UNITED NATIONS CONFERENCE ON TRADE AND DEVELOPMENT

Technical and statistical report

Non-tariff measures and deep regulatory integration in the **African Continental Free Trade Area**

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Executive Summary

The African Continental Free Trade Area (AfCFTA) brings together 1.4 billion people with a combined gross domestic product (GDP) exceeding US$ 3 trillion. The agreement has the potential to lift 30 million people out of extreme poverty and increase the incomes of 68 million more who earn less than $5.50 a day (World Bank, 2020). However, to fully realize its potential, Africa must address non-tariff measures (NTMs) – this includes outright non-tariff barriers (NTBs), sanitary and phytosanitary (SPS) measures, and technical barriers to trade (TBT). Given that NTMs are several times more costly than current tariffs (UNCTAD and World Bank, 2018), African Union Member States committed to a "*progressive elimination of NTBs*" and "*enhanced cooperation in the areas of TBT and SPS measures*" (Article 2.2 of the Protocol on Trade in Goods of the AfCFTA Agreement).

This report aims at supporting the African Union's goal of increasing trade to foster structural transformation. First, it measures the costs of NTBs and the benefits of their elimination as African countries build a free trade area. Second, it analyses SPS measures and TBT to explore the most beneficial venues of regulatory convergence.

NTBs are trade policy instruments that specifically target changes in quantities or prices of imported goods, such as quotas or price controls. Most of these instruments are already prohibited under WTO rules and are further restricted by the AfCFTA, but some still persist. Non-automatic licenses are the most common NTBs in the AfCFTA, followed by prohibitions. Econometric analysis in this report finds average NTBs ad-valorem equivalent costs of only 0.4 in agri-food and 2.3 per cent in manufacturing. However, these low averages are due to their generally low incidence. Where these barriers occur, they are very costly, with impacts of 38 per cent in agri-food and 14 per cent in manufacturing. A Computable General Equilibrium (CGE) model in this report shows that the elimination of NTBs for intra-Africa trade increases economic welfare by US$ 1.5 billion.

The AfCFTA NTB reporting, monitoring, and elimination mechanism, based on Annex 5 of the Protocol on Trade in Goods, allows the private sector to report the barriers they face. Governments are obliged to follow up and address them. While the mechanism is ahead of the curve in global comparison, governments need to fully commit to create trust and eliminate barriers.

A more complex challenge are technical measures: SPS measures and TBT. These measures are primarily designed to meet legitimate public policy objectives, such as protecting human, plant, and animal life and health, ensuring national security, and safeguarding the environment. Furthermore, they usually apply to domestic and imported products alike. The data reveals that while almost all trade in agri-food products in Africa is subject to SPS measures or TBT, the regulatory intensity is 30 per cent lower than the global average. In manufacturing sectors, African countries apply 50 per cent fewer technical measures than the worldwide average. This report estimates ad valorem equivalents of technical measures of 12.8 per cent in the agri-food sector and 1.8 per cent in manufacturing. The low aggregate impact of technical measures in manufacturing is misleading because they are applied to only 36 per cent of products in intra-Africa trade. However, for products where they are applied, the estimated impact is 5.4 per cent; and reaching double-digits in thousands of cases.

The regulatory differences between technical measures across countries significantly contribute to trade costs. Since technical measures cannot be eliminated due to their critical public policy impacts, regulatory convergence offers a viable path to reducing costs associated to their compliance, increasing competitiveness, and promoting intra-Africa trade. The report uses extensive data on mandatory SPS measures and TBT in 121 economies, including 32 African countries, and finds significant potential to increase regulatory convergence in the AfCFTA and beyond. Furthermore, as countries develop and naturally apply more SPS and TBT requirements, regulatory divergence could grow further. To avoid this, the WTO agreements and AfCFTA Annexes on SPS measures and TBT provide for transparency, regulatory cooperation and good regulatory practices – the key is implementation. The data collection in Africa for this report showed that transparency is often lacking and that trade costs could be reduced by online publishing all mandatory regulations with free and public access.

Regulatory cooperation and convergence can follow multiple pathways. The analysis shows that the regulations of the largest global markets (for example, United States of America, European Union, China, India) are highly divergent among each other and from those in African countries. For Africa, converging toward the SPS measures and TBT of one major market could lead to regulatory divergence with other large markets, including within Africa itself. Disdier et al. (2015) assesses this risk of “lock in” or “hub-and-spoke” trade structures: adopting a specific set of regulations from a developed market may increase exports to that market, but tends to result in higher domestic prices, reduced South-South trade and less diversification into new markets.

An alternative approach of regulatory convergence is the adoption of international or regional standards. While standards are voluntary recommendations by standard-setting bodies, their contents can be made mandatory by incorporation into national legislation and thus become SPS measures and TBT. Disdier et al. (2015) find that countries following international standards increase their overall exports. This report therefore also analyses the status quo as well as potential of convergence of countries' mandatory SPS measures and TBT towards the recommendations of relevant international and regional standards: The AfCFTA Annex on SPS measures and the WTO SPS Agreement recommend the use of Codex Alimentarius, International Plant Protection Convention (IPPC) and World Organization for Animal Health (WOAH), and the AfCFTA Annex on TBT recommends the adoption of standards from the African Organisation for Standardisation (ARSO).

While the three international standards recommend more than three times as many measures as currently applied by the average African country, they offer a "menu" of measures from which countries can select the most appropriate ones for their stage of development. An assessment of the ARSO standards for cereals and pulses reveals that ARSO is pursuing a strategy that aligns with the continent's needs: choosing subsets of the three international standards that fit the African context and represent a realistic common target for the region. First, the total number of measures recommended by ARSO is consistent with the average number of measures applied by African countries. Second, 90 per cent of ARSO's recommended measures align with Codex-IPPC-WOAH standards. While this would be an ideal approach, the uptake by African countries is relatively low. The AfCFTA sub-committees on SPS measures and TBT as well as the African Continental Technical Regulatory Framework (ACTReF) need to further promote regulatory coordination to reduce costs and promote intra-Africa trade.

The modelling in the report confirms the significant benefits of regulatory convergence. The costs of TBT and SPS measures can be reduced by 30-40 per cent. The CGE simulations show that intra-Africa regulatory convergence can increase economic welfare by US$ 3.4 billion – more than double the benefits of the mere elimination of NTBs. If Codex-IPPC-WOAH standards are followed in the process of convergence in agri-food sectors, trade with the rest of the world also grows and the economic benefits jump to US$ 7.1 billion.

In the latter scenario, welfare gains are primarily driven by productivity growth and capital growth through investment. Intra-Africa trade grows by 6 per cent. Real wages are predicted to rise by 0.8 per cent on average across African countries. Agri-food products account for US$ 850 million in additional exports from African countries, whereas industrial products contribute US$ 2.8 billion. In agri-food products, the reforms particularly drive the growth of trade in processed agricultural products such as meat and vegetable oils. In the industrial sector, the main contributors to additional African exports are machinery and equipment, and basic pharmaceuticals. The results suggest that the reforms are promoting sectoral structural transformation towards agri-food processing and manufacturing.

Abbreviations

ACTReF	African Continental Technical Regulatory Framework
AfCFTA	African Continental Free Trade Area
ARSO	African Organisation for Standardisation
CGE	computable general equilibrium
EAC	East African Community
ECOWAS	Economic Community of West African States
GDP	gross domestic product
GTAP	Global Trade Analysis Project
IPPC	International Plant Protection Convention
NTMs	non-tariff measures
NTBs	non-tariff barriers
SADC	Southern African Development Community
SPS	sanitary and phytosanitary
TBT	technical barriers to trade
TRAINS	Trade Analysis and Information System
UNCTAD	United Nations Conference on Trade and Development
WOAH	World Organization for Animal Health
WTO	World Trade Organization

1. Introduction

"Creating One African Market" critically depends on addressing non-tariff measures. Using newly collected data, this report analyses their incidence and costs. For outright non-tariff barriers, such as quantitative restrictions and price control measures, a general equilibrium model assesses the benefits of their full removal for intra-Africa trade. For technical measures (TBT and SPS measures) that aim at protecting health or the environment, the model simulates the economic benefits of regulatory convergence within Africa and towards international standards.

The AfCFTA Agreement was signed in March 2018, ratified by the required number of countries by May 2019, and came into force in January 2021. If all members ratify it, the agreement will bring together 1.4 billion people with a combined GDP of more than US$ 3 trillion.

Regional integration is contributing to economic prosperity and sustainable development. A reduction of intra-Africa trade costs leads to enhanced market integration, increased regional trade and greater economic efficiency. Intra-Africa trade is generally more sophisticated than African exports outside of the continent, thus providing opportunities for economic development (Knebel et al, 2019). "The general objectives of the AfCFTA are to (a) create a single market […] and (b) create a liberalised market for goods" (AfCFTA Agreement, 2018).

Achieving the aim of "Creating One African Market" will critically depend on addressing NTMs – not only tariffs. The economic restrictiveness of NTMs is several times higher than that of current tariffs (UNCTAD and World Bank, 2018).

This importance was recognised in the AfCFTA negotiations and is reflected in the Protocol on Trade in Goods, which includes the following overall objectives to increase intra-Africa trade in goods:

"Article 2.2: Objectives: […]

b) progressive elimination of non-tariff barriers;

d) enhanced cooperation in the areas of technical barriers to trade and sanitary and phytosanitary measures; […]"

Consequently, several annexes to the Protocol were agreed: Non-Tariff Barriers (NTBs, Annex 5), Technical Barriers to Trade (Annex 6), Sanitary and Phytosanitary Measures (Annex 7). The Annexes on Customs Cooperation and Mutual Administrative Assistance (Annex 3), Trade Facilitation (Annex 4), and Transit (Annex 8) are also relevant for the procedural and logistical implementation of technical measures and NTBs. The African Union Ministerial Specialised Technical Committee for Trade, Tourism, Industry and Minerals also adopted the ACTReF in May 2024 to promote regulatory convergence.

Two types of NTMs are broadly distinguished: technical measures and outright NTBs. Technical measures comprise SPS measures and TBT. These are public policy regulations with legitimate non-trade objectives. Outright NTBs have economic and protective objectives and include quantitative restrictions and price control measures.

Using newly collected data, this report will contribute to the understanding of NTBs and technical measures in AfCFTA Member States and State Parties. For SPS measures and TBT, regulatory similarity/dissimilarity is analysed across countries and vis-à-vis international and regional standards.

Section 2 will present how the NTM data was collected. This includes definitions and classification of NTMs, and data coverage. In addition to collecting national regulations, data was also collected for international standards in the agri-food sectors, namely Codex Alimentarius, International Plant Protection Convention (IPPC) and World Organisation for Animal Health (WOAH), and for selected subsector standards of the African Organisation for Standardisation (ARSO).

Section 3 will then show descriptive statistics of the data mapping. The section will introduce various measures of regulatory similarity and dissimilarity, specifically the "regulatory distance" and indicators of over-regulation and under-regulation. The results will be visualized in geographical map-like graphs that show the levels of regulatory similarity across countries and vis-à-vis the recommendations of international and ARSO standards.

Section 4 will present the results of an econometric analysis to estimate the impacts, or ad valorem equivalents, of technical measures and NTBs in Africa and the potential cost reductions from regulatory reform.

Section 5 uses the estimates from Section 4 within a CGE model. This allows an assessment of the wider economic impact of the reform scenarios on overall welfare, GDP, wages, and country-specific as well as sector-specific trade growth.

Section 6 will conclude by summarizing the results and drawing policy recommendations.

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2. Data on non-tariff measures

The non-tariff measures database covers 121 countries, including 32 in Africa, as well as Codex-IPPC-WOAH international standards and selected ARSO standards. The 20,000 regulations in the database are classified into 90,000 detailed measures according to the International Classification of Non-Tariff Measures.

2.1. The international classification of non-tariff measures

To fully grasp the following analyses, it is necessary to understand how the underlying data has been collected and classified.

The *International Classification of NTMs* (UNCTAD and Multi-Agency Support Team, 2019) was developed under the leadership of UNCTAD with the Multi-Agency Support Team.[1] The result is a universally accepted common language to enable data collection, quantification, analysis, and increased transparency of NTMs. The classification allows distinguishing between technical measures and non-tariff barriers.

Technical measures comprise SPS measures and TBT, and are mostly aimed at fulfilling public policy objectives, such as the protection of human, plant, and animal life and health, national security, or the environment. Their primary focus is not related to trade and they should apply equally to domestic and foreign products. Nevertheless, such measures are incorporated in international trade rules and are therefore considered NTMs. To enable a detailed analysis, the NTM classification disaggregates 34 types of SPS measures and 23 types of TBT.

Non-tariff barriers comprise the instruments of trade policy that specifically aim to protect domestic production from foreign competition through changes in quantities or prices of imported goods, such as quotas, price controls, or contingent trade-protective measures. Further detail on the classification is presented in annex 7.1.

2.2. Data collection – globally and in the AfCFTA

For decades, UNCTAD has been leading international efforts to collect data on NTMs. For data to be comparable across countries, the collection follows the *International Classification of Non-Tariff Measures* (UNCTAD and Multi-Agency Support Team, 2019) and the *Guidelines for the Collection of Data on Official Non-Tariff Measures* (UNCTAD, 2023). Globally, the database now covers 121 countries, over 20,000 different regulations, and 90,000 distinct measures.

Upon the requests of AfCFTA Member States and State Parties, UNCTAD rolled out the regulatory transparency initiative during the period from 2020 to 2024. The data collection process includes capacity building and multi-stakeholder workshops with all relevant regulatory ministries and agencies responsible for trade, investment, environment, agriculture, health, customs, standards/metrology, finance, and others.

