

**The KENYA INSTITUTE for PUBLIC  
POLICY RESEARCH and ANALYSIS**

# **The Implications of the African Continental Free Trade Area: Evidence from Partial Equilibrium Model on Kenya**

**Kenneth K. Malot and Martin W. Nandelenga**

**DP/306/2023**

**THE KENYA INSTITUTE FOR PUBLIC POLICY  
RESEARCH AND ANALYSIS (KIPPRA)**

# **The Implications of the African Continental Free Trade Area (AfCFTA): Evidence from Partial Equilibrium Model on Kenya**

*Kenneth K. Malot and Martin W. Nandelenga*

Kenya Institute for Public Policy  
Research and Analysis

*KIPPRA Discussion Paper No. 306*  
*2023*

## **KIPPRA in Brief**

The Kenya Institute for Public Policy Research and Analysis (KIPPRA) is an autonomous institute whose primary mission is to conduct public policy research leading to policy advice. KIPPRA's mission is to produce consistently high-quality analysis of key issues of public policy and to contribute to the achievement of national long-term development objectives by positively influencing the decision-making process. These goals are met through effective dissemination of recommendations resulting from analysis and by training policy analysts in the public sector. KIPPRA therefore produces a body of well-researched and documented information on public policy, and in the process assists in formulating long-term strategic perspectives. KIPPRA serves as a centralized source from which the Government and the private sector may obtain information and advice on public policy issues.

Published 2023

© Kenya Institute for Public Policy Research and Analysis

Bishops Garden Towers, Bishops Road

PO Box 56445-00200 Nairobi, Kenya

tel: +254 20 2719933/4; fax: +254 20 2719951

email: [admin@kippra.or.ke](mailto:admin@kippra.or.ke)

website: <http://www.kippra.org>

ISBN 978 9914 738 30 8

The Discussion Paper Series disseminates results and reflections from ongoing research activities of the Institute's programmes. The papers are internally refereed and are disseminated to inform and invoke debate on policy issues. Opinions expressed in the papers are entirely those of the authors and do not necessarily reflect the views of the Institute.

---

## Abstract

*This study aims to provide policy makers with a clear understanding of the short-term impacts of tariff liberalization within the framework of the African Continental Free Trade Area (AfCFTA) on the Kenyan economy. The study used the TRIST model to analyze the effects of AfCFTA on Kenya's revenue, price effects, trade dynamics, and overall welfare. It focuses on determining the impact of AfCFTA on the revenue effects, tariff and price impacts, welfare effects, and the influence on trade, both imports and exports using the 2021 disaggregated trade data. The findings indicate that tariff liberalization leads to a substantial decline in tariff revenue for Kenya, with an average potential loss of Ksh 22.53 billion. Additionally, there is a marginal increase of around 0.1 per cent in imports from African nations in sectors such as manufacturing dairy products and growing crops. At the same time, exports will expand within the region, particularly in countries where Kenya lacked functional trade agreements. Notably, sectors such as dairy product manufacturing experience a 0.02 per cent reduction in protectionism. Tariff liberalization significantly lowers the prices of imported products, especially in categories such as other service activities and manufactured items. The findings also show improved welfare, with the highest welfare effects observed in categories such as motor cars and other motor vehicles. Based on the findings, policy makers should develop strategic measures for revenue diversification to mitigate revenue loss. Tailored interventions are needed to protect sensitive sectors. Strengthening domestic industries is vital for the country to fully realize the AfCFTA's benefits. Ongoing monitoring of trade dynamics within AfCFTA is crucial for adapting to evolving conditions and optimizing opportunities. Additionally, robust consumer protection measures and transparent pricing are essential for shielding consumers from adverse impacts, fostering trust, and ensuring the long-term success of AfCFTA's transformative potential.*

## **Abbreviations and Acronyms**

AfCFTA	African Continental Free Trade Area
AFTA	African Free Trade Area
COMESA	Common Market for Eastern and Southern Africa
COVID-19	Coronavirus 2019
EAC	East African Community
H-O	Heckscher-Ohlin
IMF	International Monetary Fund
ISIC	International Standard Industrial Classification
ITC	International Trade Centre
LDCs	Least Developed Countries

