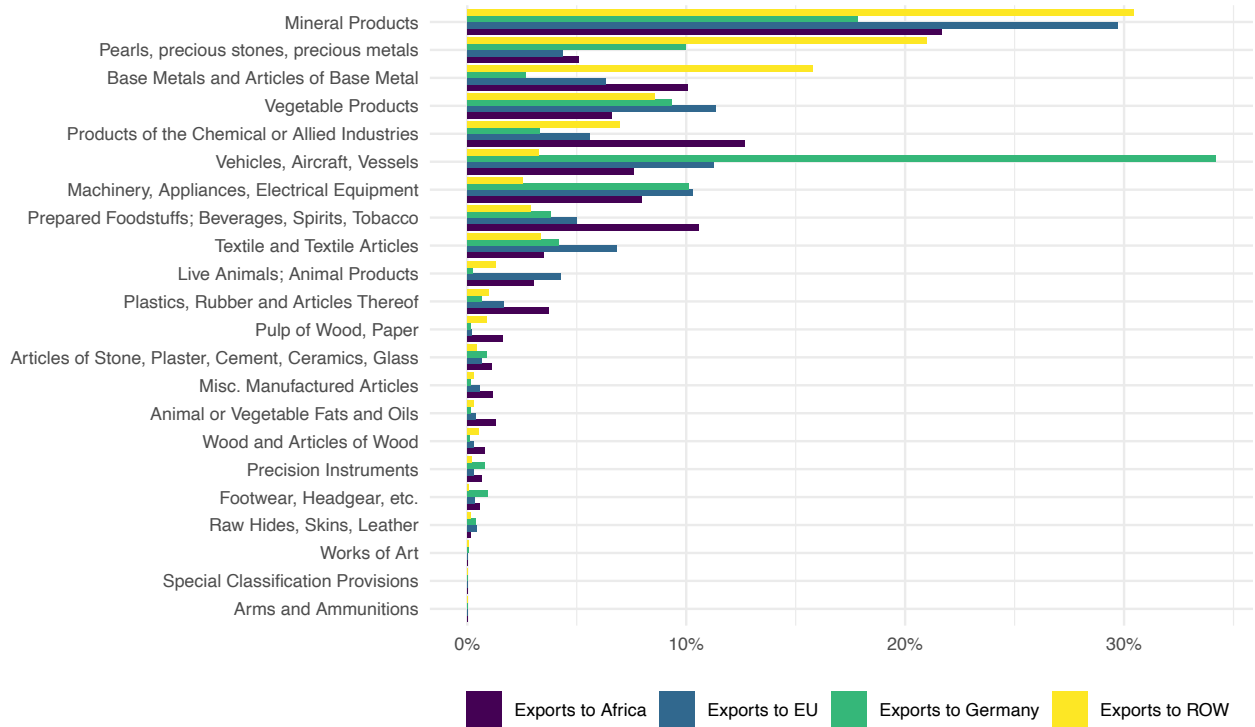


Figure 6: Top African import sectors in 2020

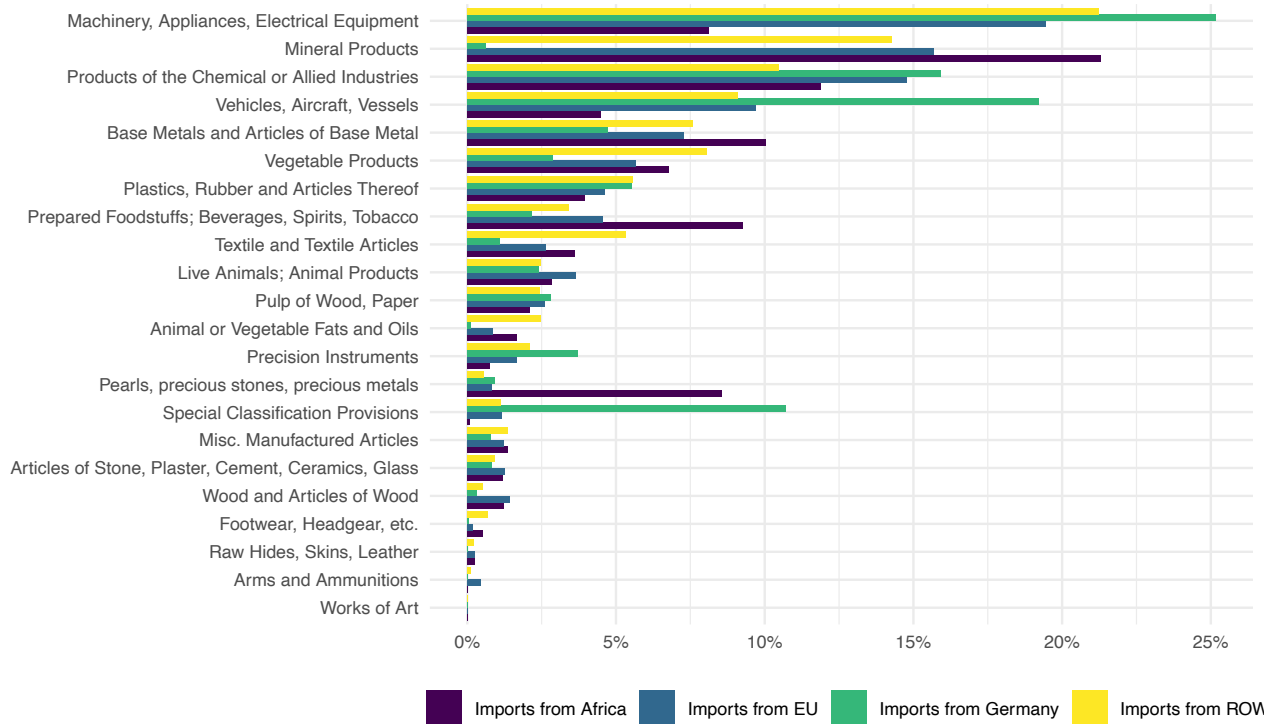
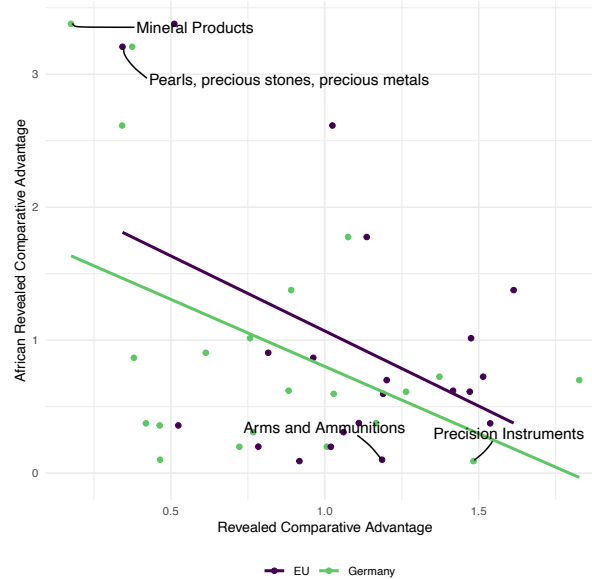


Figure 7: Revealed comparative advantage

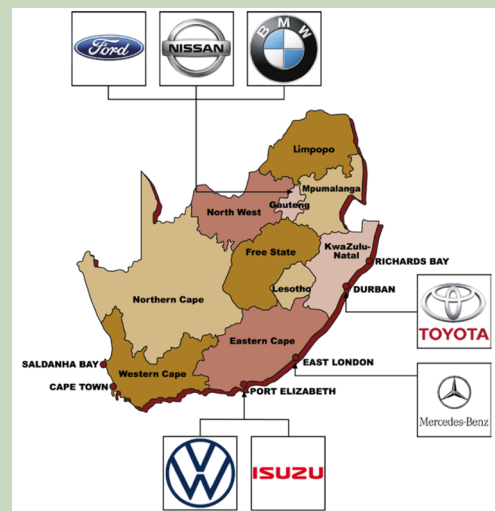


and Germany (green). The solid lines depict the overall trend. We see a negative relationship between the RCA of the AfCFTA members and the EU/Germany, pointing to very different specializations of African countries vs. Germany and other EU member states. This supports the expectation that EU/German exports are unlikely to be replaced by intra-African trade as a consequence of deepening of integration within the AfCFTA.