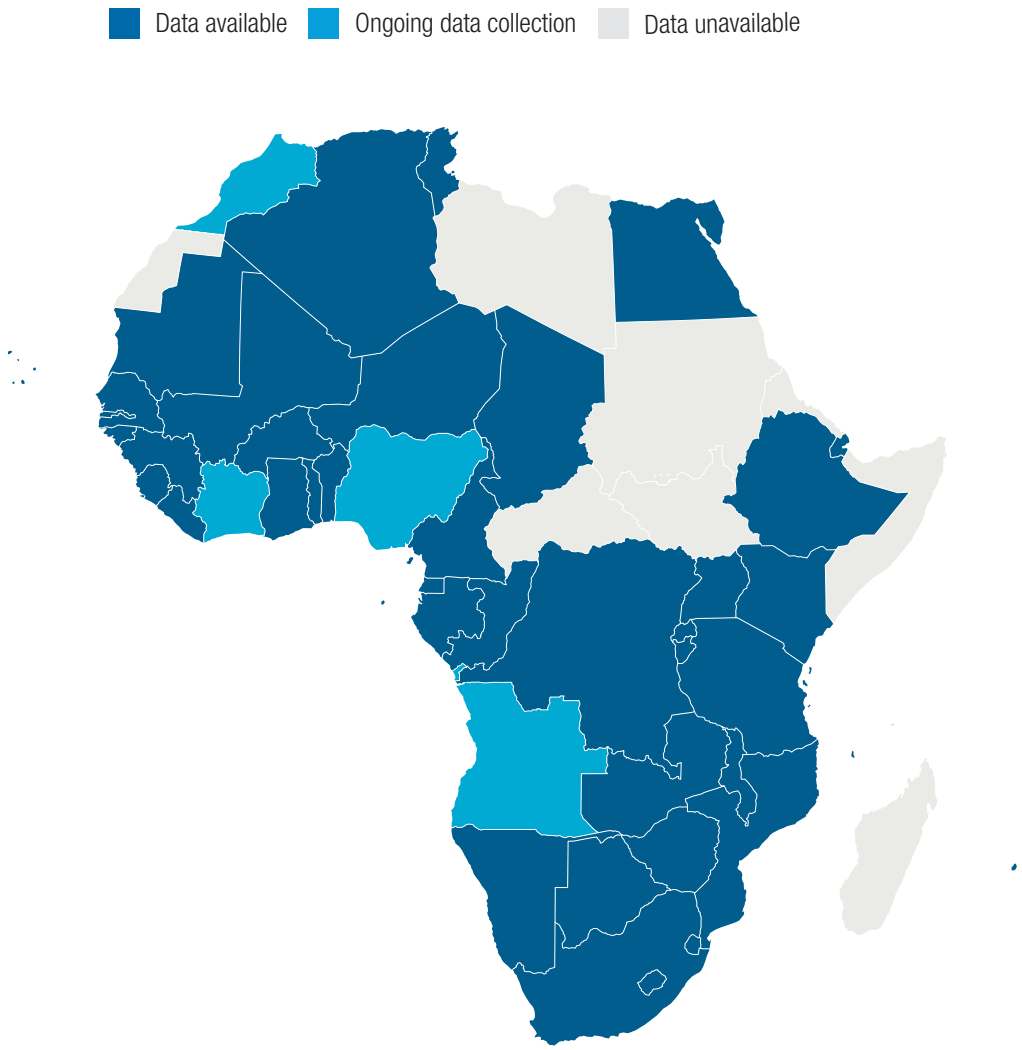
The final data coverage used for this report is indicated in dark blue in Figure 1.

Technical measures are mostly aimed at the protection of health, national security, or the environment.

Non-tariff barriers aim to protect domestic production from foreign competition.

[1] Food and Agriculture Organization of the United Nations, International Trade Centre (ITC), Organisation for Economic Co-operation and Development (OECD), United Nations Industrial Development Organization (UNIDO), World Bank, and World Trade Organization (WTO).

Figure 1
Data coverage of African countries



Source: UNCTAD illustration based on the TRAINS database as of February 2024.

2.3. Mapping international and ARSO standards

While NTMs refer to mandatory government regulations, standards refer to voluntary recommendations. Nevertheless, their substantive contents are comparable. In fact, the WTO SPS Agreement and the AfCFTA Annex on SPS measures, recommend the adoption of Codex Alimentarius, WOAH and IPPC standards into national mandatory measures.

Furthermore, the AfCFTA Annex on TBT recommends that State Parties follow ARSO standards. However, no data was available on the level of adherence to these standards.

To fill this information gap, UNCTAD mapped out the three international standards and ARSO regional standards with the same methodology as for the collection of mandatory measures at national level, using the international classification of NTMs. This exercise made the data collected from these

standards comparable with mandatory SPS measures and TBT from national legislation.

All recommendations from Codex, IPPC and WOAH related to agri-food products were mapped out (United Nations, 2019) and yielded 1991 recommended measures from 350 full text standards. ARSO standards developed for *cereals, pulses and derived products* under ARSO/TC 12 and *disinfectants* under ARSO/TC 80 comprised 238 recommended measures from 35 standards.

The mapping of these standards allows comparisons between ARSO and Codex-IPPC-WOAH as well as with national mandatory regulations for the sector of *cereals, pulses and derived products*. For *disinfectants*, comparisons are feasible between ARSO standards and country regulations, particularly in Africa. These comparisons are shown in section 3.3 and are used to estimate the potential and benefits of regulatory convergence in sections 4 and 5.

2.4. Dissemination of data on non-tariff measures

All data collected by UNCTAD and its many partners is gathered in the TRAINS database. This database has grown into the most complete collection of publicly available information on NTMs with cross-country comparability. To inform policymakers and help traders move goods across borders, UNCTAD has developed a dissemination portal for data on NTMs and worked with partners on other portals. The three main portals are as follows:

- TRAINS dissemination portal at https://trainsonline.unctad.org – for policymakers
- World Integrated Trade Solution at https://wits.worldbank.org – for researchers
- Global Trade Help Desk https://globaltradehelpdesk.org – for the private sector

All three portals draw information on NTMs from the same database, TRAINS. However, their user interfaces are aimed at different clients.

The mapping of these standards allows comparisons between ARSO and Codex-IPPC-WOAH as well as with national mandatory regulations.

3. Descriptive mapping of results

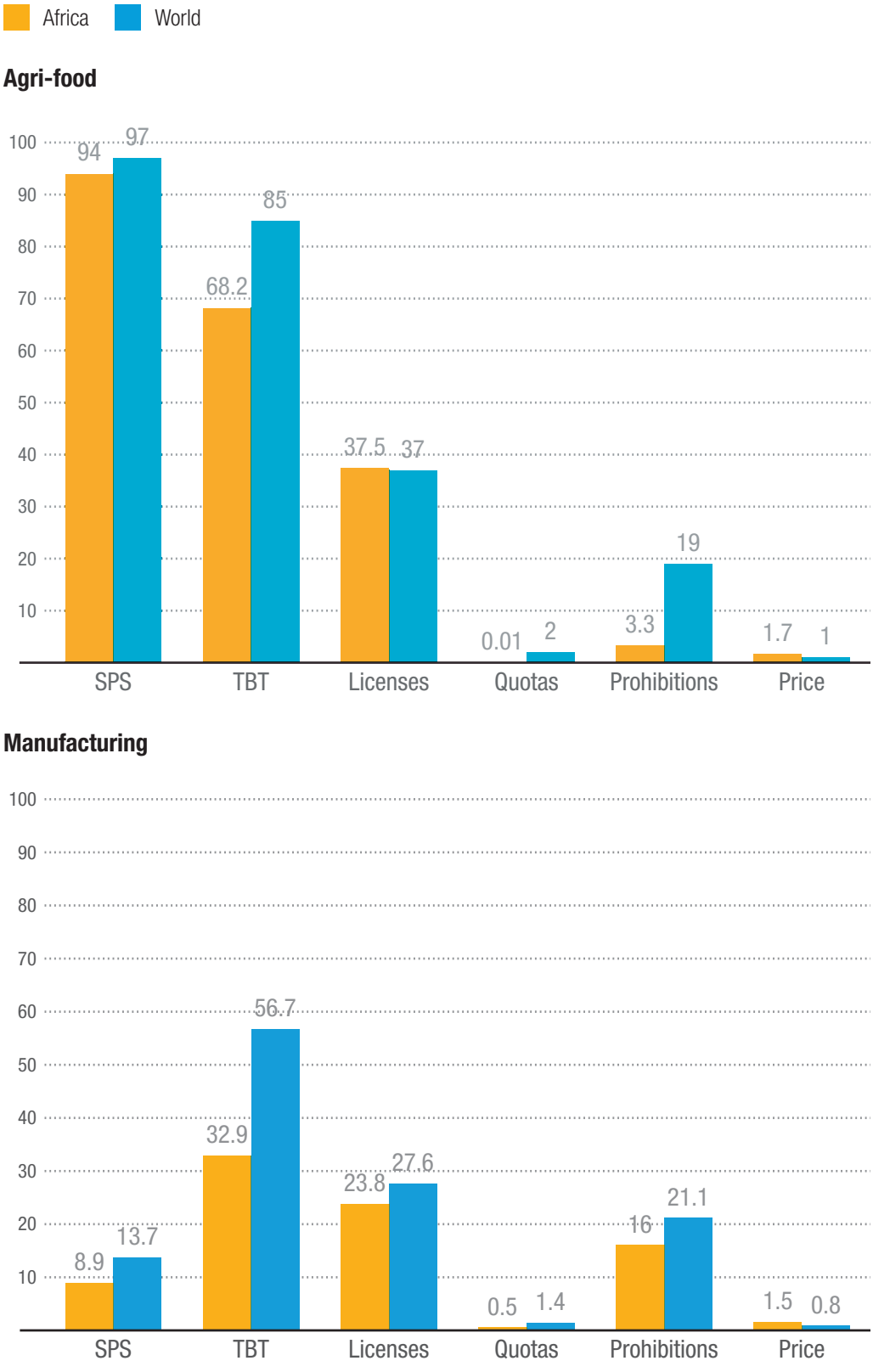
Almost all agri-food products across African countries are regulated by at least one SPS measure or TBT. However, per product, African countries apply 30 per cent fewer measures than the global average. In manufacturing sectors, African countries apply 50 per cent fewer technical measures than the average. Regulatory differences between technical measures across countries are a major driver of trade costs. African countries are similar in their relatively low levels of regulation, but much potential for increased regulatory convergence remains. For agri-food sectors, international standards provide a "menu" of recommendations. However, only partial implementation of these standards is realistic, as they comprise three times more measures than currently applied by African countries. ARSO standards suggest a subset of international standards that could fit the African context and be a realistic common target for the region. Among outright NTBs, non-automatic licenses are the most common type, followed by prohibitions. Other types of NTBs are rare.

3.1. Incidence of technical measures, quantitative restrictions, and price controls

Figure 2 gives a first overview of the types of NTMs applied by African countries and globally. It shows that almost all agri-food products are regulated by SPS measures (94 per cent in African countries and 97 per cent in the world) and to a high extent by TBT (68 and 85 per cent, respectively). The incidence is high in Africa and even a bit higher at the global level. Due to the nature of these measures to protect health, the environment, and against pests, it is normal for the product coverage to be almost complete in agri-food sectors. Non-automatic licenses are the most common type of outright NTBs, affecting close to 40 per cent of products in Africa as well as globally. While prohibitions for non-technical reasons are infrequent in Africa, they affect 18 per cent of products at a global level. Other types of barriers are rather rare.

In manufacturing sectors, TBT measures are the most frequent. While 33 per cent of products are regulated by African countries, the share is even higher at the global level with 57 per cent. Licenses and quotas also persist for around 20 per cent of products in Africa and the rest of the world.

Figure 2
Frequency index of non-tariff measures globally and in Africa, by type and sector



Source: UNCTAD calculations and illustration based on the TRAINS database.

3.2. Prevalence of technical measures in key sectors

Figure 3 presents a more detailed assessment of the SPS measures and TBT applied in two sectors and two subsectors. It shows the average number of distinct measures per product or, in other words, the intensity of regulation. The assessment also compares the global and African averages of mandatory measures with the voluntary recommendations of Codex-IPPC-WOAH and ARSO.

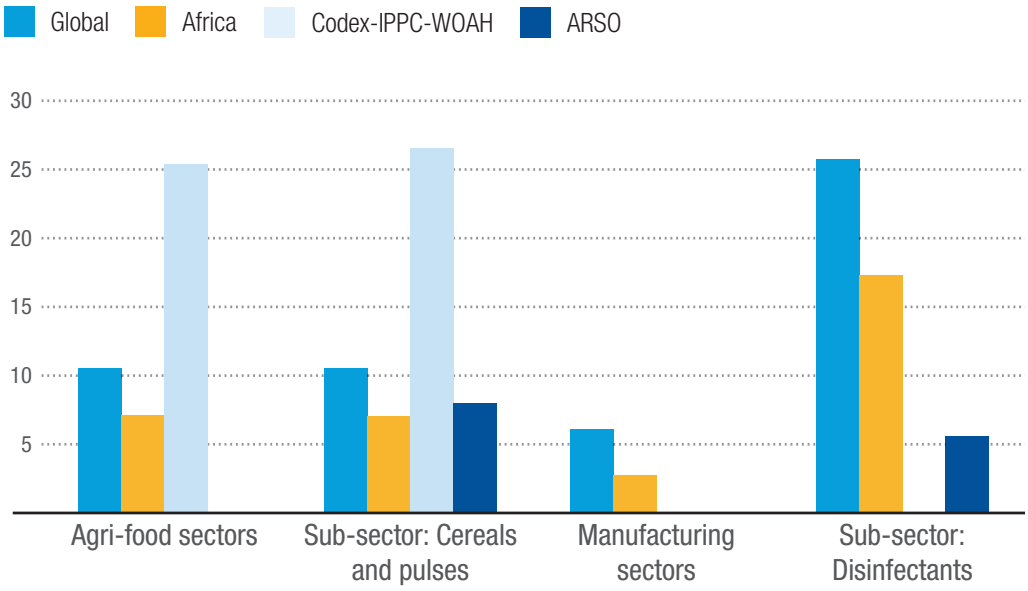
In general, agri-food sectors are much more heavily regulated than manufacturing sectors. In terms of the global average, while 10.5 SPS measures and TBT are applied per product in agri-food sectors, only 1.8 measures are applied in manufacturing. African countries regulate less intensively, with 7.1 measures in agri-food and 0.8 measures in manufacturing. Globally and at the African level, the cereals and pulses subsector is regulated with the same intensity as the average of agri-food sectors. The subsector of disinfectants, however, is regulated much more than the average manufacturing sector: 7.7 and 5.2 measures are applied per product on global and African average, respectively.

For agri-food sectors, including the cereals and pulses subsector, the average number of measures recommended by Codex-IPPC-WOAH goes far beyond global and African averages of applied measures. With over 25 measures per product, they recommend two-and-a-half times as many measures as the global average.

Only few economies come close to the number of measures recommended by the international standards, such as the United States of America (22 measures), the European Union (16), India (21), and China (29). The African countries with the highest number of average measures are South Africa (15), Mauritius (15), Rwanda (11) and Tanzania (11). While the number of measures is not a direct indicator of stringency, it is a useful approximation.

Only a few economies come close to the number of measures recommended by international standards.

Figure 3
Average number of SPS measures and TBT across regions and standards, by sector



Source: UNCTAD calculations and illustration based on the TRAINS database.

Measures recommended by ARSO in the cereals and pulses subsector are much more in line with the number of measures applied by most countries: slightly above the African average and slightly below the global average. This may indicate that ARSO tries to provide reasonable objectives for the African context. The following subsection further analyses how far the ARSO recommendations correspond to the measures applied by African countries.

For disinfectants, the measures recommended by ARSO are far less than both global and African averages. The ARSO standards may therefore be interpreted as basic minimum requirements to ensure the safety of these products in the context of COVID-19 while allowing the expansion of production without too many regulatory hurdles.

3.3. Concept of assessing over-regulation and under-regulation

Since SPS measures and TBT are necessary to ensure food safety (UNCTAD, 2024), protect harvests, and mitigate climate change (UNCTAD, 2023b), among other public policy objectives, their elimination is not an option. However, their divergence across countries is a major factor that causes trade to become costly. Regulatory cooperation and convergence through harmonization, equivalence, or mutual recognition has therefore become a key policy challenge. For instance, commonly agreed international standards based on science should facilitate trade. Convergence of measures reduces trade costs, as products do not need to be customized to meet requirements specific to each export market (UNCTAD, 2012; Knebel and Peters, 2019).