---

## Table of Contents

<b>Abstract</b> .....	<b>iii</b>
<b>Abbreviations and Acronyms</b> .....	<b>iv</b>
<b>1. Introduction</b> .....	<b>1</b>
<b>2. Stylized Facts of Trade in Kenya</b> .....	<b>4</b>
2.1 Kenya’s Trade Performance in the African Continent .....	5
<b>3. Related Literature</b> .....	<b>8</b>
3.1 Theoretical Literature .....	8
3.1.1 The Theory of Absolute Advantage .....	8
3.1.2 The Heckscher-Ohlin (H-O) Theory .....	8
3.2 Empirical Literature.....	9
<b>4. Methodology and Data</b> .....	<b>12</b>
4.1 Analytical Framework .....	12
4.2 Data Sources .....	15
4.3 Descriptive Statistics .....	15
<b>5. Results and Discussion</b> .....	<b>17</b>
5.1 Revenue Effects .....	17
5.2 Price and Sector Protection Effects .....	19
5.3 Impact on Import Trade .....	19
5.4 Welfare Effects .....	20
5.5 Change in Kenya Exports Post-AfCFTA .....	22
5.6 Sensitivity Analysis and Robustness Check .....	23
<b>6. Conclusion and Policy Recommendations</b> .....	<b>25</b>
6.1 Conclusion .....	25
6.2 Policy Recommendations .....	25
<b>References</b> .....	<b>27</b>
<b>Appendix</b> .....	<b>29</b>
Appendix Table 1: Simulation results by the ISIC classification .....	29
Appendix 2: Detailing the Calculation Steps in the TRIST Model .....	35

## **List of Tables and Figures**

### **List of Tables**

Table 2.1: Kenyan exports to and imports from Africa as a share (%) of the total...	6
Table 4.1: Descriptive statistics .....	17
Table 5.1 Impact of AfCFTA implementation on tariff revenue.....	18
Table 5.2: Change in tariff revenues at tariff line in Ksh billion .....	19
Table 5.3: Percentage change in commodity prices and sector protection .....	20
Table 5.4: Impact of tariff liberalization on import trade .....	21
Table 5.5: Change in the value of imports by ISIC classification .....	21
Table 5.6: Top 15 products with the highest welfare potential in AfCFTA (KSh million) .....	22
Table 5.7: Kenya's top export destinations post-AfCFTA .....	23
Table 5.8: Robustness and sensitivity analysis of tariff revenue imports .....	25
Annex Table 1: Simulation results by the ISIC classification .....	30

### **List of Figures**

Figure 2.1: Export and import markets of average value between 2011 and 2021 (%) .....	4
--	---

---

## 1. Introduction

On 21st March 2018, Heads of State and governments in Africa signed the Africa Continental Free Trade Area (AfCFTA),<sup>1</sup> marking considerable progress towards achieving continental integration. The agreement with a coverage of 55 countries and a population of 1.3 billion people offers room for the largest global trade liberalization in goods and services (World Bank, 2020). Central to the formation of the AfCFTA is securing a single market for African merchandise with the expectation to increase productivity and enhance social economic development. According to the World Bank Report (2020), AfCFTA is expected to lift 30 million people from extreme poverty, increase the amount of income by US\$ 450 million, increase intracontinental exports by 81 per cent (with manufacturing increasing by 62 per cent), and cushion the continental from external shocks such as the recent COVID-19 pandemic.<sup>2</sup> The benefits notwithstanding, the implementation of AfCFTA may reveal heterogeneous effects across countries.<sup>3</sup>

This study investigates the implications of AfCFTA on Kenya. More specifically, it aims to assess the revenue, trade, price impacts, and welfare implications of AfCFTA on Kenya. The theoretical framework of Free Trade Area asserts that it leads to socio-economic development, improved welfare, higher output, and increased intra-trade (Stolper and Samuelson, 1941), and higher output due to comparative advantage and factor endowments (Ricardo's thesis and Heckscher-Ohlin hypothesis). In addition, empirical literature suggests that the Free Trade Area (FTA) will enhance welfare and accelerate economic development via increased intra-trade (Darku and Appau, 2015; Masiya, 2019; and Bayale et al., 2020). However, Epaphra (2014) opines that they lead to higher trade tax revenue due to increased imports.

This study seeks to improve and complement existing literature by broadening the understanding of AfCFTA and its implications to member countries to strengthen membership and coordination of the trade regime. As such, the contribution of this study is fourfold. First, it is important to approach the African Continental Free Trade Area (AfCFTA) from a policy standpoint that comprehensively evaluates its potential ramifications on both welfare and revenue. This examination holds

---

1 The AfCFTA agreement was signed on March 18, 2018, and, pursuant to Article 23 of the Treaty, it came into effect on May 30, 2019, after 22 countries submitted the ratified documents to African Union Commission (AUC). Further, the AfCFTA Treaty, Articles 3 and 4 allude to the fact that there should be a single African market to offer free movement of goods and services, businesses, investments, and factor inputs, among others. For details see [https://au.int/sites/default/files/treaties/36437-treaty-consolidated\\_text\\_on\\_cfta\\_-\\_en.pdf](https://au.int/sites/default/files/treaties/36437-treaty-consolidated_text_on_cfta_-_en.pdf), last accessed on 17 October, 2020.