### Box 1: South-African Automobile sector

In Figure 5, we showed the importance of Germany as a trading partner for AfCFTA economies in the automotive sector wherein 37% of African exports to Germany are in the vehicles, aircrafts and vessels industries. South Africa is one example where this special relation is particularly visible. In 2019, 15.5% of total South African export value have been automotive exports with 151 export destinations. Germany plays an important role for South Africa: It is the top trading partner in Rand value terms for both imports and exports in that sector. Furthermore, the EU is the top trading region in this sector for South Africa and accounts for 73.8% of South Africa's total vehicle exports. While the contribution of the automotive sector to the GDP amounted only to 6.4% (retail and manufacturing) in South Africa in 2019, it is the largest manufacturing sector in the economy. Furthermore, it is one of the sectors with the highest Foreign Direct Investment (FDI) rates in South Africa. The country has thus become an important link in international supply chains in the global automotive industry. A key contribution to this development has been the establishment of Original Equipment Manufacturers (OEMs) of globally leading automotive manufactures in South Africa. As depicted in figure 8, three German manufacturers are among the automotive OEMs in South Africa, namely BMW, Volkswagen and Mercedes-Benz. In addition, South Africa has evolved into a globally competitive automotive component manufacturer.

Figure 8: Automotive clusters in South Africa



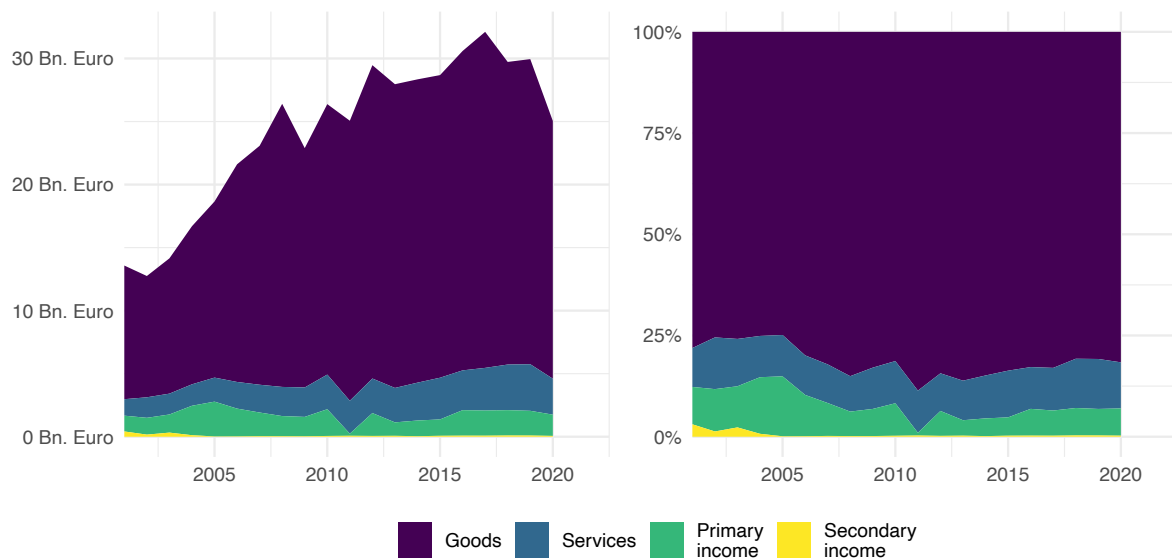
Source: Automotive Industry Export Council

Over the last three decades, Germany has been the top trading partner in the automotive component sector for South Africa. In 2019, 80% of South African automotive exports to Germany have been light vehicles, followed by automotive components such as catalytic converters (11%), engine parts (2%), radiators (0.5%) and suspension parts (0.5%).<sup>a</sup>

Vehicles manufactured in South Africa are not necessarily destined for sale in the domestic market, but the government's automotive policy regime allows manufacturers to earn duty credits with which they cost effectively import other vehicles. The policy regime encourages domestic OEMs to manufacture high volumes of selected models linked to export contracts to obtain economies of scale. Low-volume models are imported to complement domestic market demands, such as luxury cars from Germany.

<sup>a</sup> <https://www.aiec.co.za/downloads/AutomotiveExportManual2020.pdf>

Figure 9: Balance of payments: Absolute and relative inflows



### Balance of payments: Services trade

Complementary to bilateral trade data, balance of payments data allows us to examine another dimension of economic relations between the African continent and its partner countries. Data from Germany sourced from Deutsche Bundesbank in the figures below shows the evolution of the nature of financial transactions.<sup>9</sup> Four different categories of payments are shown:

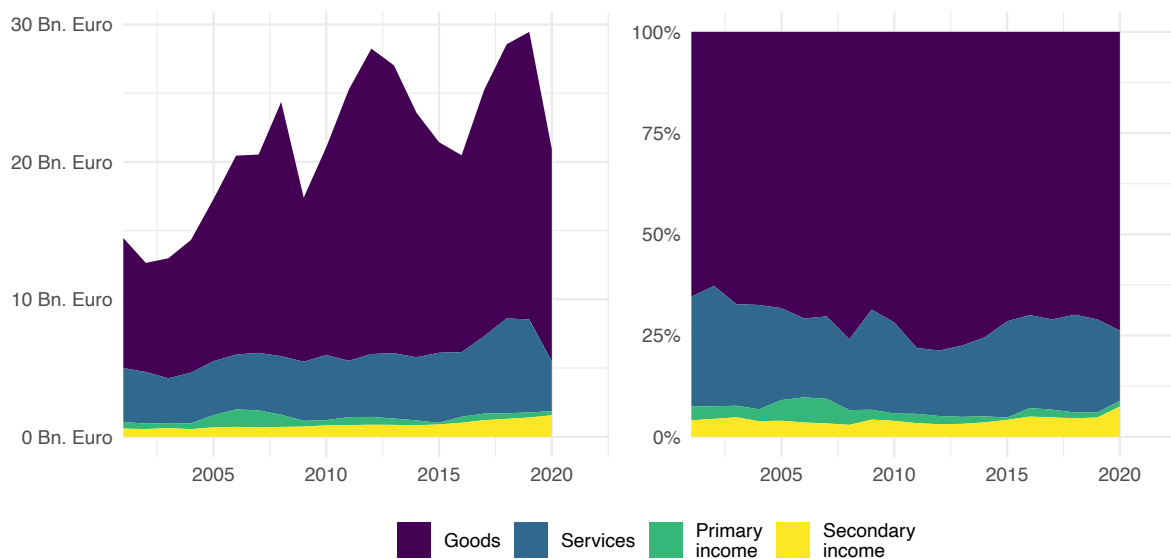
1. *Goods*, i.e. money transfers in exchange for traded goods,
2. *Services*, i.e. money transfers in exchange for traded services,
3. *Primary income*, i.e. income generated through economic processes such as FDI, as well as
4. *Secondary income*, i.e. other income such as international aid flows and remittances.

Figure 9 shows the inflows of payments to Germany from the African continent. Payments in exchange for goods trade — in this case for German exports — dominate the picture. Over 2000-2020, goods trade made up between 75 – 80% of all inflows, with a slight increase over time. Payments for services exports grew steadily in absolute terms, yet stayed stable in relative terms, making up about 11% of inflows. Primary income, i.e. flows generated from German FDI, peaked in 2005 with 13% of inflows, decreasing since then to approximately 7%.<sup>10</sup> Somewhat unsurprisingly, secondary income makes up only a minor fraction of flows.

<sup>9</sup> For further details, see <https://www.bundesbank.de/en>.

<sup>10</sup>Note that these flows can reflect both income from FDI, as well as divestments. Hence, these numbers reflect *changes* in FDI, not the absolute stock.