The AfCFTA Annex 7 on SPS measures encourages the "use of international standards in the elimination of barriers to trade" (Article 4). Furthermore, Annex 6 on TBT calls for "the adoption of standards developed by the ARSO" (Article 6).

This section therefore analyses the similarity between national regulations, the Codex-IPPC-WOAH international standards, as well as ARSO standards. The International Classification of NTMs distinguishes 57 types of SPS measures and TBT, and this level of detail is used for structural comparisons across many countries and products.

The approach is illustrated in Table 1. In this example, both the country's mandatory regulations and the standard's recommendations comprise maximum residue limits (NTM classification code A21), here referred to as a 'match in regulation' (1;1 pair). As neither the country's regulations nor the standards include fumigation (A53), this is referred to as a 'match in non-regulation' (0;0 pair). Both matches in regulation and matches in non-regulation are interpreted as regulatory similarity. The next row shows that the country applies certain product quality requirements (B7), whereas the standards does not recommend this. This case is considered 'over-regulation' vis-à-vis the standards. The last row shows the opposite case where the country does not require hygienic production practices (A42) that are recommended by standards. This is referred to as 'under-regulation'. Both over-regulation and under-regulation are considered regulatory dissimilarities. Table 1 also illustrates the fact that countries can both over-regulate and under-regulate at the same time. In this example, both the country and the standards each apply two measures to the product. Still, the country under-regulates one measure (product quality, B7) and over-regulates another (hygienic practices, A42).

Importantly, this analysis is based on a large amount of data. First, there are not just four rows of possible NTMs as shown in the example, but up to 57 rows for all possible SPS measure and TBT types. In total, 5159 products are covered, thereof 899 agri-food products. Through aggregation across NTM types and

Table 1
Example of data mapping comparing standards and national regulations

NTM types for a specific product at HS6 level, e.g., barley	**Country**	**Standard recommendation**	**Interpretation**
Maximum residue limit (A21)	Yes (1)	Yes (1)	Match in regulation (1;1)
Fumigation (A53)	No (0)	No (0)	Match in non-regulation (0;0)
Product quality (B7	No (0)	Yes (1)	Mismatch by over-regulation (1;0)
Maximum residue limit (A21)	Yes (1)	No (0)	Mismatch by under-regulation (0;1)
… up to 57 rows of possible NTMs	....	....	....

Source: UNCTAD illustration.

products, the statistics on matches in (non-) regulation, over-regulation, and under-regulation give a general idea of regulatory similarity between countries, international standards, and ARSO standards.

3.3.1. Adherence to international standards in agri-food sectors

Figure 4 shows the average number of over-regulated and under-regulated NTMs per product in the agri-food sector, vis-à-vis international standards. The (0;0) position can be interpreted as the perfect match with the regulatory recommendations of international standards. Positions in the graph that are further away from the (0;0) position indicate growing regulatory dissimilarity from the standards. Regulatory differences can arise from over-regulating (vertical axis) or from under-regulating (horizontal axis). For example, Uganda (UGA) over-regulates about four NTMs per product and under-regulates about 16 NTMs per product.

Countries that tend to over-regulate are likely to have higher import and consumer prices, whereas countries that under-regulate may expose their population to higher health or environmental risks. For the shown countries in Figure 4, only China (CHN) and the United States of America (USA) mostly over-regulate (positions above the dashed 45° line). All other countries, including all African countries and their comparators (Australia AUS, European Union EUN, and India IND), are below the 45° line – they tend to under-regulate vis-à-vis the Codex-IPPC-WOAH international standards.

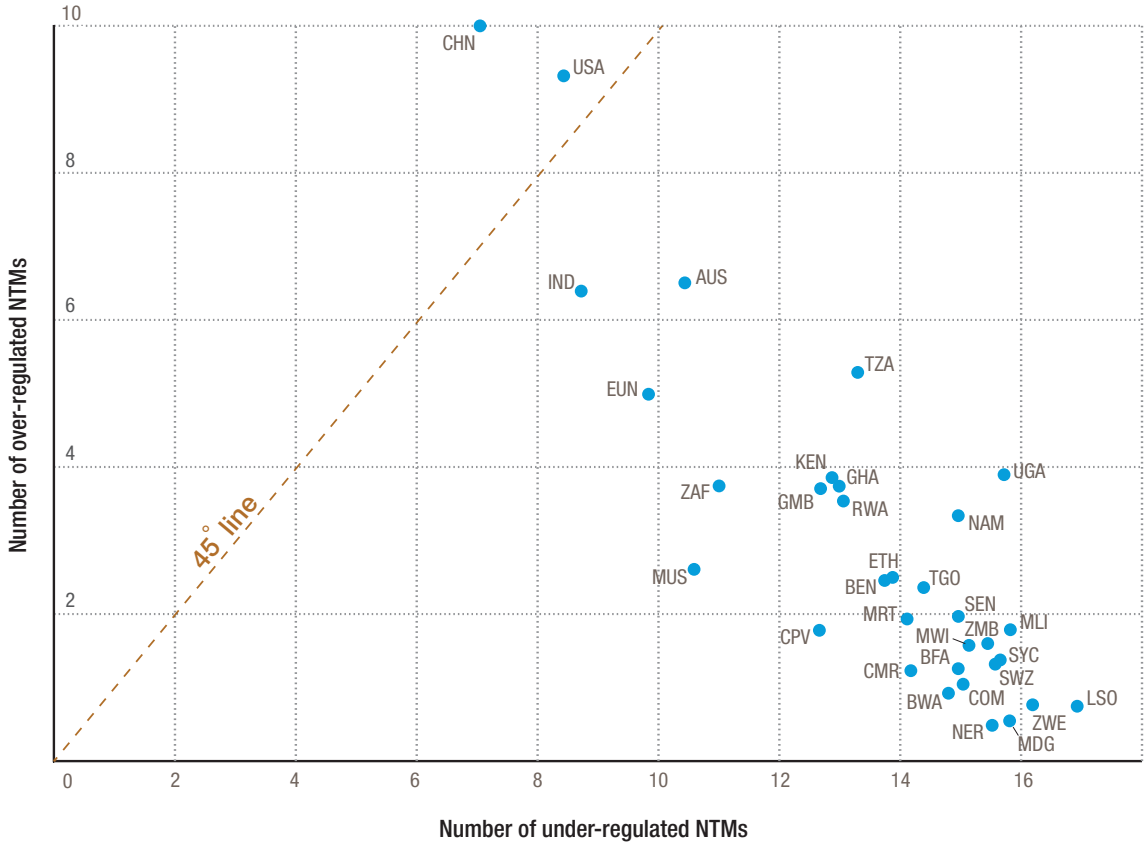
A key question, however, is whether the relatively few NTMs applied by African countries match international standards or not. For African countries, 5 of the average 7 NTMs per product are matching international standards, whereas 2 are over-regulated. While there remains potential to further align to the international standards even without increasing the number of NTMs, there is already a significant overlap.

Several members of the East African Community (EAC), namely Tanzania (TZA), Uganda (UGA), Kenya (KEN), and Rwanda (RWA) are among those countries with the highest number of over-regulated NTMs vis-à-vis international standards. South Africa (ZAF) and Namibia (NAM) from the Southern African Development Community (SADC) as well as Ghana (GHA) and the Gambia (GMB) from the Economic Community of West African States (ECOWAS) are also over-regulating more than most other African countries.

On average for African countries, 5 of the 7 NTMs are matching international standards.

Most remaining African countries are clustered in the bottom right of Figure 4 with high levels of under-regulation (13-18 NTMs) and low levels of over-regulation (0-2.5 NTMs) – and generally low numbers of applied NTMs.

Figure 4
Over- and under-regulation vis-à-vis international standards in agri-food sectors



Source: UNCTAD calculations and illustration based on the TRAINS database.

3.3.2. Adherence to ARSO standards

Adherence of most African countries to ARSO standards for cereals and pulses is low.

As a case study for the subsector cereals and pulses, Figure 5 maps out over- and under-regulation vis-à-vis ARSO standards and includes the Codex-IPPC-WOAH international standards as a comparator: As expected, the international standards are significantly over-regulated vis-à-vis ARSO standards due to the much higher number of recommended measures. Remarkably, however, the level of under-regulation of Codex-IPPC-WOAH standards is below 1 (horizontal axis in Figure 5). This implies that ARSO only recommends about 1 measure that is different from the international standards – out of an average of 8 measures recommended by ARSO.

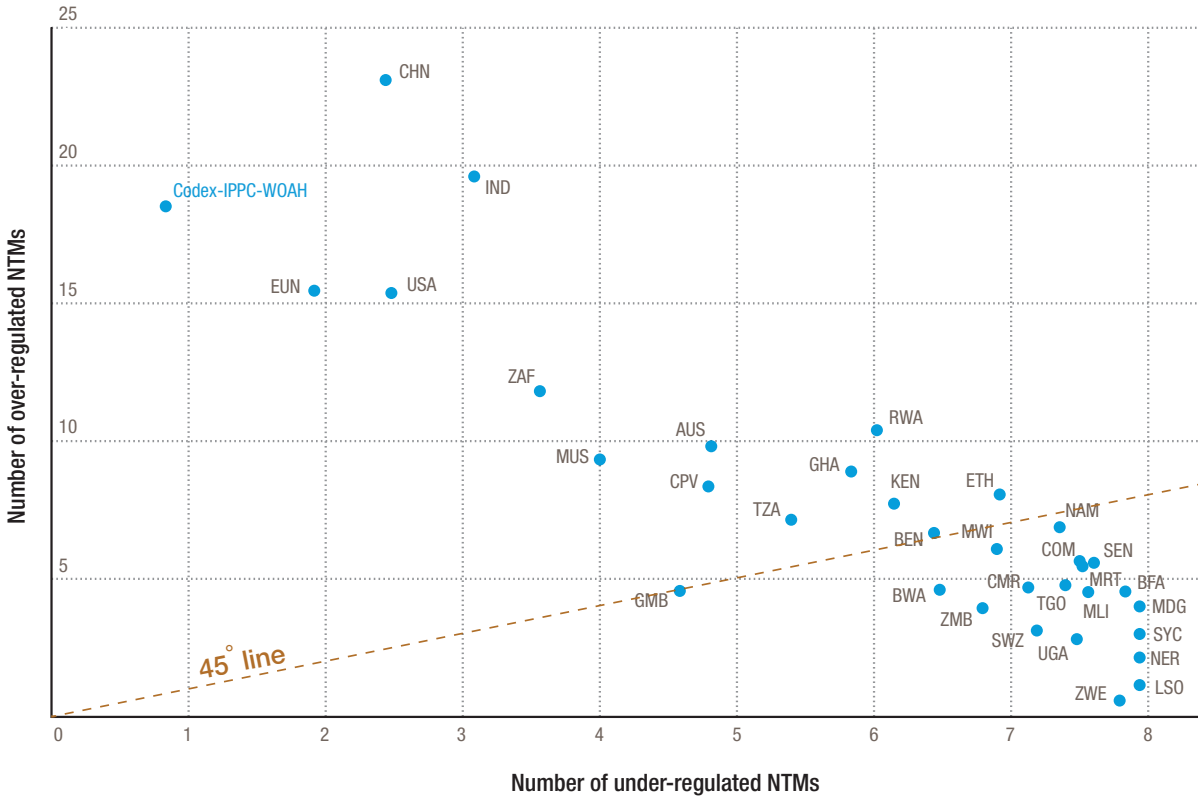
This high level of coherence suggests that ARSO is recommending a subset of international standards that it deems most appropriate for African countries and their level of development. This can be considered an ideal strategy as it can foster convergence among African countries and represents a stepping stone towards the more extensive Codex-IPPC-WOAH standards. This would lead to lower trade costs and increased intra-Africa trade but also promote trade with the rest of the world.

However, Figure 5 also shows that adherence of most African countries to ARSO standards for cereals and pulses is low. The average African country applies 7 measures per product in this sector, whereas ARSO

recommends 8. With ARSO standards only slightly above average, there would be potential for high levels of regulatory similarity with African countries' regulations. However, many countries under-regulate vis-à-vis ARSO recommendations and at the same time impose different measures (over-regulate). For example, Madagascar (MDG), Seychelles (SYC), Niger (NER), and Lesotho (LSO) follow none of the measures recommended by ARSO (right edge of Figure 5) but impose 4, 3, 2, and 1 different measures, respectively. Another example is Kenya (KEN) which only follows 2 of the 8 measures recommended by ARSO but applies 8 different ones. Most African countries are located somewhere between these two examples. The countries with the highest levels of convergence towards ARSO standards are the Gambia (GMB), Mauritius (MUS), and South Africa (ZAF) which follow approximately half of the ARSO recommendations, but also impose 4, 9 and 12 different measures, respectively.

In conclusion, ARSO appears to offer a valid regional regulatory approach in line with international standards, but most African countries have not converged towards it.

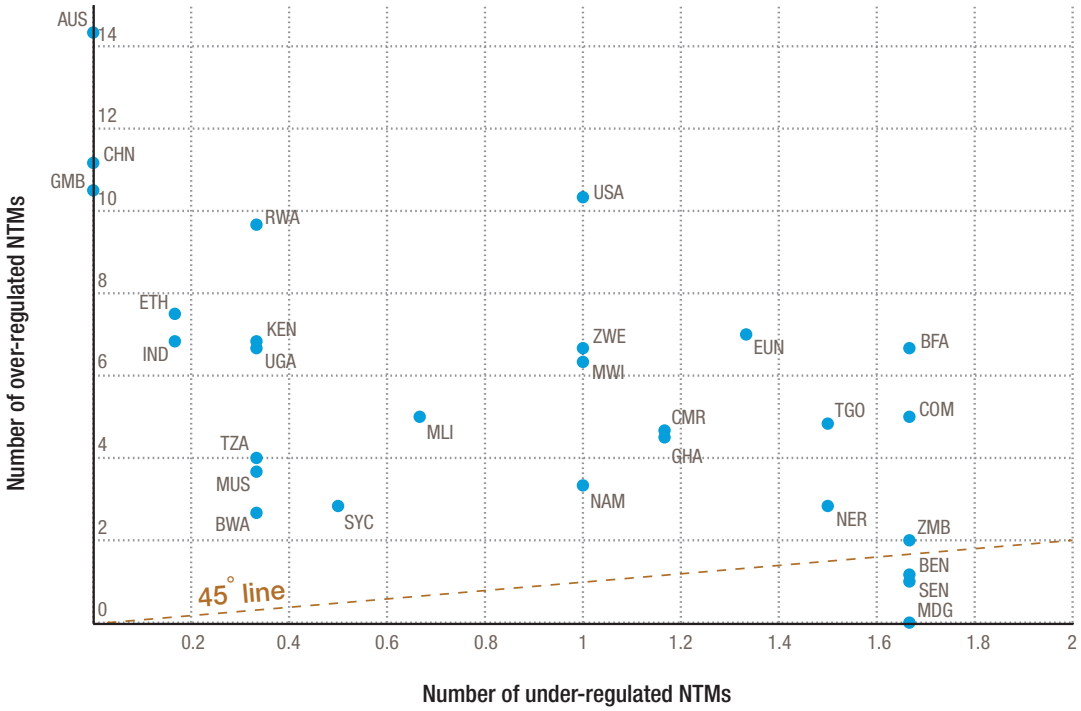
Figure 5
Over- and under-regulation vis-à-vis ARSO in cereals and pulses sectors



Source: UNCTAD calculations and illustration based on the TRAINS database.