Figure 10: Balance of payments: Absolute and relative outflows



The picture is slightly different when looking at German balance of payments outflows as depicted in Figure 10. First, while overall strong growth is recorded over time, the overall volume is much more volatile, with steep downturns following the financial crisis of 2007, as well as in the years after 2012. Second, services trade takes a much more important role: An important 18% – 26% of outflows from Germany to the African continent consists of payments for imported services. Box 2 highlights the partner countries and sectors driving this aggregate result. Payments for imported goods still make up the largest fraction of payments, accounting for between 62% and 75% of outflows. Secondary income, i.e. remittances and development aid, account for between 8% and 11%.<sup>11</sup> Importantly, primary income, i.e. outflows connected to African investment in Germany, has declined from a high of about 8% in 2006 and 2007, to about 2% after 2012.

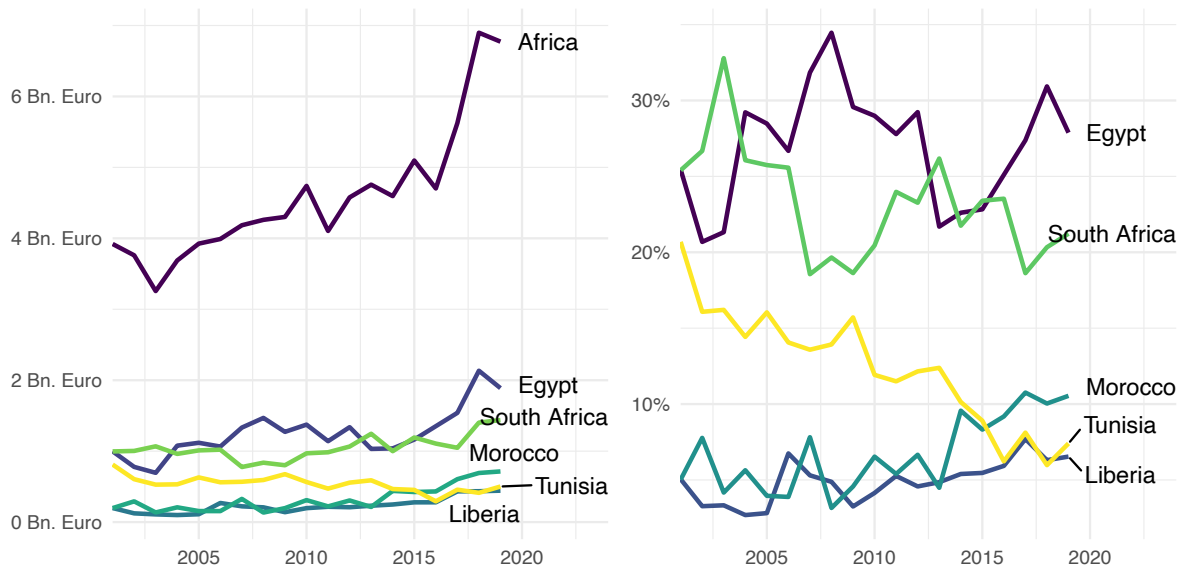
The impact of the Coronavirus pandemic in 2020 is visible in both outflows and inflows. While inflows declined by about 17 % and outflows by 23 %, the relative composition remained largely the same.

Figure 11 shows the German outflows of payments for imported services from the African continent from 2001 to 2019 by main trading partner. Payments for services imports increased from around 3.2 Bn. Euro in 2003 to almost 7 Bn. Euro in 2018. Among the five main partner countries are three from the geographic North of Africa, namely Egypt, Morocco and Tunisia. Payments for Egyptian services make up the largest fraction of payments, namely between 20% and 35% of outflows over time. Payments to South Africa have remained rather stable in absolute terms but have declined

<sup>11</sup>The average figures are of course driven by Nigeria and South Africa, the two biggest African economies, where aid and remittances are comparatively low. Many poorer African economies are highly dependent on aid and remittances.



Figure 11: Services Imports: Absolute and relative outflows by country

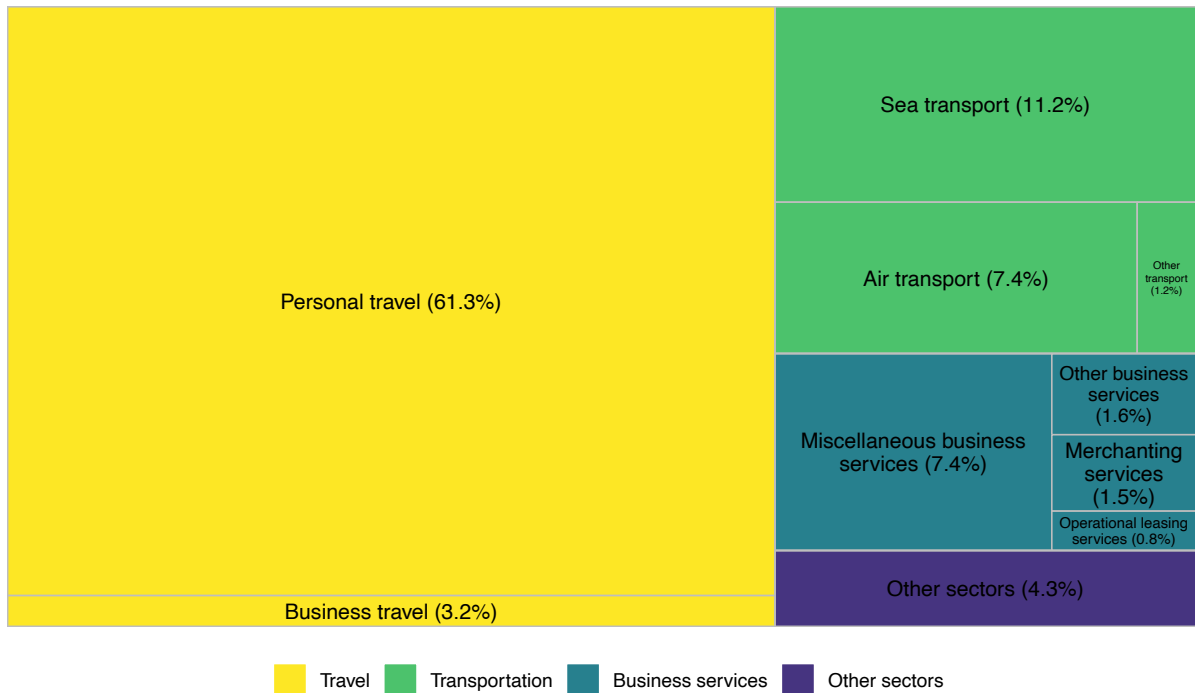


in relative terms from around 32% in 2003 to 20% in 2019. A similar picture can be drawn for Tunisia. While the payments to Tunisia were the third largest in 2001, making up 20% of outflows, they fell behind the ones from Morocco and Liberia — a global “superpower” for ship registrations — and represent only around 7% of outflows in 2019. In contrast, the outflows to Morocco have been slightly increasing in absolute and relative terms, from around 5% in 2013 to 10% in 2019. The absolute outflows to Liberia have remained stable over time. The total payments to the top five partner countries accounted for about 74% of German services outflows to Africa in 2019, while the payments to the next five partner countries — Kenya, Namibia, Mauritius, Nigeria and Tanzania — only amounted to about 11% of outflows.

Having examined the geographical distribution, we next consider the sectoral composition of services trade flows. As depicted in Figure 12, travel is the most important services import sector for Germany from the African continent, making up 64.6% of the outflows.<sup>12</sup> Payments for personal travel clearly dominate the outflows of this sector, with 61.4% compared to 3.2% for business travel. Thereafter follow the payments to services from the transportation sector and the business services sector, with 19.8% and 11.3% of outflows, respectively. Sea transport services (11.2%) exceed air services (7.4%) in the transportation sector, and miscellaneous business services (7.4%) dominate other business services (1.6%) and merchanting services (1.5%) in the business services sector. Payments to other

<sup>12</sup>Trade in services is not well documented in international databases. Most databases on international trade do not report services trade at all or only for a handful of countries and/or sectors. Figure 12 shows imports of services from four countries only, namely Morocco, Egypt, South Africa and Nigeria. Since three of those countries also represent the main trading partners for imported services from the African continent to Germany it is representative enough to draw conclusions about the sectoral distribution of these imports.

Figure 12: Services import sectors



sectors, such as construction, IT, communication and financial services sectors, play a minor role, only amounting to 4.3% of outflows.

### Box 2: German services imports from Africa

German outflows of payments for services imported from the African continent exceed the inflows for services exported (see Figures 9 and 10). This is a rather surprising result. Figure 12, however, shows that it is mainly the travel sector that makes the difference. The personal travel sector (tourism) alone makes up 61.4% of outflows to Africa. It also constitutes the largest fraction of payments to the main services export countries depicted in Figure 11. In 2018, outflows for personal travel accounted for about 1.6 Bn. Euro (76%) from the total 2.1 Bn. Euro of outflows to Egypt, for 0.7 Bn. Euro (50%) from the 1.4 Bn. Euro to South Africa, and for 0.4 Bn. Euro (57%) from the 0.7 Bn. Euro to Morocco. Payments to the transportation sector also play an important role in the German services deficit, amounting to almost 20% of outflows. In 2018, outflows for transport services made up about 22% of outflows to Egypt, 23% to South Africa, and 10% to Morocco.

**Summary:**

- Intra-Africa trade integration is shallow when compared to the levels of integration achieved within other major economic zones such as the EU.
- The EU is a major trade partner for the African continent and has dominated African imports and exports since the 1990s. However, it is increasingly displaced by Asia.
- For the EU itself, the African continent is a minor partner. Its share in total exports from the EU persistently stays around 2%. This trade concentrates in the geographical north of the continent as well as South Africa.
- Generally, African exports are dominated by commodities and raw materials. This industrial structure is markedly different from that of the EU and therefore reduces the likelihood of intra-African integration diverting trade away from the EU. Still, some trade hubs exist, showing a more diversified sectoral distribution, i.e. Germany's machinery and automotive trade with South Africa.
- Balance of payments data reveals that payments in exchange for goods trade dominate the structure of the African-German economic relationship.
- Interestingly, German imports of services from African economies exceeds its exports to the continent. This is dominated by expenses for travel.

### 3. Opportunities and risks for German and European companies through AfCFTA

We now turn to the quantification of the opportunities and risks resulting from the entry into force of AfCFTA for German and other EU companies.

#### 3.1. Quantitative analysis of expected export and import dynamics

To assess the economic effects of the agreement, we exploit a state-of-the-art quantitative model that allows us to compute so-called *counterfactual* scenarios of the global economy. These are simulations of the state of the world economy under different possible outcomes for the implementation of AfCFTA. These simulation exercises are carried out with the KITE model ("Kiel Institute Trade Policy Evaluation Model").

### Three Scenarios of AfCFTA Implementation

Overall, we investigate three potential scenarios which are outlined below. These scenarios represent successively higher levels of trade liberalization under the AfCFTA. Moreover, they allow us to identify the precise mechanisms through which the AfCFTA can generate trade creation or trade diversion effects for third party economies.

#### **Scenario 1** *Negotiated tariff reductions only*

In our first scenario, we examine the effect of completely eliminating all customs duties amongst AfCFTA states. In doing so, this scenario provides an upper-bound to the impact of tariff reduction, given that the AfCFTA tariff schedules mandate the elimination of most (97%) but not all tariff lines. Note that the AfCFTA does not alter the Most Favored Nation (MFN) or preferential tariffs imposed by the bloc's members on imports from non-AfCFTA economies. Accordingly, this scenario maintains the same rates for external tariffs as in the status quo.

#### **Scenario 2** *Tariff and bilateral NTB reductions*

In this scenario, we significantly deepen the extent of trade liberalization achieved by the AfCFTA. Under this counterfactual, the agreement lowers NTBs amongst the bloc's members by 10% in addition to eliminating all intra-AfCFTA tariffs. These NTBs are reduced only between AfCFTA economies whereas NTBs faced by third party exporters to AfCFTA remain unchanged. Phrased differently, this corresponds to an exclusively 'bilateral' reduction in NTBs by AfCFTA members. The elimination of import quotas under the AfCFTA can be considered a fitting example of such bilateral reductions in NTBs. While the AfCFTA mandates the removal of quantitative import restrictions within the bloc, they continue to apply to third party exporters.

#### **Scenario 3** *Tariff and multilateral NTB reductions*

Our final scenario further expands the scope of trade liberalization achieved by the AfCFTA. Similar to the two preceding scenarios, all intra-AfCFTA tariffs are eliminated. In addition, NTBs are lowered by 10% but now on a multilateral basis. This corresponds to decreasing NTBs amongst AfCFTA economies (as in Scenario 2) while also extending these NTB reductions to third party exporters to the AfCFTA. Such multilateralized NTB reductions can be realized even from an essentially plurilateral agreement like the AfCFTA. For instance, the agreement's provisions on improving customs procedures and transit systems can reduce red tape barriers faced by all firms trading with AfCFTA economies irrespective of their origin.

## KITE Model

We simulate these three scenarios with the KITE model (Chowdhry et al., 2020), a computable general equilibrium model of the global economy and international trade which is based on the trade model proposed by Caliendo and Parro (2015).<sup>13</sup> This model pays particular attention to intra- and international input-output linkages that reflect the cross-border nature of production today. Therefore the model reflects the modern world economy, where countries are highly interconnected through global value chains (GVCs). Moreover, in the context of our application, GVCs imply that countries that are not members of AfCFTA may still be affected by the agreement.

With the KITE model, we compare a baseline scenario (i.e., world without AfCFTA) with counterfactual scenarios in which the AfCFTA agreement is implemented upto varying degrees. In doing so, the KITE model can thus be used to quantify the long-term direct and indirect trade effects for African and European economies.<sup>14</sup> Moreover, it can be used to compute the AfCFTA's potential impact on labor markets, prices, GDP or welfare. The evaluation is disaggregated for 65 sectors and 141 countries (and groups of smaller countries), covering more than 90% of global economic activity. For the purposes of this study, we focus our description of the results on the impact of the agreement on AfCFTA members, Germany, and the EU-27. The baseline year is taken to be 2020, the most recent year for which there are accurate statistics on bilateral trade flows.<sup>15</sup> In doing so, we incorporate the effects of the COVID-19 outbreak on the magnitude and composition of global trade. Rather remarkably, the results are not dramatically different when assuming an earlier base year of 2019. This hints at no structural break in the global, and — importantly — African continental trading structure.

In the KITE model, the AfCFTA agreement is implemented through changes in trade costs. The role of NTBs and tariff adjustments can be addressed separately. For calibration, we use standard data sources. The global input-output database GTAP 10 (Aguiar et al., 2019) provides detailed information on intra-national sectoral linkages and GVCs. In addition, standard databases such as the UN Comtrade for trade data and the WITS and MacMaps databases for customs data are used to define the baseline scenario in our model. Finally, certain parameters that enter the model but are not directly observed can be estimated using econometric methods. These include “trade elasticities”, which measure the sensitivity of sectoral trade flows to changes in trade costs in those sectors — e.g., due to tariffs or NTBs. We calculate the required parameters using the well-known gravity model of international trade (Head and Mayer, 2014).