Another case study focuses on a manufacturing subsector, namely disinfectants. ARSO recommends an average of 1.7 measures across disinfectant products. Given that the African countries in the sample apply an average of 5 measures and the global average is almost 8 measures, the ARSO recommendations can be viewed as a minimum standard. In the context of the COVID-19 pandemic, this seems to be a valid approach that would ensure a minimum level of product safety while enabling increased production and trade without too many regulatory constraints. Figure 6 shows dispersed results with the overall tendency of over-regulation vis-à-vis ARSO in most countries.

Figure 6
Over- and under-regulation vis-à-vis ARSO for disinfectant products



Source: UNCTAD calculations and illustration based on the TRAINS database.

3.4. Concept of overall regulatory distance

The AfCFTA Protocol on Trade in Goods calls for "cooperation in the development and implementation of standards, technical regulations, conformity assessment procedures" (Annex 6 on TBT, Article 4) and for enhanced "cooperation and transparency in the development and implementation of SPS measures to ensure that they do not become unjustifiable barriers to trade" (Annex 7 on SPS measures, Article 4). As the current state of regulatory convergence between countries is largely unknown, this report uses a data-based approach to provide a baseline and to assess the potential for further cooperation.

Regulatory distance measures the overall similarity or dissimilarity between the technical measures of different countries. For the regulatory distance indicator, only matching and mismatching measures are distinguished, irrespective of their subtypes. A match, either through matching regulation or matching non-regulation, is scored a zero (0) "distance". A mismatch, either through over-regulation or under-regulation, is scored a one (1) "distance". Aggregating these scores across all 57 types of SPS measures and TBT as well as over hundreds of products, results in an overall similarity score.[2]

[2] Technically, this is written as: $RD_{ijk} = \frac{1}{A_k} \sum_l^L |n_{ijk}^l - n_{jik}^l|$

Where $n_{ijk}^l = \begin{cases} 1, & \text{if country } i \text{ applies NTM type } l \text{ to product } k \text{ from origin } j \\ 0, & \text{if no such NTM is applied} \end{cases}$

and where the denominator A_k is the total number of distinct SPS and TBT measures that are applied to product k by any country in the world.

The term "distance" is chosen intentionally to illustrate regulatory proximity (scores close to 0) and regulatory remoteness (scores close to 1) in a geographical sense. Countries with high regulatory distance would have to overcome this distance, just like a geographical distance, when trading with each other. Conversely, countries with low regulatory distance would find it easier to trade.

The following graphs plot the many bilateral regulatory distance scores on a two-dimensional plane. These graphs should be interpreted similarly to geographical maps: what matters is the distance between country points. Only the relative location to each other matters, not whether countries are positioned left, right, high, or low in the graph.

Figure 7 maps out the regulatory distance in agri-food sectors. A cluster of African countries with relatively low regulatory distance from each other is observed. Further analysis of the results shows that similarity is driven by a common low level of regulation (matches in non-regulation, see Table 1). On the other extreme are the selected comparator economies (Australia – AUS, China – CHN, European Union – EUN, India – IND, United States of America – USA). They are both distant to the cluster of African countries and distant to each other. This highlights that the largest markets tend to develop regulatory frameworks rather independently. From the perspective of African countries, this implies that regulatory convergence towards one large import market will likely cause regulatory divergence and thus higher trade costs with other large markets as well as other African countries. This risk of a "lock-in" or "hub-and-spoke" trade structure is also found by Disdier et al. (2015).

Most Western and Southern African countries have low regulatory distance from each other, as evidenced by their clustering together in the main group shown in Figure 7. Outliers are the Gambia (GMB) and Ghana (GHA) in the West, and South

Figure 7
Regulatory distance in agri-food sectors

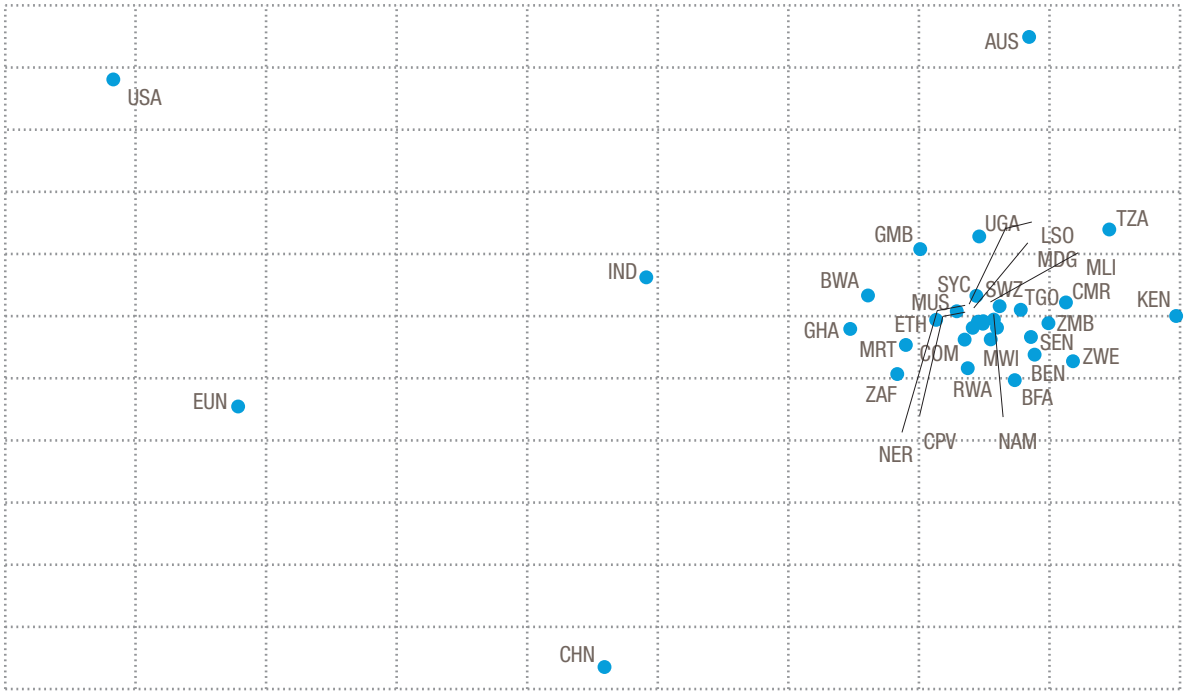
Source: UNCTAD calculations and illustration based on the TRAINS database.

Africa (ZAF) and Mauritius (MUS) in the South. Furthermore, three members of the EAC, Kenya (KEN), Tanzania (TZA), and Uganda (UGA) are outside the main cluster, but close to each other – an indication of sub-regional regulatory convergence.

The international standards of Codex Alimentarius, IPPC, and WOAH are also indicated as a point of reference. They recommend more than twice as many measures as the average country in the database (see Figure 3). Therefore, the regulatory distance to them is generally high for all countries.

Figure 8 shows the average regulatory distance across 4260 products in the manufacturing sector. The global average of the number of measures applied per product for the 121 countries in the database is 1.8. The average for African countries is 0.8 measures. The selected comparators are among the largest producers of manufactured goods in the world and are much more heavily regulated: China applies on average 7.5 measures per product, the United States of America 6.9, the European Union 5.6, Australia 5.0, and India 3.2. It is therefore unsurprising that the regulatory distance is high between these economies and the cluster of much less regulated African countries.

Figure 8
Regulatory distance in manufacturing



Source: UNCTAD calculations and illustration based on the TRAINS database.

4. Estimating the impact of non-tariff measures and regulatory convergence/divergence

In Africa, the average ad valorem equivalent costs of technical measures in the agri-food and manufacturing sectors are 12.8 and 1.8 per cent. The low average impact of technical measures in manufacturing is due to their relatively low incidence. However, for manufacturing products where measures are applied, the average cost is 5.4 per cent. Through further regulatory reform and convergence, the ad-valorem equivalents of SPS measures and TBT could be lowered by 30 to 40 per cent. The average cost of outright barriers is rather low due to their limited incidence, but very costly where they occur – with 38 per cent and 14 per cent in agri-food and manufacturing, respectively.

4.1. Ad valorem equivalents: estimation approach and results

The following shows estimates of the *ad valorem equivalent* price effects of non-tariff barriers and technical measures.

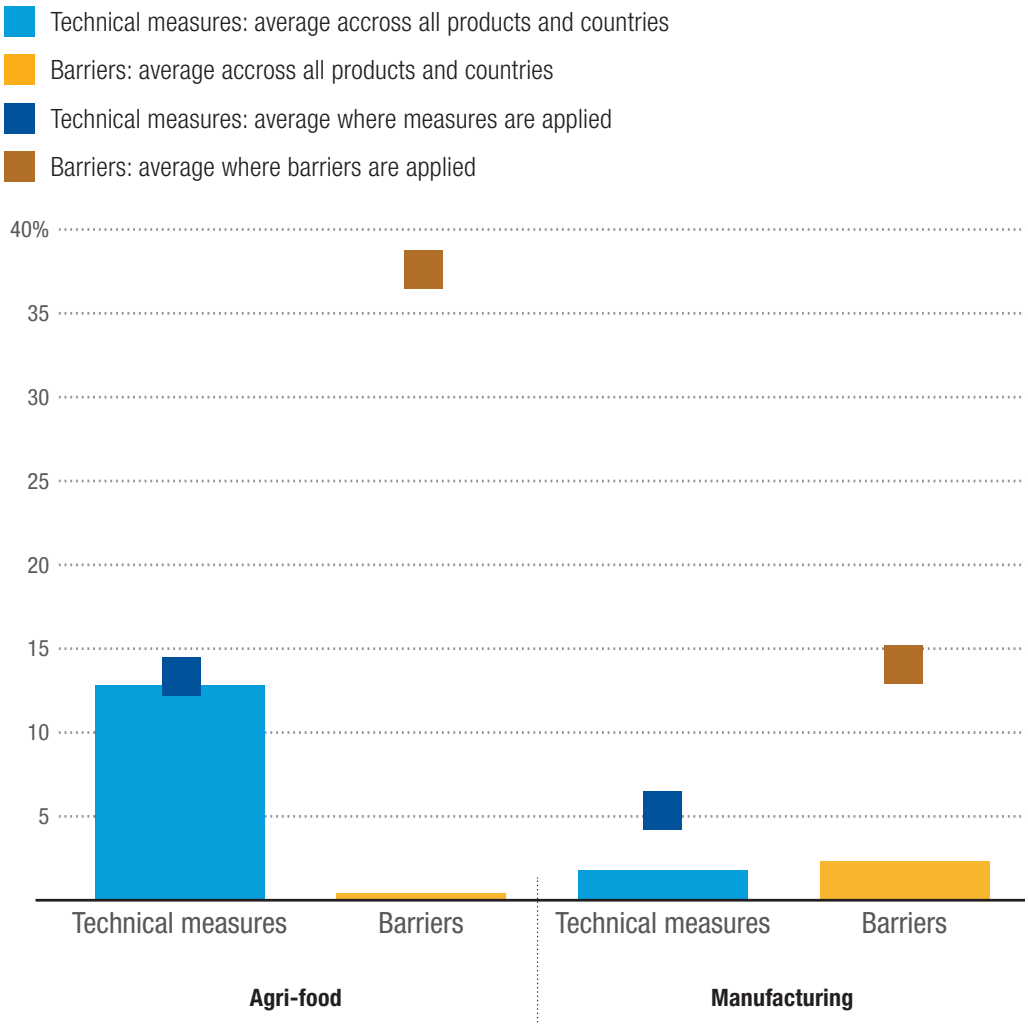
The estimation uses a direct and price-based method that builds upon the approaches of Cadot et al. (2015) and Reyes and Kelleher (2015). In addition, it includes a measure of regulatory similarity that estimates the price-reducing effects of convergence of SPS or TBT measures.

The estimations also update Knebel and Peters (2019) by including more countries in the dataset and adding the comparison with international standards.

The basic intuition of the estimations is to observe *cost-insurance-freight* (c.i.f.) product prices depending on the presence of different types of NTMs and regulatory similarity/dissimilarity between import and exporter. The final sample of the estimation includes 104 countries (counting the European Union as one), of which 32 are in Africa, over 5000 products, 57 distinct technical measures, and 4 distinct types of barriers (non-automatic licenses, quotas, prohibitions, and price-control measures). Econometric regressions are run separately for global trade and intra-Africa trade as well as for agri-food and manufacturing sectors. Annex 7.2 of this report provides further details on the estimation method and results.

Figure 9
Ad valorem equivalents of technical measures and non-tariff barriers for intra-Africa trade

(percentage points)



Source: UNCTAD calculations and illustration.

For intra-Africa trade, the overall aggregated results are presented in Figure 9.[3]

The average ad valorem equivalent effects of technical measures in the agri-food and manufacturing sectors are 12.8 and 1.8 per cent (blue bars in Figure 9). These estimated average effects take into account the level of regulatory similarity that already exists among African countries (see section 3.4), which reduces the effective costs of technical measures. Still, the costs of technical measures in the agri-food sector are significant and several times higher than current tariffs. The lower aggregate impact of technical measures in manufacturing is misleading because they are only applied to 36 per cent of products in intra-Africa trade (see Figure 2). However, for products where they are applied, the estimated average impact is 5.4 per cent (blue square marker in Figure 9); and the top 1 per cent highest ad valorem equivalents (over 1000 instances) range between 15 and 54 per cent.

[3] The estimated parameters from the regression are multiplied by the actual incidence and number of respective measure types in all countries and across products. This yields an extrapolated total impact of NTBs and technical measures.

The overall average ad valorem equivalent of outright barriers is low because only a few infrequent types were found to have a statistically significant effect on trade prices (yellow bars in Figure 9).[4] These concern predominantly price control measures and some types of quantitative restrictions. However, where these barriers occur, their impact is very costly with 38 per cent and 14 per cent in agri-food and manufacturing, respectively (yellow square markers in Figure 9).

In summary, technical measures in agri-food sectors are applied to almost all products and by all countries and the average ad valorem equivalent is high. Technical measures in manufacturing as well as quantitative measures and price control measures are not as widespread but increase prices significantly where they do occur.

4.2. Scenarios of regulatory reform

In the following, three different scenarios of regulatory reform to reduce the impact of NTMs are discussed.

Scenario 1 only focuses on the elimination of non-tariff barriers. In Article 2.2.b of the Protocol on Trade in Goods of the AfCFTA Agreement, members agree to the "progressive elimination of non-tariff barriers". Therefore, the complete removal of quantitative and price-control barriers is assumed for intra-Africa trade in Scenario 1; barriers to imports from non-African countries remain unchanged.

Scenario 2 also tackles technical measures in addition to the elimination of barriers in Scenario 1. This follows Article 2.2.d of the Protocol on Trade in Goods ("*enhanced cooperation in the areas of technical barriers to trade and sanitary and phytosanitary measures*") as well as the AfCFTA Annexes on SPS measures and TBT. Since SPS measures and TBT play a crucial role for the protection of human, animal and plant health as well as the environment, their elimination is not an option. However, estimations show that regulatory convergence can significantly reduce their cost. For example, in intra-Africa agri-food trade, each technical measure increases trade product prices by 2.3 per cent if NTMs diverge between importer and exporter. However, the cost of an NTM shrinks to only 1 per cent if the measures of the importer and exporter match (see section 3.3 for the concept of *matching* and *non-matching* measures). A scenario is constructed where countries within Africa increase their regulatory convergence within a reasonable margin and through a regional approach. As the number and stringency of SPS measures and TBT applied by a country is dependent on its state of development, the scenario of regulatory convergence does not change the number of applied measures. The suggested regulatory reform would realign measures to maximize matching measures and reduce non-matching measures, but without increasing or decreasing the number of applied measures in any country.[5] It also implies that countries will not fully harmonize all regulations, but only to the extent of their abilities. Despite this important restriction to the reform scenario, the cost of technical measures can be reduced from 12.8 to 7.7 per cent in agri-food and from 1.8 to 1.2 per cent in manufacturing – or relative reductions of 40 and 33 per cent, respectively.

Scenario 3 modifies the regulatory convergence approach of Scenario 2: instead of harmonizing SPS measures and TBT towards the recommendations of African regional standards, it simulates regulatory convergence of all African countries towards the international standards referenced in the WTO SPS Agreement and AfCFTA SPS Annex (Codex Alimentarius, IPPC and WOAH) for the agri-food sector. Again, countries will not be able to completely adopt all recommendations, but only align their current measures.

Intra-Africa regulatory convergence can lower the costs of technical measures from 12.8 to 7.7 per cent in agri-food and from 1.8 to 1.2 per cent in manufacturing.

[4] A quantity-based estimation approach, like the Gravity equation, may yield different results, particularly for quantitative restrictions.

[5] For a simplified example of such regulatory reform, please refer to Table 5 in the annex.

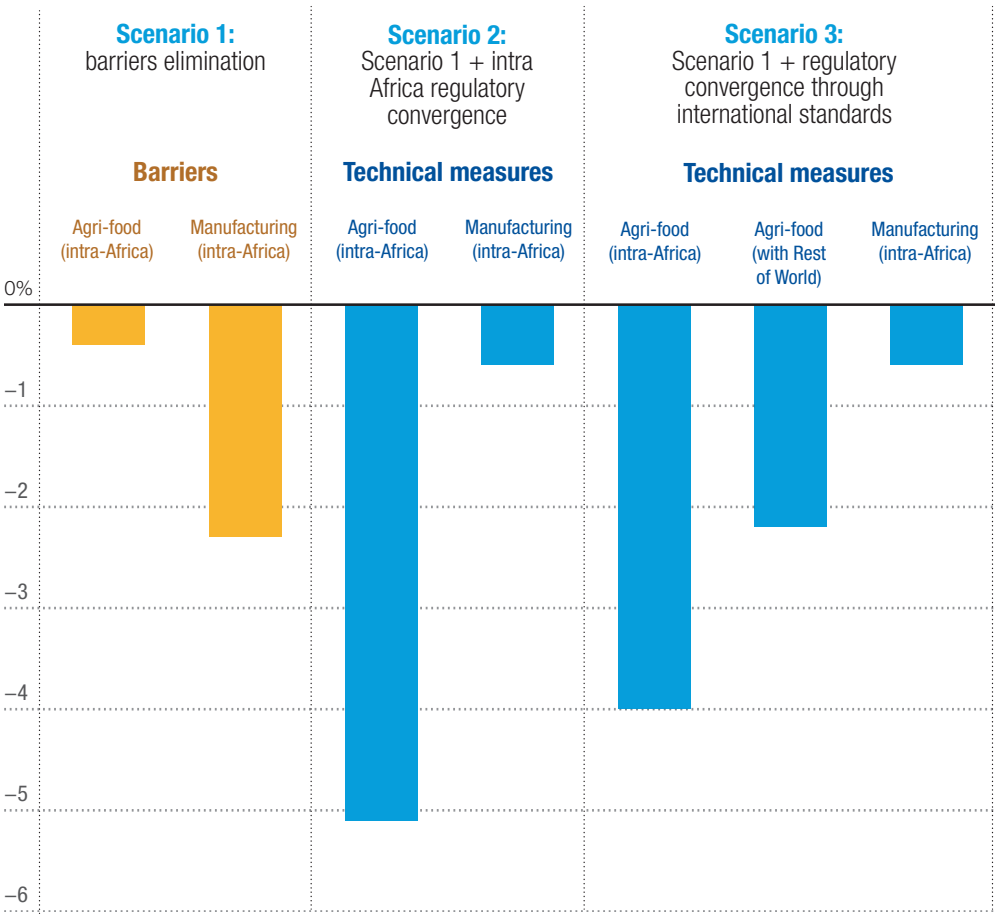
Convergence towards international standards also brings with it cost reductions when trading with the rest of the world.

In the trajectory of moving towards the recommendations of international standards, African countries also converge towards each other to a significant extent. The implication is that intra-Africa trade costs due to technical NTMs are still reduced from 12.8 to 8.8 per cent. In addition, convergence towards international standards brings with it cost reductions of an average 2.2 percentage points when trading with the rest of the world.

In the manufacturing sector, convergence towards international standards cannot be simulated because the WTO TBT Agreement does not define specific international standards or which organizations are recognized as producing international standards. Consequently, intra-Africa convergence as in Scenario 2 is used.

Figure 10 summarizes the potential impacts of the three reform scenarios. Section 5 uses these estimates to assess the wider economic implications of the scenarios.

Figure 10
Potential cost reductions through regulatory reform scenarios
(percentage points)



Source: UNCTAD calculations and illustration.

5. Potential welfare gains from regulatory convergence

Removing intra-Africa non-tariff barriers (Scenario 1) leads to annual welfare gains of US$ 1.6 billion. These gains are doubled to US$ 3.4 billion if technical measures within Africa are also addressed through regulatory convergence (Scenario 2). Following international standards in the agri-food sector and thereby extending the reforms to facilitate trade with the rest of the world (Scenario 3) further doubles the welfare gains to US$ 7.1 billion. In the latter and best scenario, most welfare gains stem from increased productivity and investment inflows. Wages rise by 0.8 per cent. Intra-Africa trade grows by an average of 6 per cent and particularly in manufacturing and processed agri-food products.

5.1. Global Trade Analysis Project model

Following the estimation of reduction scenarios for NTM ad valorem equivalents in Section 4, the next step is to assess their broader economic impact. This is done by feeding the changes in trade costs, so-called "shocks", into a well-known Computable General Equilibrium (CGE) model: the Global Trade Analysis Project (GTAP). This allows an examination of the resulting impacts on national income, trade flows and real wages.

A general equilibrium model such as GTAP captures the interactions in the whole economy by linking all sectors through input-output tables and all countries through trade flows. GTAP is a well-documented, static, multiregional, multi-sector model that assumes perfect competition, constant returns to scale and imperfect substitution between foreign and domestic goods and between imports from different sources.[6] In this application, version 11 of GTAP is used. The model has been updated from 2017 to 2023 using estimates of real GDP, population, capital and labour (Fontagné et al. 2022).

The model is aggregated into 47 countries and regions as well as 41 sectors.[7] The regional aggregation separates out African countries and their trading partners as much as possible. The model is static, with no phasing in of reforms. Therefore, the results should be interpreted as mid- to long-term impacts.

There are two main approaches to feeding changes in NTM ad valorem equivalents into a general equilibrium model.[8] These are: (i) tariff equivalent; and (ii) productivity shocks.

The results can be interpreted as mid- to long-term impacts.

[6] For information on GTAP, see https://www.gtap.agecon.purdue.edu/. The version 11 database is described in Aguiar et al. (2022). The model is documented in Corong et al. (2017).

[7] The GTAP database includes 160 countries or regions and 65 sectors. The full model cannot be solved with this number of countries, so both countries and sectors must be aggregated.

[8] A third approach is to treat NTBs as an export subsidy equivalent. This is applicable when the exporter captures the rents. This is not used here.

A tariff equivalent is appropriate for NTBs such as quotas and licensing arrangements. It implies that a tariff-like revenue is collected by the importing country government (for example, a paid licensing arrangement), and removal of the NTB will lead to a fall in that revenue.[9]

A productivity shock is used for technical measures, which do not generate government revenue. Reform reduces the cost of trade between two countries without the side-effect of revenue losses.[10,11]

The potential impact of eliminating NTBs and of regulatory convergence of technical measures is simulated in three scenarios. Table 2 summarizes the reform scenarios that were described in more detail in section 4.2.

Table 2
Reform scenarios overview

	Description
Scenario 1	Remove NTBs within Africa
Scenario 2	Remove NTBs within Africa + Technical measures convergence within Africa
Scenario 3	Remove NTBs within Africa + Technical measures convergence towards international standards

5.2. Simulation results

5.2.1. Overall welfare gains

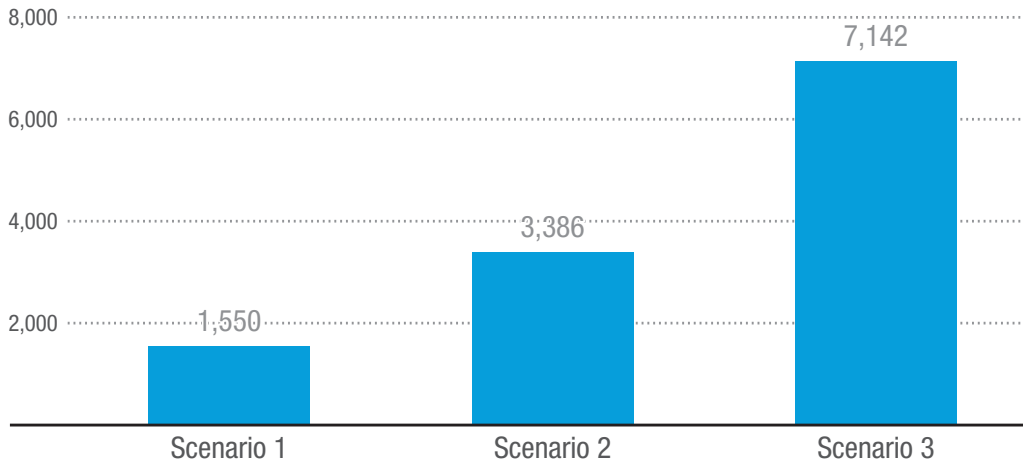
GTAP combines different economic effects into a composite welfare indicator. The aggregate welfare gains of African countries are shown in Figure 11 and for each African country in annex Table 6. The removal of intra-Africa NTBs (Scenario 1) leads to annual welfare gains of about US$ 1.6 billion, but these gains are doubled if technical measures within Africa (Scenario 2) are also addressed through regulatory convergence. Following international standards in the agri-food sector and thereby extending the reforms to facilitate trade with the rest of the world (Scenario 3) further doubles the welfare gains to US$ 7.1 billion.

[9] To implement this in GTAP, first the tariff equivalent needs to be estimated, as described in the previous section. Next, the Altertax procedure in GTAP is used to set the baseline tariffs at the appropriate level. This is applied bilaterally or multilateral depending on how the NTB is implemented. In a simulation, these tariffs are removed or reduced, either bilaterally or multilaterally as appropriate, and the impacts are reported. The relevant GTAP variable for tariffs is 'tms'.

[10] This can be done in GTAP by shocking the productivity variable 'ams'. This is a technical change variable on bilateral imports. This is commonly referred to as the iceberg approach, analogous to value melting away during transport.

[11] Walmsley and Strutt (2021) note that the productivity shock has two effects on trade, an expansion effect and a substitution effect. The expansion effect reduces the amount that needs to be imported for a given level of demand, thereby decreasing exports. The second effect reduces the importers price, thereby increasing demand. The second effect generally outweighs the first resulting in an increase in imports.

Figure 11
Overall annual welfare gains for Africa, by scenario
(US$ millions)



Source: UNCTAD calculations based on the GTAP model.

In absolute terms, and across scenarios, Egypt, South Africa, Ethiopia, Kenya and Ghana gain the most because they have the largest initial trade flows. The gains for Egypt, in particular, and also South Africa, increase the most in Scenario 3 vis-à-vis the other scenarios.

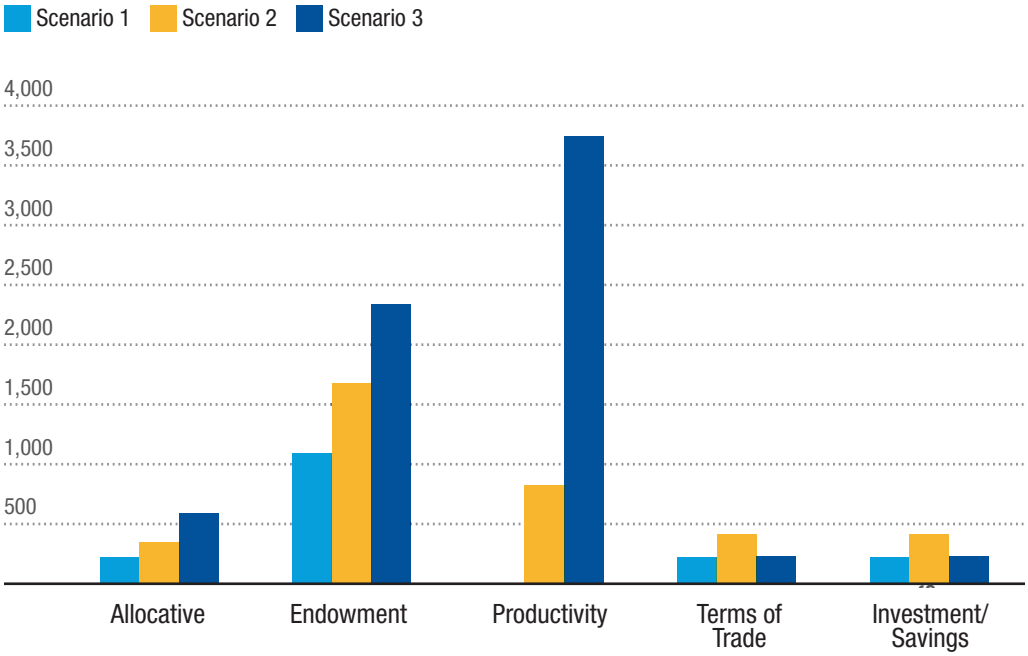
In relative terms, the biggest beneficiaries of the reforms are Eswatini, Namibia, Botswana and Mozambique –all neighbours of South Africa–, Tunisia and Benin. There are welfare gains in all African countries except for Guinea and Chad, where losses are negligible.