Table 2: Economic impact of the three different scenarios for AfCFTA member countries

	<i>Scenario 1</i> <i>Tariffs only</i>	<i>Scenario 2</i> <i>Tariffs + bilateral NTBs</i>	<i>Scenario 3</i> <i>Tariffs + multilateral NTBs</i>
Change in Global Exports	0.37 %	17.4 %	22.9 %
Change in intra-African Exports	0.38 %	23.0 %	19.9 %
Change in Exports to EU	-0.56 %	-21.6 %	36.3 %
Change in Tariff Revenue	-6.42 %	-38.7 %	15.5 %
Change in Income	≈ 0	11.6 %	18.7 %
Change in Production (real)	0.3 %	24.0 %	29.9 %

### 3.2. Results of the simulation exercise

Our simulation exercise with the KITE model reveals stark differences between the AfCFTA implementation scenarios for a range of economic outcomes. These are summarized in Table 2. Looking at Scenario 1, we observe that tariff elimination alone provides only a marginal boost to AfCFTA's global exports (0.37%), an increase which is directed only towards other AfCFTA economies. Meanwhile, tariff revenues earned by member states drop by more than 6%. This effect is driven primarily by the choice of the baseline year (2020) that witnessed increased intra-African trade flows due to severe disruptions in global value chains from COVID-19 related lockdowns in key trade partners of the bloc such as China and the EU. Eliminating all tariffs on these (higher) intra-African trade flows in the counterfactual correspondingly leads to falling tariff revenues. This significant reduction in tariff revenues negates any increase in income (defined here as nominal GDP) that AfCFTA members potentially experience from growth in their exports. Overall, the impact of the agreement on AfCFTA economies under this counterfactual is therefore low. This is also apparent when looking at the change in AfCFTA members' production or real GDP (0.3%).

In Scenario 2, we allow for NTBs to be reduced bilaterally amongst AfCFTA economies by 10% alongside complete tariff elimination. The results from this extension are markedly different in comparison to Scenario 1. Now, AfCFTA economies are seen to experience global export growth of more than 17%. The jump in intra-AfCFTA exports is even higher (23%), reflecting deeper regional trade integration. These outcomes highlight that NTBs, rather than tariffs, constitute the critical barrier to AfCFTA trade amongst its members. Under this scenario, we also observe significant trade diversion effects from the AfCFTA as the bloc's exports to the EU decline by 21.6%. In addition, EU exports to AfCFTA also contract by 13.8%. Given this shift in the composition of AfCFTA trade, tariff revenues in Scenario 2 also fall by 38.7%. However, this reduction is fully offset by higher export growth for the AfCFTA economies such that incomes (11.6%) as well as real GDP or production (24%) increase.

<sup>13</sup>We provide a technical description of the model in Appendix B.

<sup>14</sup>Note that the model does not include FDI due to lack of detailed bilateral investment data at the sectoral level.

<sup>15</sup>Data on trade flows for 2021 is affected by reporting issues.

Figure 13: Scenario 3: Change of total production

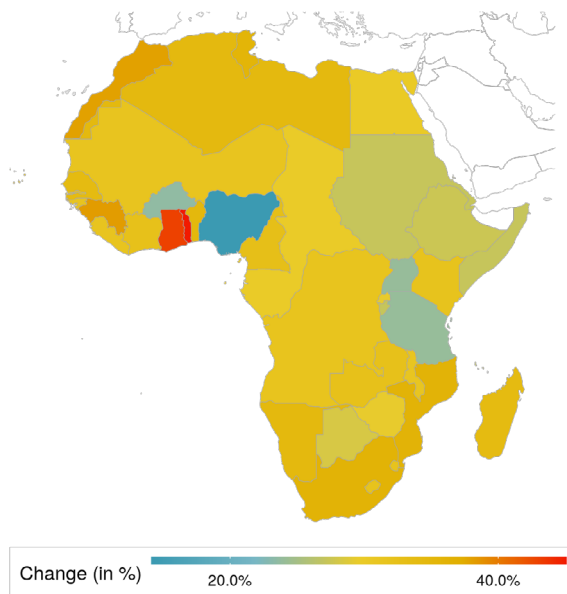
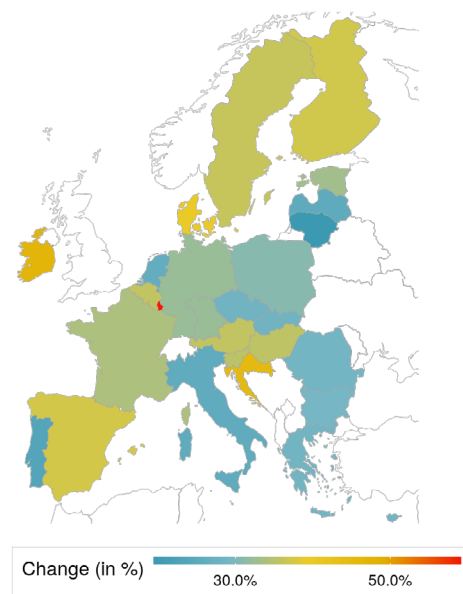


Figure 14: Scenario 3: Change of exports to AfCFTA



In our final scenario, we extend the AfCFTA's NTB reductions to third countries. This further magnifies the positive impact of the agreement on the bloc's economic outcomes. In comparison to previous scenarios, AfCFTA countries now benefit from the highest growth rate in their global exports (22.9%), tariff revenues (15.5%), income (18.7%) and production (29.9%). Therefore, by reducing NTBs towards non-AfCFTA exporters, the bloc's own gains from the AfCFTA are amplified. Across AfCFTA members, Ghana experiences the highest growth in aggregate production closely followed by Togo, Guinea, Morocco and South Africa (Figure 13).<sup>16</sup>

How do these different scenarios affect the EU? Across the three simulation exercises, we observe that the impact of the agreement on EU's aggregate production or output is negligible. This is due to the fact that the AfCFTA constitutes a relatively minor share of overall EU goods exports. This does not imply, however, that EU exports to AfCFTA economies remain unchanged. When the AfCFTA lowers NTBs on a *multilateral* basis, EU's aggregate exports to the bloc grow by 32%, further highlighting the importance of reducing such regulatory or infrastructural frictions to trade. Within the EU, all member state see an expansion of exports to AfCFTA under this scenario. Moreover, the largest EU economies (Germany, France, Italy, Spain and Netherlands) see similar export growth rates of around 30% vis-a-vis the status quo (Figure 14). Some EU members experience even higher export growth to AfCFTA such as Luxembourg, Denmark, Ireland and Croatia. In contrast, there is virtually no change in EU exports to AfCFTA under Scenario 1 and where only tariffs are reduced amongst AfCFTA

<sup>16</sup>See figures 18 and 19 for the spatial distribution of the change in of total production for scenarios 1 and 2. Note that the magnitude of the impact is significantly smaller than that of scenario 3.

economies.<sup>17</sup> Overall, these scenarios indicate that European companies benefit meaningfully from the AfCFTA only when the agreement lowers NTBs on a multilateral basis.