Welfare gains can be decomposed into five effects:

- allocative efficiency gains from using resources more productively.
- endowment effects, from changes in use of capital and labour.
- technical productivity effects from reducing trade costs.
- terms of trade effects, that may be positive or negative (they sum to zero globally).
- changes in investment or savings.

These five effects can be positive or negative, although productivity effects are generally positive. Figure 12 shows the breakdown of these effects for the three scenarios. In each scenario, the allocative efficiency, terms of trade and investment/savings effects are positive but minimal. The main effects are endowment growth, i.e. the inflow of capital to take advantage of greater investment opportunities, in all scenarios; and productivity effects in scenarios 2 and 3 which include the productivity shocks due to regulatory convergence. The first scenario has no productivity shocks and hence no productivity effects.

Figure 12
Welfare decomposition for Africa
(US$ millions)



Source: UNCTAD calculations based on the GTAP model.

Countries with higher trade-to-GDP ratios also gain more from the reforms.

5.2.2. Growth in gross domestic product

In terms of real GDP, the gains for African countries as a region amount to 0.08, 0.16 and 0.32 per cent for the three scenarios respectively. The changes in GDP for individual African countries are shown in annex Table 7. The changes are generally small, less than one per cent. This reflects the relatively low trade-to-GDP ratios in most countries, implying that gains through trade do not have a large effect on the overall economy. Countries with higher trade-to-GDP ratios also gain more from the reforms. Examples are neighbours of South Africa, and particularly Eswatini (4.8 per cent increase in GDP), Namibia (1.6 per cent), Mozambique (1.4 per cent), and Rest of South African Customs Union (2.9 per cent).

5.2.3. Real wages and other factor prices

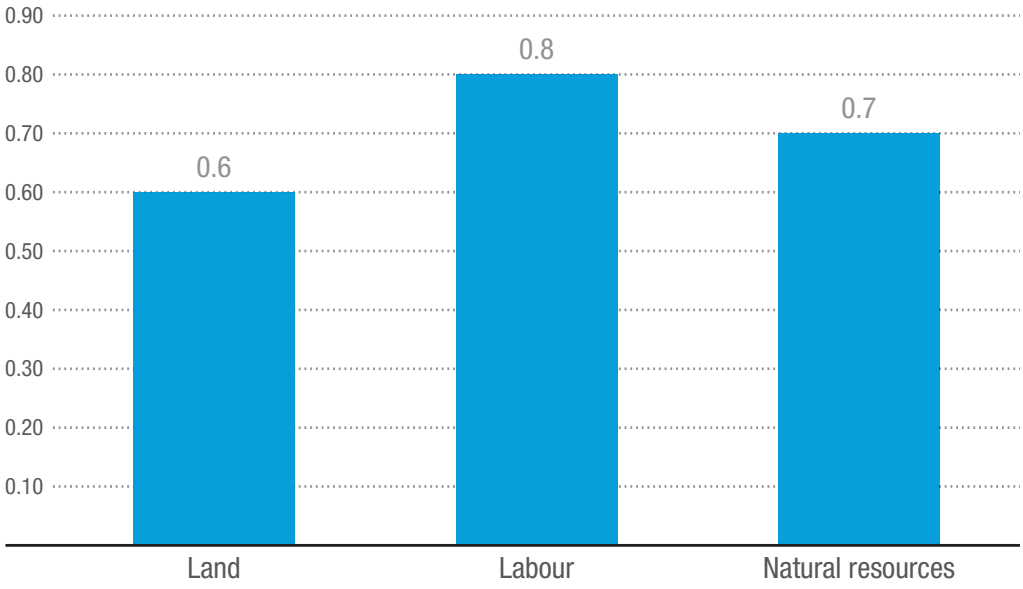
Figure 13 shows the changes in real wages, land and natural resources factor prices as an (unweighted) average of African countries.

The simulations allow capital to reallocate between countries, according to the rate of return in each country. Investments tend to flow to those countries that are liberalising and away from those that are not. For the model results, this implies that adjustments are primarily through endowment quantities and that capital prices remain almost unchanged and are not shown in Figure 13.

For modelling purposes, and in contrast to capital, labour is not allowed to move across countries, although in practice workers may be moving across countries in Africa. Within a country, however, workers of each labour type can move between sectors but their total quantities remains unchanged. This implies that unemployment is fixed. Wages, however, are flexible. All the adjustment in the labour market occurs through wages. Likewise, the quantity of land and natural resources is also fixed, with the adjustment occurring through prices.

Wages increase by over 0.8 per cent on average in Africa, with moderate variation across countries – ranging mostly between 0.3 and 1.3 per cent. On average, land prices rise by 0.6 per cent, but show greater variation between countries, including some price declines, depending on the demand for specific products. Rising natural resource prices reflect the increasing demand for coal, oil and gas due to economic growth. Detailed country-level results are shown in annex Table 8.

Figure 13
Change in real wages and factor prices in Africa
(per cent change)



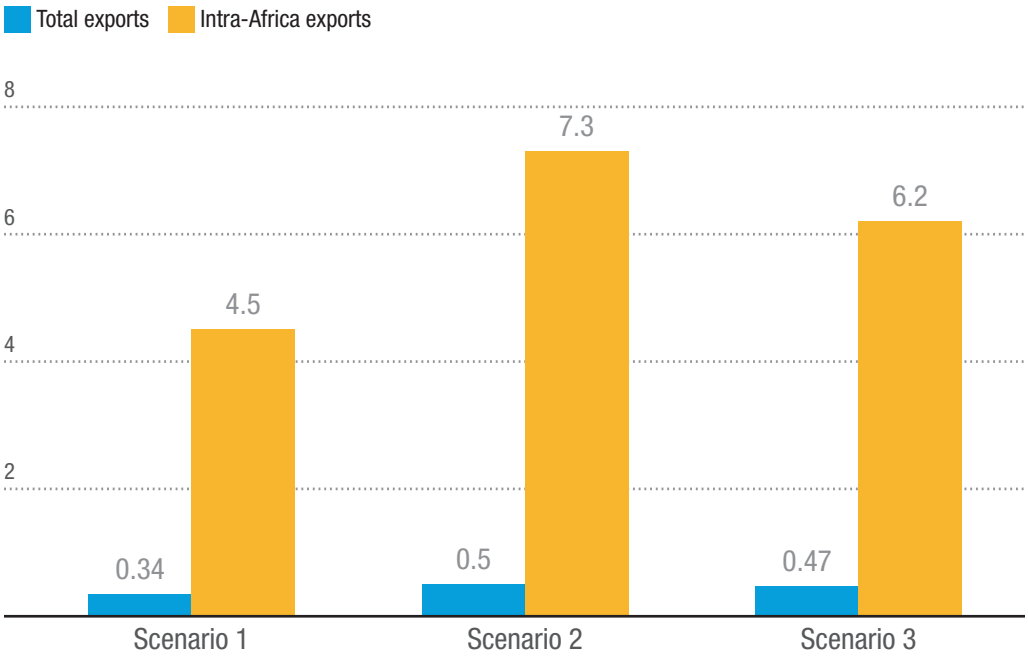
Source: UNCTAD calculations and illustration based on the GTAP model.
Note: Unweighted average of African countries.

5.2.4. Trade growth

Intra-Africa exports increase significantly in scenarios 2 and 3, up to seven per cent on average (see Figure 14). While intra-Africa trade grows slightly less in scenario 3 than in scenario 2, the overall economic benefits are larger in scenario 2. The biggest export growth is by Ghana (33 per cent in scenario 3), Chad (24 per cent), Ethiopia (23 per cent), Gabon (19 per cent) and Rwanda (16 per cent). Neighbours of South Africa also increase their exports by double-digit percentage points. South Africa is an important economic driver with increased imports from its neighbours, but also from Ghana. South Africa also increases intra-Africa exports by over 5 per cent, with significant increases to Kenya and Tanzania.

Overall export growth is relatively modest because the reform scenarios primarily focus on intra-Africa liberalization. It is less than one per cent in many cases and below two per cent in most cases. Exceptions are some of South Africa's neighbours and Togo. See annex Table 9 for country level exports. On average, the percentage increase in exports is 0.3 to 0.5 per cent for the three scenarios, as shown in Figure 14.

Figure 14
Changes in African exports, by reform scenario
(per cent change)



Source: UNCTAD calculations and illustration based on the GTAP model.

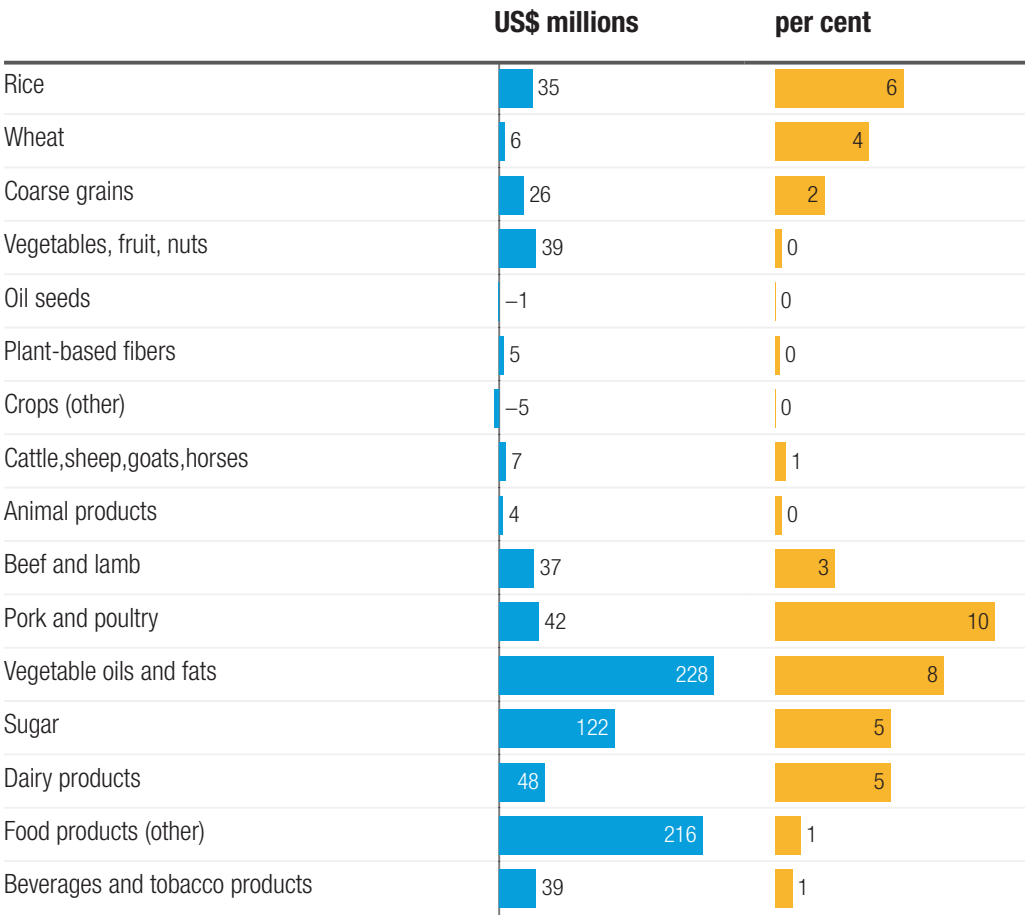
5.2.5. Sectoral impacts

Agri-food products account for US$ 850 million in additional exports from African countries in scenario 3, whereas industrial products contribute US$ 2.8 billion.[12] In agri-food products, the reforms particularly promote trade growth in processed agricultural products such as meat and vegetable oils. This can be seen in Figure 15, where vegetable oils, sugar and other food products dominate the changes in absolute terms (blue bars, left scale). In relative terms (yellow bars, right scale), exports of pork and poultry, vegetable fats and oils, sugar, rice, wheat and dairy products grow the most.

In the industrial sector, the main contributors to additional African exports are other

[12] Results for all three scenarios are provided in annex Table 9.

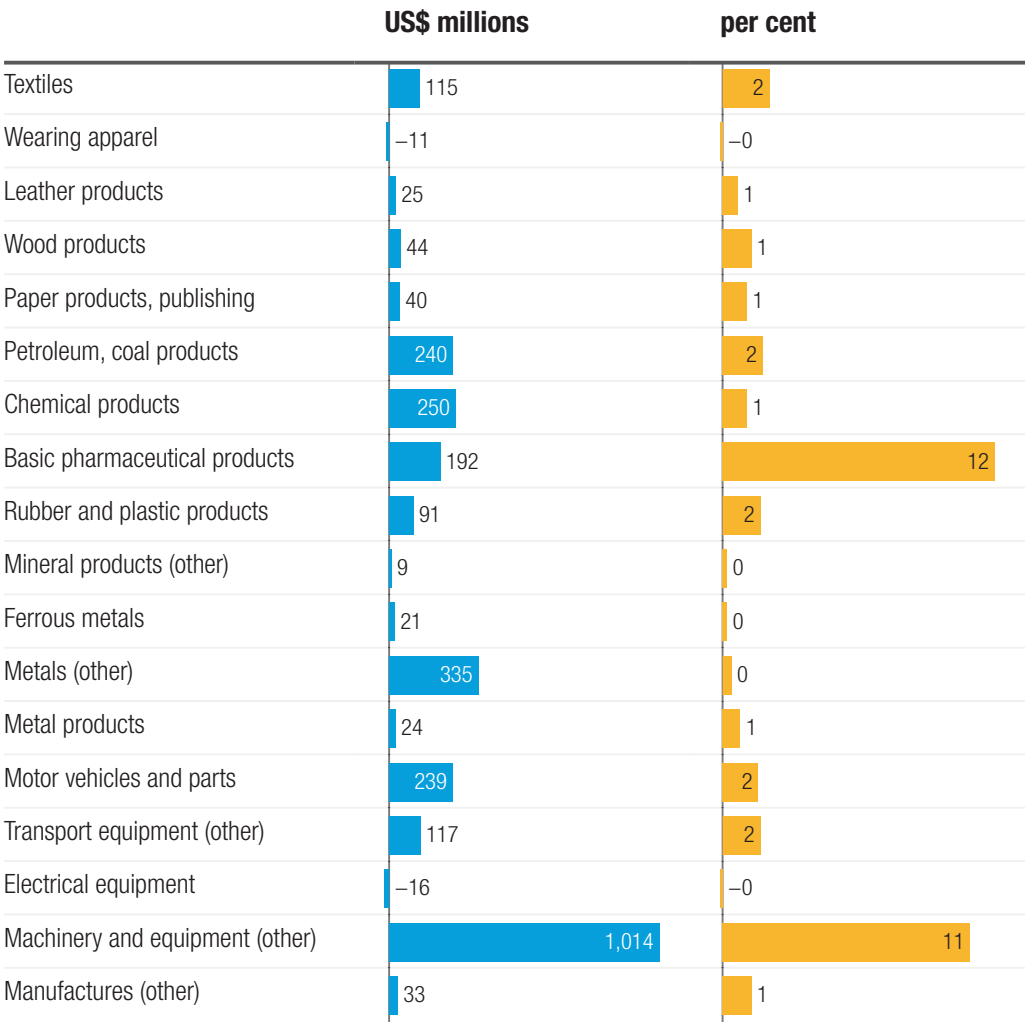
Figure 15
Changes in African agri-food exports (scenario 3), by sector