Figure 15: Change in German exports by destination and scenario

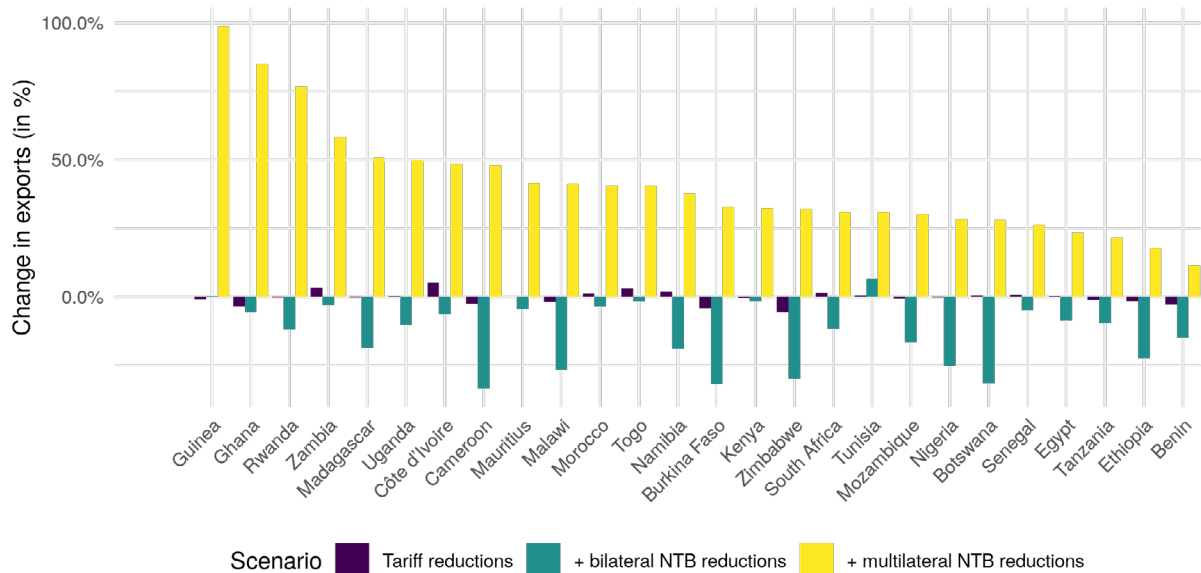
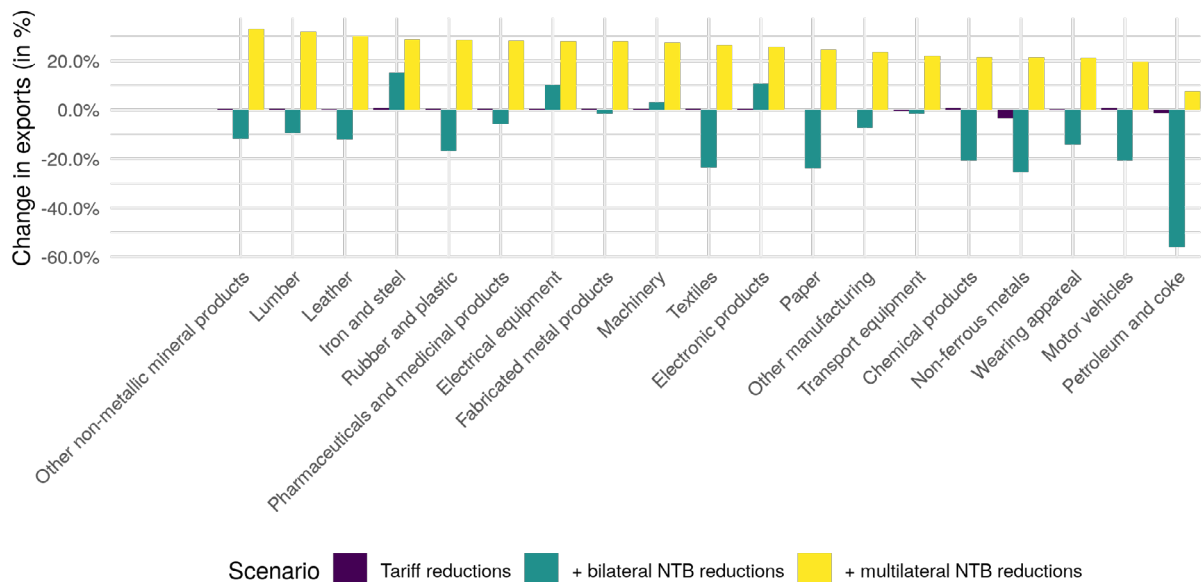


Figure 16: Change in German exports by sector and scenario



As discussed previously, Germany’s trading relationship with AfCFTA economies is unique within the EU. Therefore, we next turn to analysing the impact of these three scenarios on Germany’s exports to the bloc. Looking at Figure 15, we observe that — as expected — the export gains for Germany are highest under Scenario 3 and exhibit considerable heterogeneity across destinations. For instance,

<sup>17</sup>There is even negative impact on European exports in the case of Scenario 2 due to trade diversion created by the strong reduction in trade barriers on the African continent that does not extend to the rest of the world.



German exports to Guinea nearly double under this scenario.<sup>18</sup> For several other AfCFTA economies such as Ghana, Rwanda, Zambia, Madagascar and Uganda, Germany's export growth nears or exceeds 50%. We can also decompose changes in Germany's exports to AfCFTA economies by sector of economic activity (see Figure 16). As before, it is Scenario 3 that generates export growth for German companies to AfCFTA. This export growth is visible across the board for nearly all major industries. Export growth to AfCFTA is therefore substantial in all key German sectors such as motor vehicles (19.2%), pharmaceuticals (26.9%) and chemical products (21%). Note also, that in Scenario 2 a strong trade diversion — a displacement effect — is visible. Here, AfCFTA economies would source their imports more intensively from within the bloc — especially South Africa — resulting in a drop for EU exports to AfCFTA by 13.8%.

#### Summary:

- Tariff elimination alone provides only a marginal boost to AfCFTA's global exports. Gains from this are mainly offset by a significant reduction in tariff revenues.
- The main boost to trade comes from a reduction in NTBs. If the AfCFTA reduces NTBs by 10% for trade within the bloc, members would experience global export growth up to 17% alongside an even steeper growth in intra-AfCFTA exports (23%).
- Extending the AfCFTA's NTB reductions to third countries further magnifies the positive impact of the agreement on the bloc's economic outcomes.
- Global exports, tariff revenues, income and production show their highest growth rates when NTBs are reduced on a multilateral basis. Therefore, by reducing NTBs towards non-AfCFTA exporters as well, the bloc's own gains from the AfCFTA are amplified.
- For EU exports to AfCFTA members to grow, NTB cuts must to be multilateralized. Under this scenario, EU exports to AfCFTA jumps by 32% over the long run.
- For Germany, export growth to AfCFTA is substantial in all key German sectors such as motor vehicles, pharmaceuticals and chemical products.

## 4. Conclusion and main take-aways for private sector support of AfCFTA

Supply chains are becoming increasingly organised around mega-regional agreements with the emergence of new trade blocs such as the RCEP, CPTPP and CETA. In this context, the AfCFTA is a critical step towards building regional value chains on the African continent. Simulation results show that

<sup>18</sup>Note that the strong simulated growth stems from a low initial level of exports and is predominantly driven by manufacturing sectors, especially machinery and chemicals.

this ambitious agreement has the potential to address the chronically low levels of intra-African trade observed today and to spur economic growth across African economies. The agreement also presents a valuable opportunity for the EU to stem its declining share in African economies' trade baskets.

In order to capture the full benefits of economic integration, AfCFTA members must ensure that NTBs are effectively and irreversibly reduced during the agreement's implementation phase. Such NTBs should also feature prominently in ongoing negotiations to deepen the AfCFTA. Results show that even a 10% reduction in these NTBs can generate high growth in the bloc's global and intra-African exports. Moreover, when these NTBs are lowered on a multilateral basis, i.e. for all trading partners of the AfCFTA, the gains from the agreement are magnified for African economies and extend to the EU. German companies benefit substantially, experiencing export growth in most AfCFTA countries and across major goods sectors including machinery, motor vehicles, transport equipment and pharmaceutical products. In contrast, export and income growth are negligible for both AfCFTA and EU economies when only tariffs are eliminated for intra-African trade flows without corresponding NTB cuts. Overall, these results highlight that NTBs constitute a major obstacle for African trade integration and for EU exports to the continent.

In view of these findings, we recommend that public and private sector actors in Germany focus on the agreement's provisions concerning NTBs, carefully monitor future negotiations between AfCFTA members on NTBs and if feasible, provide technical support to AfCFTA economies in lowering NTBs on a *multilateral* basis. For instance, sharing best practices, technologies and information to modernize customs procedures in AfCFTA economies can lower costly red tape and documentation burden faced by German businesses. In addition, German companies should consider geographically diversifying their exports to Africa and tapping into new markets within the continent. This suggestion is motivated by the finding that multilateral NTB reductions produce high rates of revenue growth for German companies in economies that currently do not feature prominently in its export basket.

Beyond increasing engagement with AfCFTA states, German companies with experience of operating in African economies can provide ground-level insights to the EU on key trade bottlenecks. This can support the development of EU's strategy towards Africa and inform the EU's plans for infrastructure investment under the newly launched Global Gateway Initiative. Such EU-level investment in building and maintaining quality infrastructure in Africa offers new opportunities for German companies active in the construction/engineering/logistics sectors besides reducing costs of doing business in Africa more broadly for all German companies.