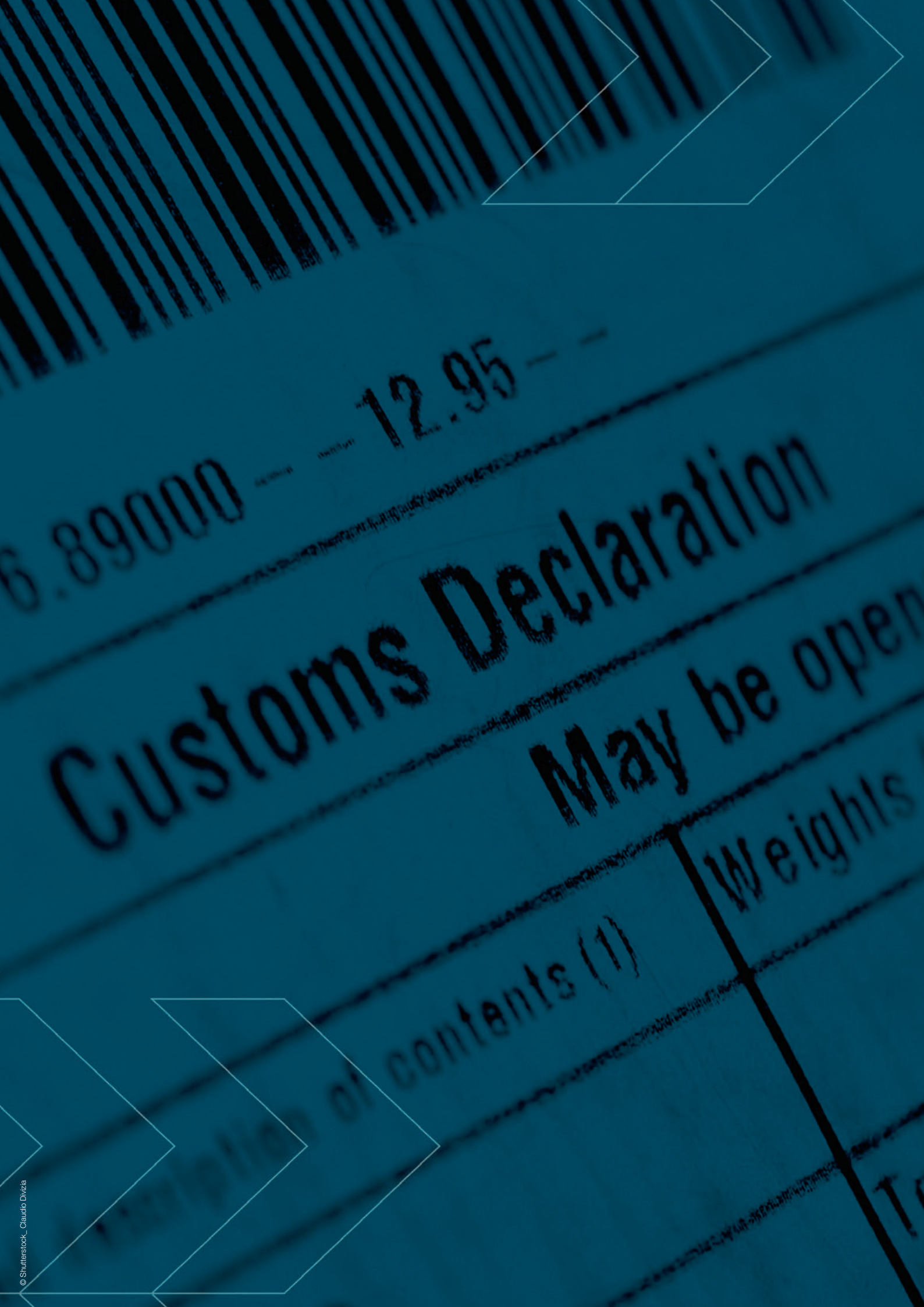
Source: UNCTAD calculations and illustration based on the GTAP model.

machinery and equipment (see Figure 16) – both in absolute and relative terms. The main changes in exports occur in South Africa, Ethiopia and Botswana. Basic pharmaceutical products also grow substantially in relative terms. In this sector, Kenya and South Africa grow the most in absolute terms, while Tunisia, Uganda, the Republic of the Congo, Burkina Faso and Botswana show significant relative growth rates of over 25 per cent.

Figure 16
Changes in African industrial exports (scenario 3), by sector



Source: UNCTAD calculations and illustration based on the GTAP model.



6. Conclusions and policy recommendations

This report shows that a gradual convergence of mandatory SPS measures and TBT towards the recommendations of international standards is the most beneficial strategy for African countries to promote trade and support economic growth and development. To maximize intra-Africa regulatory convergence and trade, ARSO follows an ideal strategy by proposing subsets of international standards that are suitable for African countries. However, the data shows that uptake in national legislation is rather low. The AfCFTA Sub-Committees on SPS measures and TBT, and ACTReF, should foster intensive dialogue between AfCFTA Member States and State Parties, ARSO and the other Pan African Quality Infrastructure (PAQI) institutions to promote convergence. Transparency is a necessary condition for regulatory cooperation and needs to be improved. To eliminate NTBs, the AfCFTA NTB online reporting, monitoring and elimination mechanism provides a platform for traders to report obstacles they encounter. Governments need to ensure effective follow-up to remove barriers and conduct awareness raising activities for their private sectors.

This report analyses data on the mandatory trade-related measures of 121 countries, including 32 African countries, for all agri-food and manufacturing sectors. The data shows that technical regulations are applied to almost all agri-food products and to 40 per cent of manufacturing products in Africa. The estimates show that ad valorem costs for intra-Africa trade are over 12 per cent and around 2 per cent in the broad sectors, respectively. Outright NTBs, such as non-automatic license and price controls are much less frequent, but very costly where they occur.

The cost of NTMs is a significant burden for intra-Africa trade, economic growth and structural transformation. Computable General Equilibrium modelling therefore explores regulatory reform scenarios in line with the mandate of the AfCFTA Protocol on Trade in Goods: to eliminate NTBs and enhance regulatory cooperation on SPS measures and TBT.

The simulations find that the elimination of quantitative restrictions and price controls can increase economic welfare in Africa by US$ 1.5 billion. However, benefits from addressing technical measures are much larger. While SPS measures and TBT cannot be eliminated due to their critical role in protecting health and the environment, the estimates show that 30-40 per cent of their costs can be reduced through regulatory convergence. If regulatory convergence is primarily intra-Africa, through adoption of regional standards, annual welfare is expected to rise by US$ 3.4 billion. If African countries converge towards the recommendations of Codex-IPPC-WOAH international standards in the agri-food sector, overall welfare benefits jump to US$ 7.1 billion.

In the latter and recommended scenario, the welfare boost in primarily driven by capital growth through investment and productivity growth. It also entails rising real wages by 0.8 per cent in African countries. Intra-Africa trade grows by more than 6 per cent on average and shows structural transformation towards agri-food processing and manufacturing, where some growth rates exceed 10 per cent.

The assessment of regulatory similarity and dissimilarity between countries' mandatory requirements and vis-à-vis the recommendations of international and ARSO standards allows further conclusions: For all sectors, the regulations of the largest global markets (for example, United States of America, European Union, China, India) are relatively different from each other and from African countries. For African countries, this implies that regulatory convergence towards one particular market will likely cause regulatory divergence with other large markets as well as African partners – and higher overall trade costs. The report's results corroborate the risk of "lock in" or "hub-and-spoke" trade structures found by Disdier et al. (2015). Adopting regulations from a developed market may increase exports to that market, but at the expense of higher domestic prices, lower South-South trade and less diversification into new markets.

The recommended strategy, as suggested by Disdier at al. (2015) and confirmed by this report, is convergence of mandatory SPS measures and TBT towards the recommendations of international standards. The analysis of Codex Alimentarius, IPPC and WOAH standards shows that a full adoption can only be a long-term target. In fact, only very few developed countries come close to these international standards recommendations. This, however, does not retract from the previous conclusion that adopting international standards is the dominant strategy for African countries. Even partial and gradual convergence towards international standards delivers the benefits estimated in this report.

Codex-IPPC-WOAH standards can be viewed as a "menu" from which to choose the most appropriate measures for the needs of a country. This strategy reduces the costs of technical measures, while maintaining a level of regulatory intensity appropriate for each country's level of development. Consequently, it promotes trade with intra-Africa partners as well as with the rest of the world.

To maximize growth of intra-Africa trade while following the strategy of global regulatory convergence, African regional standards should propose subsets of international standards that could fit the African context and be a realistic common target for the continent. An assessment of ARSO standards for cereals and pulses reveals that ARSO is seemingly pursuing exactly that strategy. While this can be considered the ideal approach, it turns out that the regulatory distance of African countries to ARSO standards is relatively high. Most African countries apply similar numbers of mandatory measures as recommended by ARSO, but different ones. Further analysis, including stakeholder consultations, is needed to investigate the reasons behind the relatively low uptake of the ARSO recommendations. The AfCFTA Sub-Committees on SPS measures and TBT should foster an intensive dialogue between AfCFTA Member States and State Parties, ARSO and the other Pan African Quality Infrastructure (PAQI) institutions to promote convergence. The African Union Ministerial Specialised Technical Committee for Trade, Tourism, Industry and Minerals adopted the ACTReF in May 2024 to further facilitate regulatory coordination and convergence. Cooperation should extend to conformity assessment, metrology and accreditation, as stipulated in the AfCFTA TBT Annex; and promote effective risk assessment, equivalence and regionalization of measures where possible as described in the AfCFTA SPS Annex.

Regulatory transparency is a necessary condition for regulatory cooperation and convergence. According to Cadot and

Gourdon (2015), transparency per se also reduces trade cost significantly. The data collection work undertaken by UNCTAD has shown that regulatory transparency in Africa could be improved dramatically by making all mandatory regulations freely and publicly accessible online. Increasing regulatory transparency is also mandated by the SPS and TBT Annexes of the AfCFTA Protocol on Trade in Goods.

For the elimination of NTBs, including procedural obstacles and burdensome SPS measures and TBT, Annex 5 on NTBs establishes a reporting, monitoring and elimination mechanism where private sector and/or governments can file complaints. The complaint is then transmitted to the government of the responsible trading partner. If both parties agree on a solution, the complaint is resolved.[13] For this mechanism to be effective, the private sector must feel comfortable in reporting NTBs and see genuine efforts by governments to help resolve the problems. It is therefore critical that governments embrace NTB reports as a constructive means to eliminate barriers and grow their own economies. They should also invest in national awareness raising campaigns on NTB reporting for their own private sector.

[13] The AfCFTA NTB Online Mechanism at https://tradebarriers.africa has been developed with the support of UNCTAD and is fully functional.

7. Annex

7.1. The International Classification of Non-Tariff Measures

The classification comprises 16 chapters covering different categories of measures (Table 3, left side). The first 15 chapters (A–O) cover import-related NTMs, that is, the requirements imposed by a country on imported products, and the final chapter (P) covers export-related measures, that is, the requirements imposed by a country on its own exports. A distinction is made between technical measures (chapters A–C) and non-technical measures (chapters D–O). Quantitative restrictions (chapter E) and price-control measures (chapter F) are referred to as NTBs in this report.

The classification of NTMs has a tree structure, whereby each chapter is further divided into several subgroups with up to three levels. For example, at the finest level of detail, chapter A on SPS measures consists of 34 codes (Table 3, right side), and chapter B on TBT has 23 disaggregated codes.

Table 3
UNCTAD-MAST international classification of non-tariff measures

Import-related measures	Technical measures	A	Sanitary and Phytosanitary (SPS) measures
		B	Technical barriers to trade (TBT)
		C	Pre-shipment inspections and other formalities
	Non-technical measures	D	Contingent trade-protective measures
		E	Non-automatic licensing, quotas, prohibitions and quantity-control measures
		F	Price-control measures, including additional taxes and charges
		G	Finance measures
		H	Measures affecting competition
		I	Trade-related investment measures
		J	Distribution restrictions
		K	Restrictions on post-sales services
		L	Subsidies (excl. export subsidies)
		M	Government procurement restrictions
		N	Intellectual property
		O	Rules of origin
Export-related measures		P	Export-related measures

Tree structure -- for example:

A Sanitary and Phytosanitary (SPS) measures

A1 Prohibitions/restrictions of imports for SPS reasons
- A11 Temporary geographic prohibition
- (…)

A2 Tolerance limits for residues and restricted use of substances
- (…)

A3 Labelling, marking, packaging requirements
- (..)

A4 Hygienic requirements
- (…)

A5 Treatment for the elimination of pests and diseases
- A51 Cold/heat treatment
- A52 Irradiation
- (…)

A6 Requirements on production / post-production processes
- (…)

A8 Conformity assessment
- A81 Product registration
- A82 Testing requirement
- A83 Certification requirement
- A84 Inspection requirement
- A85 Traceability requirement
  - A851 Origin of materials and parts
  - A852 Processing history
  - (…)
- A86 Quarantine requirement
- A89 Other conformity assessments

Source: UNCTAD illustration based on UNCTAD (2019)

7.2. Econometric estimation methodology

The basic intuition of the estimation is that *cost-insurance-freight* (c.i.f.) product prices at the border are "treated" by different types of technical measures and NTBs and various other factors known from the *Gravity* literature (see Anderson and van Wincoop, 2003; Head and Mayer, 2014). The dataset covers 104 countries (counting the European Union as one) with data newer than 2018, thereof 32 in Africa, and over 5000 products.

The explained variables are *cost-insurance-freight* (c.i.f.) unit values, instead of *free-on-board* (f.o.b.) as they are likely to capture more of the NTM-related costs. Unit values are calculated from COMTRADE data as a 4-year average between 2018 and 2021. While unit values at the bilateral- and product-level are known to be statistically noisy, various data cleaning approaches proposed by Berthou and Emlinger (2011) are used to improve data quality significantly. The estimated effects are therefore ad valorem equivalents in terms of the impact on the final *c.i.f.* unit value goods price.

The NTM variables distinguish matching and non-matching technical regulations, and 4 types of NTBs (non-automatic licenses, quotas, prohibitions and price-control measures). In specifications (1) and (2), the matching/non-matching NTMs refer to bilateral regulatory similarities between Africa countries and estimations are run only for intra-Africa trade. In specifications (3) and (4), matching/non-matching NTMs refer to regulatory similarities with agri-food international standards. Specification (3) is run for intra-Africa data and specification (4) for African imports from the rest of the world.

Furthermore, *Gravity*-style control variables are included to capture overall price levels (the logarithm of exporter's and importer's per capita GDP) and transport costs (distance, landlocked and common borders). Tariffs are also included as a 5-year average between 2018 and 2022.

Product-specific effects are absorbed through product-level fixed effects.