To conclude, the AfCFTA is a vital step towards deeper internal trade integration of African economies and their external integration with key partners such as the EU. However, the gains from signing the

AfCFTA are far from automatic. This study finds that economic outcomes rest heavily on members' willingness and capacity to lower NTBs consistently and broadly. With China's increasing influence in the region, the EU should bolster efforts to renew and modernize its long-standing economic partnership with African economies. By assisting in the agreement's implementation, the AfCFTA offers a valuable opportunity for the EU and Germany to demonstrate their support of Africa's economic growth and development. Businesses in the EU and Germany have a uniquely important role to play here. With their considerable knowledge and experience of African markets, they can inform ongoing efforts in both the EU and AfCFTA economies to reduce critical trade barriers.

## References

- Angel Aguiar, Maksym Chepeliev, Erwin Corong, Robert McDougall, and Dominique van der Mensbrugghe. The gtap data base: Version 10. *Journal of Global Economic Analysis*, 4(1):1–27, June 2019. ISSN 2377-2999.
- Rahel Aichele, Gabriel J Felbermayr, and Inga Heiland. Going deep: The trade and welfare effects of ttip. Available at SSRN 2550180, 2014.
- Lorenzo Caliendo and Fernando Parro. Estimates of the Trade and Welfare Effects of NAFTA. *Review of Economic Studies*, 82(1):1–44, 2015.
- Sonali Chowdhry, Gabriel Felbermayr, Julian Hinz, Katrin Kamin, Anna-Katharina Jacobs, and Hendrik Mahlkow. The economic costs of war by other means. Technical report, Kiel Policy Brief, 2020.
- Robert Dekle, Jonathan Eaton, and Samuel Kortum. Global rebalancing with gravity: Measuring the burden of adjustment. *IMF Economic Review*, 55(3):511–540, 2008.
- Andreas Dür, Leonardo Baccini, and Manfred Elsig. The design of international trade agreements: Introducing a new dataset. *The Review of International Organizations*, 9(3):353–375, 2014.
- Jonathan Eaton and Samuel Kortum. Technology, Geography, and Trade. *Econometrica*, 70(5): 1741–1779, 2002.
- Keith Head and Thierry Mayer. Gravity equations: Workhorse, toolkit, and cookbook. In *Handbook of international economics*, volume 4, pages 131–195. Elsevier, 2014.
- Julian Hinz and Evgenii Monastyrenko. Bearing the cost of politics: consumer prices and welfare in russia. *Journal of International Economics*, page 103581, 2022. ISSN 0022-1996. doi: <https://doi.org/10.1016/j.jinteco.2022.103581>. URL <https://www.sciencedirect.com/science/article/pii/S0022199622000137>.

## A. Additional plots

Figure 17: EU export destinations over time

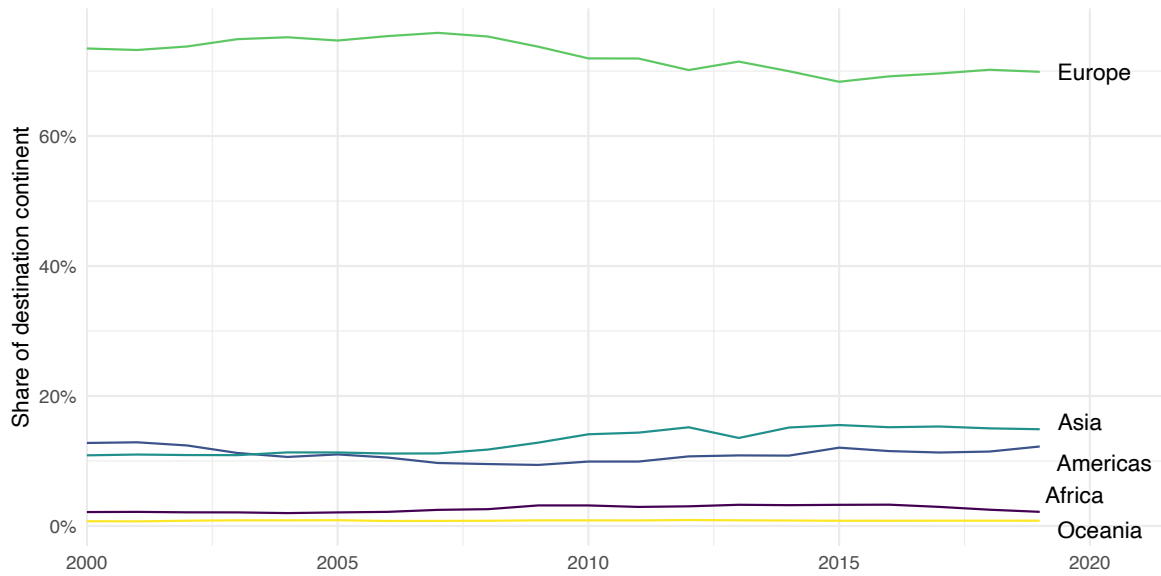


Figure 18: Scenario 1: Change of total production

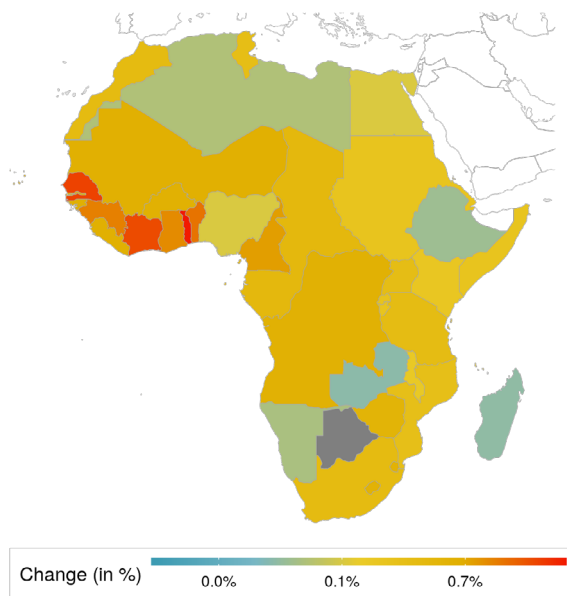
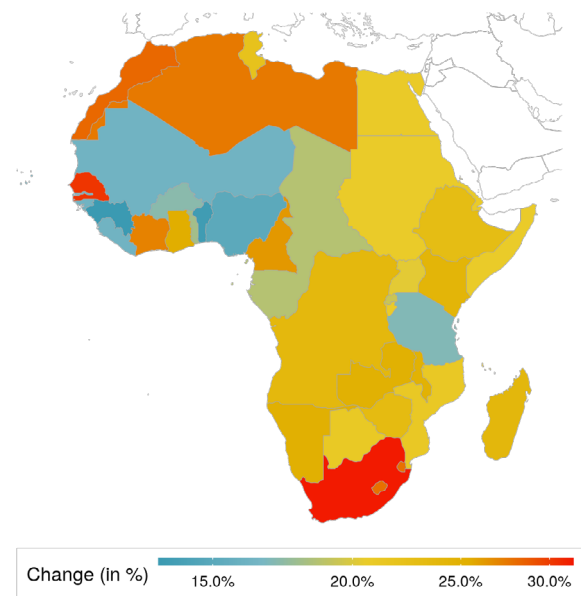


Figure 19: Scenario 2: Change of total production



## B. Technical description of the KITE Model

The KITE model builds on Caliendo and Parro (2015) and its implementation is similar to that of Aichele et al. (2014) and Hinz and Monastyrenko (2022). There are  $N$  countries, indexed  $o$  and  $d$ , and  $J$  sectors, indexed  $j$  and  $k$ . Production uses labor as the sole factor, which is mobile across sectors but not across countries. All markets are perfectly competitive. Sectors are either wholly tradable or non-tradable.