The simple log-linear ordinary-least-squares estimation equation reads as follows with sub-indices for product *k*, importer I and exporter *j*:

$$\ln(p_{ijk}) = \alpha + \beta_1 \text{matchingNTM}_{ijk} + \beta_2 \text{non-matchingNTM}_{ijk} + \boldsymbol{\beta}\ \mathbf{NTBs}_{ijk} + \beta_7 \ln(1 + tariff)_{ijk} + \beta_8 \ln(\text{GDPpc}_i) + \beta_9 \ln(\text{GDPpc}_j) + \beta_{10} \text{landlocked}_i + \beta_{11} \text{landlocked}_j + \beta_{12} \ln(\text{distance}_{ij}) + \beta_{13} \text{contig}_{ij} + FE_k + \varepsilon_{ijkt}$$

The regression results are presented in Table 4. Statistically insignificant β-parameters, for example for quotas, are considered as zero.

Table 4
Regression results

Dependent variable: ln(import unit value)

	(1) Agri-food Intra-Africa	(2) Manufacturing Intra-Africa	(3) Int. standards Intra-Africa	(4) Int. standards Africa import from the rest of the world
Non-matching technical measures	0.023***	0.022***		
	(0.00)	(0.00)		
Matching technical measures	0.010*	-0.0061		
	(0.01)	(0.01)		
Standard-non-overlapping technical measures			0.024***	0.033***
			(0.01)	(0.00)
Standard-overlapping technical measures			0.011**	0.026***
			(0.00)	(0.00)
Non-automatic license (dummy)	-0.58	0.024		
	(0.40)	(0.20)		
Quota (dummy)	-0.42	-0.047		
	(0.46)	(0.14)		
Non-technical prohibition (dummy)	0.086	0.13***		
	(0.13)	(0.02)		
Price control (dummy)	0.38*	0.11**		
	(0.21)	(0.05)		
ln(1+tariff)	-0.59***	-0.074	-0.60***	-0.14
	(0.15)	(0.07)	(0.15)	(0.08)
ln(importer GDP per capita)	0.027	0.015*	0.027	0.27***
	(0.02)	(0.01)	(0.02)	(0.03)
ln(exporter GDP per capita)	0.37***	0.21***	0.37***	0.14***
	(0.02)	(0.01)	(0.02)	(0.01)
ln(distance)	0.19***	0.33***	0.19***	0.020
	(0.03)	(0.01)	(0.03)	(0.01)
1 for common border	0.00048	0.096***	-0.0026	0.13
	(0.05)	(0.02)	(0.05)	(0.32)
1 if importer landlocked	0.30***	0.0090	0.28***	0.61***
	(0.04)	(0.01)	(0.03)	(0.03)
1 if exporter landlocked	0.22***	0.30***	0.25***	0.43***
	(0.04)	(0.02)	(0.04)	(0.06)
Constant	-4.18***	-2.31***	-4.14***	-3.03***
	(0.27)	(0.12)	(0.26)	(0.23)
	Product-fixed effects			
Observations	12287	78751	12287	31399
Adjusted R^2	0.497	0.578	0.497	0.497
AIC	34332.6	250703.0	34337.9	91493.9
ll_0	-17815.3	-127613.3	-17815.3	-47275.0

Standard errors in parentheses
* p < 0.10, ** p < 0.05, *** p < 0.01

7.3. Technical example of reform scenarios for technical measures

Using the NTM data collected by UNCTAD with its many partners, it is possible to compare regulatory structures across countries and across over 5000 disaggregated products. Table 5 illustrates the method using an example of a few NTMs applied to a specific product in two countries.

The left pane of Table 5 shows four different types of technical NTMs. As indicated by a '1' in the respective fields, importer X applies three of these measure types. Exporter Y applies two. Both importer and exporter require an SPS inspection for the given product. This can be considered a regulatory match from the perspective of exporter Y (as indicated by the arrow in the second row).[14] It can be assumed that a producer in country Y is used to domestic SPS inspections and therefore finds it less difficult to also comply with the inspection of importer X. However, there is no match regarding the other two measures that importer X applies (as indicated by the crossed arrows in the other rows). The special authorization (A14) applied by exporter Y (first row of the table) does not create an additional regulatory match because this type of NTM is not applied by importer X. In summary, we see that in the baseline scenario, there is one overlapping NTM between the two trading partners, two additional (non-matching) measures applied by the importer, and one non-matching measure applied by the exporter.

If exporter Y wanted to increase the regulatory overlap through domestic reform (exporter Y*), a simple scenario could be imagined. Exporter Y could replace the discretionary "A14: special authorization" by an “A83: SPS certificate”, like importer X. The total number of NTMs in exporter Y remains the same. However, all two measures applied by the exporter Y* now match importer X. This minimal policy reform should decrease the costs of trading the product from exporter Y* to importer X.

Certainly, details are particularly crucial with complex technical measures. SPS certificates, inspections and maximum residue limits may vary substantially between two countries. Nevertheless, the proposed regulatory matching delivers an approximation with respect to the similarity of regulatory structures and mechanisms. With thousands of products and many countries to compare and aggregate, a bigger picture is visible.

Table 5
Example of NTM reform scenario

NTM types and codes for a specific product at HS-6 level: e.g. rice	Importer X	Exporter Y	Exporter Y* after reform
A14: Special authorization	0	1	0
A81: SPS inspection	1	1	1
A83: SPS certificate	1	0	1
A61 Plant growth processes	1	0	0
Total number of NTMs	**3**	**2**	**2**
Number of overlapping NTMs	**1**		**1+1=2**
Number of non-overlapping NTMs in Importer X	**2**		**2-1=1**
Number of non-overlapping NTMs in Exporter Y	**1**		**1-1=0**

[14] Following WTO principles of non-discrimination between domestic and foreign products, most measures applied as import-related NTMs should also be applied domestically for domestic producers.

7.3. Computable General Equilibrium model: results tables

Table 6
Welfare impacts in all regions, in US$ millions

Country / Region	Scenario 1	Scenario 2	Scenario 3
European Union	-329	-938	-1200
United States of America	-223	-1044	-1829
Japan	-108	-337	-573
China	-276	-683	-944
Australia	-2	-27	-63
European Free Trade Association	-21	-57	-89
Other developed	-65	-204	-330
India	-172	-328	-378
South Asia	-31	-119	-180
Southeast Asia	-69	-262	-366
Russian Federation	3	-80	-200
Central Asia & Eastern Europe	2	-40	-120
Latin America	-68	-353	-604
Middle East	-88	-417	-650
Algeria	-9	36	448
Benin	4	42	163
Botswana	45	130	130
Burkina Faso	4	16	27
Cameroon	21	39	54
Chad	0	-1	-1
Congo (the)	12	7	18
Egypt	204	392	1975
Eswatini	158	207	152
Ethiopia	177	188	252
Gabon	29	33	27
Ghana	157	191	293
Guinea	0	-1	-3
Kenya	198	495	584
Malawi	35	62	62
Mauritius	19	56	65
Mozambique	27	132	184
Namibia	109	206	200
Niger	7	26	26
Nigeria	5	26	258
Rwanda	22	45	68
Senegal	28	68	122
South Africa	332	642	1150
Tanzania, United Republic of	17	72	165
Togo	-94	-14	-41
Tunisia	31	79	465
Uganda	71	145	161
Zambia	9	35	53
Zimbabwe	93	134	146
Rest of Eastern Africa	-31	-12	40
Rest of South African Customs Union	23	31	31
Rest of Western Africa	-28	36	93
Rest of Africa	-125	-159	-223
Africa	1550	3386	7142

Table 7
GDP impacts by African regions, in per cent

Country / Region	Scenario 1	Scenario 2	Scenario 3
Algeria	0.0	0.0	0.4
Benin	0.0	0.2	1.0
Botswana	0.4	1.1	1.1
Burkina Faso	0.0	0.1	0.1
Cameroon	0.1	0.1	0.1
Chad	0.0	0.0	0.0
Congo (the)	0.4	0.4	0.5
Egypt	0.0	0.1	0.6
Eswatini	5.0	6.2	4.8
Ethiopia	0.2	0.2	0.2
Gabon	0.2	0.3	0.2
Ghana	0.3	0.3	0.5
Guinea	0.0	0.0	0.0
Kenya	0.2	0.5	0.6
Malawi	0.2	0.3	0.3
Mauritius	0.2	0.4	0.6
Mozambique	0.2	1.0	1.4
Namibia	0.8	1.6	1.6
Niger	0.1	0.1	0.1
Nigeria	0.0	0.0	0.1
Rwanda	0.2	0.4	0.6
Senegal	0.1	0.3	0.5
South Africa	0.1	0.2	0.4
Tanzania, United Republic of	0.1	0.2	0.3
Togo	-0.7	0.0	-0.1
Tunisia	0.1	0.2	1.4
Uganda	0.3	0.5	0.5
Zambia	0.0	0.1	0.2
Zimbabwe	0.5	0.9	0.9
Rest of Eastern Africa	0.2	0.3	0.6
Rest of South African Customs Union	2.6	3.0	2.9
Rest of Western Africa	0.0	0.4	0.7
Rest of Africa	0.0	0.0	0.0
Africa	0.08	0.16	0.32

Table 8
Real factor prices by African regions, scenario 3, in per cent

Country / Region	Land	Unskilled labour	Capital	Natural resources
Algeria	-0.6	0.6	0.4	0.8
Benin	0.7	1.1	0.8	-0.6
Botswana	2.4	1.6	-0.1	-0.6
Burkina Faso	0.5	0.2	0.0	-0.1
Cameroon	0.1	0.2	0.0	0.2
Chad	-0.1	0.2	0.0	-0.4
Congo (the)	1.6	1.7	0.3	1.3
Egypt	-0.3	0.6	0.2	-0.6
Eswatini	8.1	3.9	-1.7	na
Ethiopia	0.4	0.2	0.0	1.2
Gabon	1.0	0.3	-0.1	-0.3
Ghana	0.4	0.5	0.1	2.4
Guinea	0.0	0.0	0.0	-0.1
Kenya	0.2	0.6	0.2	2.5
Malawi	1.6	0.9	-0.3	1.7
Mauritius	0.1	0.8	0.2	-1.2
Mozambique	2.3	1.7	0.5	1.1
Namibia	1.7	2.3	0.3	2.4
Niger	0.8	0.0	-0.5	0.4
Nigeria	-0.3	0.0	0.1	0.2
Rwanda	1.0	0.6	0.0	1.6
Senegal	0.4	0.5	0.2	2.3
South Africa	-1.6	0.5	0.1	0.2
Tanzania, United Republic of	0.3	0.4	0.1	0.5
Togo	-3.3	-0.4	0.6	-4.3
Tunisia	-3.1	1.2	0.7	1.0
Uganda	1.8	0.6	-0.3	1.9
Zambia	1.6	0.3	0.1	0.1
Zimbabwe	-0.3	1.5	-0.1	1.4
Rest of Eastern Africa	0.8	0.6	-0.3	1.7
Rest of South African Customs Union	2.0	3.4	-0.9	4.2
Rest of Western Africa	0.5	0.8	0.4	1.5
Rest of Africa	-0.1	-0.1	0.0	0.1

Table 9
Export gains by African regions, in per cent

Country / Region	Scenario			Scenario		
	1	2	3	1	2	3
	Total exports			Intra-Africa exports		
Algeria	0.1	0.2	0.3	1.5	4.0	3.2
Benin	0.1	0.3	-0.3	2.3	11.2	5.5
Botswana	0.9	1.4	1.4	10.0	13.9	13.
Burkina Faso	0.1	0.2	0.2	0.6	3.1	2.7
Cameroon	0.3	0.5	0.4	4.6	6.9	6.4
Chad	0.1	0.1	0.1	20.8	25.0	24.0
Congo (the)	0.8	0.8	0.9	1.9	2.0	2.2
Egypt	0.1	0.2	-0.3	4.3	8.3	6.1
Eswatini	5.7	7.1	4.9	6.6	8.6	5.3
Ethiopia	0.8	0.9	0.9	22.5	24.4	23.4
Gabon	0.5	0.5	0.5	18.1	21.8	19.2
Ghana	0.8	0.9	1.1	31.7	35.3	33.4
Guinea	0.0	0.0	0.0	7.8	9.7	8.7
Kenya	0.8	1.7	1.5	5.4	12.4	9.6
Malawi	0.6	1.0	0.6	6.2	11.1	8.0
Mauritius	0.4	0.8	0.7	4.0	8.8	5.4
Mozambique	0.8	1.6	1.2	3.8	6.9	5.5
Namibia	2.1	2.9	2.9	8.5	11.4	10.6
Niger	0.3	1.1	1.0	1.1	5.4	4.8
Nigeria	0.0	0.0	0.1	0.6	0.9	0.7
Rwanda	1.3	1.7	1.6	13.6	17.8	16.4
Senegal	0.2	0.5	0.5	1.8	3.8	2.9
South Africa	0.7	1.0	1.2	3.7	6.2	5.5
Tanzania, United Republic of	0.7	1.1	1.0	4.5	8.3	6.2
Togo	3.0	1.7	3.3	4.8	6.5	6.2
Tunisia	0.2	0.3	0.8	4.2	7.9	7.7
Uganda	1.2	1.8	1.8	3.0	6.6	6.1
Zambia	0.1	0.2	0.2	4.7	6.3	5.8
Zimbabwe	2.1	2.4	2.4	10.1	10.5	10.7
Rest of Eastern Africa	0.7	0.8	0.9	4.0	6.2	6.8
Rest of South African Customs Union	3.6	3.7	3.7	10.5	10.9	10.5
Rest of Western Africa	0.6	0.9	0.8	1.4	6.3	3.5
Rest of Africa	-0.1	-0.1	-0.2	-2.5	-2.7	-3.7
Total	0.34	0.50	0.47	4.5	7.3	6.2

Table 10
Change in total African exports by sector, in US$ millions

Sector	Scenario 1	Scenario 2	Scenario 3
Rice	5	35	35
Wheat	0	7	6
Coarse grains	17	29	26
Vegetables, fruit, nuts	-22	3	39
Oil seeds	-6	-3	-1
Plant-based fibers	0	1	5
Crops (other)	-34	-4	-5
Cattle, sheep, goats, horses	2	21	7
Animal products	-3	4	4
Forestry	1	0	0
Fishing	-1	-1	-1
Minerals	-8	-9	-4
Resources	-94	-161	-186
Beef and lamb	4	33	37
Pork and poultry	4	58	42
Vegetable oils and fats	80	335	228
Sugar	36	168	122
Dairy products	9	68	48
Food products (other)	1	317	216
Beverages and tobacco products	22	61	39
Textiles	96	125	115
Wearing apparel	20	-8	-11
Leather products	5	4	25
Wood products	10	36	44
Paper products, publishing	26	25	40
Petroleum, coal products	148	233	240
Chemical products	195	323	250
Basic pharmaceutical products	87	174	192
Rubber and plastic products	46	56	91
Mineral products (other)	9	15	9
Ferrous metals	28	16	21
Metals (other)	317	179	335
Metal products	28	25	24
Motor vehicles and parts	190	211	239
Transport equipment (other)	104	106	117
Electrical equipment	27	-10	-16
Machinery and equipment (other)	886	990	1014
Manufactures (other)	28	30	33
Utilities	7	16	14
Transport & communications	-21	-109	-168
Services	-123	-233	-266

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