There are  $L_d$  representative households in each country that maximize their utility by consuming final goods  $C_d^j$  in the familiar Cobb-Douglas form

$$u(C_d) = \prod_{j=1}^J C_d^{\alpha_d^j} \quad \text{with} \quad \sum_{j=1}^J \alpha_d^j = 1.$$

where  $\alpha_d^j$  is the constant consumption share on industries  $j$ 's goods. Household income  $I_d$  is derived from the supply of labor  $L_d$  at wage  $w_d$  and a lump-sum transfers of tariff revenues. Intermediate goods  $\omega^j \in [0, 1]$  are produced in each sector  $j$  using labor and *composite* intermediate goods from all sectors. Let  $\beta_d^j \in [0, 1]$  denote the cost share of labor and  $\gamma_d^{k,j} \in [0, 1]$  with  $\sum_k \gamma_d^{k,j} = 1$  the share of sector  $k$  in sector  $j$ 's intermediate, such that

$$q_d^j(\omega^j) = z_d^j(\omega^j) \left[ l_d^j(\omega^j) \right]^{\beta_d^j} \left[ \prod_{k=1}^J m_d^{k,j}(\omega^j) \gamma_d^{k,j} \right]^{1-\beta_d^j}$$

where  $z_d^j(\omega^j)$  is the overall efficiency of a producer,  $l_d^j(\omega^j)$  is labor input, and  $m_d^{k,j}(\omega^j)$  represent the composite intermediate goods from sector  $k$  used to produce  $\omega^j$ . With constant returns to scale and perfectly competitive markets, unit cost are

$$c_d^j = \frac{\Upsilon_d^j w_d^{\beta_d^j}}{z_d^j(\omega^j)} \left[ \prod_{k=1}^J (P_d^k)^{\gamma_d^{k,j}} \right]^{1-\beta_d^j}$$

where  $P_d^k$  is the price of a composite intermediate good from sector  $k$ , and the constant  $\Upsilon_d^j = \prod_{k=1}^J (\gamma_d^{k,j} - \beta_d^j \gamma_d^{k,j})^{-\gamma_d^{k,j} + \beta_d^j \gamma_d^{k,j}} (\beta_d^j \gamma_d^j)^{-\beta_d^j \gamma_d^j}$ . Hence, the cost of the input bundle depends on wages and the prices of *all* composite intermediate goods in the economy. Producers of composite intermediate goods supply  $Q_d^j$  at minimum costs by purchasing intermediate goods  $\omega^j$  from the lowest cost supplier across countries, so that

$$Q_d^j = \left[ \int r_d^j(\omega^j)^{1-1/\sigma^j} d\omega^j \right]^{\sigma^j/(\sigma^j-1)}.$$

$\sigma^j > 0$  is the elasticity of substitution across intermediate goods within sector  $j$ , and  $r_d^j(\omega^j)$  the

demand for intermediate goods  $\omega^j$  from the lowest cost supplier such that

$$r_d^j(\omega^j) = \left( \frac{p_d^j(\omega^j)}{P_d^j} \right)^{-\sigma^j} Q_d^j$$

where  $P_d^j$  is the unit price of the composite intermediate good

$$P_d^j = \left[ \int p_d^j(\omega^j)^{1-\sigma^j} d\omega^j \right]^{1/(1-\sigma^j)}$$

and  $p_d^j(\omega^j)$  denotes the lowest price of intermediate good  $\omega^j$  in  $d$  across all possible origin locations, i.e.

$$p_d^j = \min_o \{ p_{od}^j \}. \quad (1)$$

Composite intermediate goods are used in the production of intermediate goods  $\omega^j$  and as the final good in consumption as  $C_d^j$ , so that the market clearing condition is written as

$$Q_d^j = C_d^j + \sum_{k=1}^J \int m_d^{j,k}(\omega^j) d\omega^j \quad (2)$$

Trade in goods is costly, such that the offered price of  $\omega^j$  from  $o$  in  $d$  is given by

$$p_{od}^j = \phi_{od}^j \cdot \frac{c_o^j}{z_o^j(\omega^j)} \quad (3)$$

where  $\phi_{od}^j$  denote generic bilateral sector-specific trade frictions. These can take a variety of forms — e.g. tariffs, non-tariff barriers, but also sanctions. In that case we can specify

$$\phi_{od}^j = \tau_{od}^j \cdot \kappa_{od}^j,$$

where  $\tau_{od}^j \geq 1$  represent sector-specific ad-valorem tariffs and  $\kappa_{od}^j \geq 1$  other iceberg trade costs. Tariff revenue  $(\tau_{od}^j - 1)$  is collected by the importing country and transferred lump-sum to its households. Ricardian comparative advantage is induced à la Eaton and Kortum (2002) through a country-specific idiosyncratic productivity draw  $z^j$  from a Fréchet distribution.<sup>19</sup>

The price of the composite good is then given as

$$P_d^j = A^j \left[ \sum_{o=1}^N \lambda_o^j (c_o^j \phi_{od}^j)^{-\theta^j} \right]^{-1/\theta^j} \quad (4)$$

<sup>19</sup>The productivity distribution is characterized by a location parameter  $\lambda_o^j$  that varies by country and sector inducing *absolute* advantage, and a shape parameter  $\theta^j$  that varies by sector determining *comparative* advantage.

which, for the non-tradable sector towards *all* non-domestic sources collapses to

$$P_d^j = A^j (\lambda_d^j)^{-1/\theta^j} c_d^j \quad (5)$$

where  $A^j = \Gamma(\xi^j)^{1/(1-\sigma^j)}$  with  $\Gamma(\xi^j)$  being a Gamma function evaluated at  $\xi^j = 1 + (1 - \sigma^j)/\theta^j$ . Total expenditures on goods from sector  $j$  in country  $d$  are given by  $X_d^j = P_d^j Q_d^j$ . The expenditure on those goods originating from country  $o$  is called  $X_{od}^j$ , such that the share of  $j$  from  $o$  in  $d$  is  $\pi_{od}^j = X_{od}^j / X_d^j$ . This share can also be expressed as

$$\pi_{od}^j = \frac{\lambda_o^j (c_o^j \phi_{od}^j)^{-\theta^j}}{\sum_{h=1}^N \lambda_h^j (c_h^j \phi_{hd}^j)^{-\theta^j}} \quad (6)$$

Total expenditures on goods from sector  $j$  are the sum of the firms' and households' expenditures on the composite intermediate good, either as input to production or for final consumption

$$X_d^j = \sum_{k=1}^J (1 - \beta_d^k) \gamma_d^{j,k} \sum_{o=1}^N X_o^k \frac{\pi_{od}^k}{\tau_{od}^k \zeta_{od}^k} + \alpha_d^j I_d \quad (7)$$

with  $I_d = w_d L_d + R_d + B_d$ , i.e., labor income, tariff revenue and the aggregate trade balance. Sectoral trade balance is simply the difference between imports and exports

$$B_d^j = \sum_{o=1}^N X_{od}^j - X_{do}^j \quad (8)$$

and the aggregate trade balance  $B_d = \sum_{j=1}^J B_d^j$ , and  $\sum_{d=1}^N B_d = 0$ , with  $B_d$  being exogenously determined. The total trade balance can then be expressed as

$$\sum_{j=1}^J \sum_{o=1}^N X_d^j \frac{\pi_{od}^j}{\tau_{od}^j \zeta_{od}^j} - B_d = \sum_{j=1}^J \sum_{o=1}^N X_o^j \frac{\pi_{do}^j}{\tau_{do}^j \zeta_{do}^j}. \quad (9)$$

A counterfactual general equilibrium for alternative trade costs in the form of  $\hat{\phi}_{od}^j = \phi_{od}^{j'}/\phi_{od}^j$ <sup>20</sup> can be solved for in changes following Dekle et al. (2008).

<sup>20</sup>I.e. where any variable  $\hat{x}$  denotes the relative change from a previous value  $x$  to a new one  $x'$ .