2 According to the Brookings Institution (2019) report, the AfCFTA will boost intra-Africa trade between 40 per cent and 50 per cent. The reports note that although intra-trade in Africa has increased on average from 10 per cent in 1995 to 17 per cent in 2017, it is way below Europe and Asia at 69 per cent and 59 per cent, respectively.

3 Since the 1960s, integration efforts have been pursued by African leaders, with the formation of the Organization of African Unity in 1963. These efforts continued resulting to the Abuja Treaty of 1991, where African countries were encouraged to create regional economic communities (RECs). For details, see Treaty Establishing the African Economic Community (the Abuja Treaty), available at [https://au.int/sites/default/files/treaties/37636-treaty-0016\\_\\_treaty\\_establishing\\_the\\_african\\_economic\\_community\\_e.pdf](https://au.int/sites/default/files/treaties/37636-treaty-0016__treaty_establishing_the_african_economic_community_e.pdf). Last accessed on October 17, 2020.



the potential to be immensely beneficial to the participating member countries, most notably the Government of Kenya, as it could offer a strategic avenue for diversifying and expanding revenue streams (Smith et al., 2020). Such a diversification of revenue sources could yield substantial improvements in socio-economic welfare across the nation. Delving deeper into this context, a thorough analysis of the implications of tariff liberalization within the AfCFTA framework becomes an essential endeavour. This assessment stands to provide valuable insights into how the liberalization of tariffs may influence import demand patterns, which in turn plays a pivotal role in shaping consumer welfare (Jones and Brown, 2019). It is well established within the literature that the advent of free trade agreements often leads to a reduction in commodity prices. This reduction, in turn, translates to tangible benefits for consumers, thereby amplifying overall welfare (Johnson et al., 2018). The underpinning idea is that as barriers to trade decrease and competition intensifies, prices tend to decrease, and consumers are positioned to derive greater value from their purchases, fostering an environment of enhanced well-being. This collective understanding highlights the intricate relationship between tariff liberalization, consumer welfare enhancement, and the potential positive impact on the broader social and economic fabric.

Second, several studies with a focus on AfCFTA have emerged, for example Masiya (2019), Obeng-Odoom (2020), Aniche (2020), Ndonga et al. (2020), Simo (2020) and Bayale et al. (2020), among others. All these studies assess the relevance of the AfCFTA Treaty to achieving Africa's integration agenda and the implications of the Treaty on welfare and trade revenue. While we acknowledge the valuable information from these studies for policy to strengthen the Treaty going forward, they also fall short of addressing country dynamics. For example, Masiya (2019), Ndonga et al. (2020), and Bayale et al. (2020) address similar objectives that this study focuses on. However, they fail to consider Kenya's dynamic nature in the international trade market and the individual effects at the tariff lines. Importantly, coffee, tea, and horticultural sectors are key export goods to the international market, and thus provide a need to assess AfCFTA implications on Kenyan products.

Third, despite a plethora of empirical studies on this topic, the findings are at best equivocal or conflicting. For instance, several studies have established that AfCFTA will increase intra-trade, improve welfare, increase trade creation, and accelerate economic development (Darku and Appau, 2015; Masiya, 2019; Bayale et al., 2020). In addition, empirical evidence suggests that specific goods have a detrimental effect on trade revenue (Masiya, 2019). On the other hand, FTAs have been censured for accentuating inequality and advancing trade imbalance at the expense of less developed countries (LDCs) (Chang, 2002; Robinson and Joan, 1979; Dunn, 2009; and Valiente-Riedl, 2016). From a theoretical standpoint, trade liberalization through the Free Trade Area is geared toward a reduction in trade tax revenue (Matlanyane and Harmse, 2002; Lang, 2006). However, Epaphra (2014) opines that lower tariffs as a result of trade liberalization lead to cheaper imports and thus increase import volumes resulting in increased trade tax revenues. Indeed, the forementioned lack of consensus both from the theoretical

and empirical standpoints, highlights the need for further investigation of this thematic area.

Fourth, this study focuses on Kenya, because of the country's relevance in trade and GDP contribution to Africa. In terms of GDP size, Kenya is ranked the sixth biggest economy in Africa and third in Sub-Saharan Africa (SSA).<sup>4</sup> In addition, the country has experienced a steady GDP growth averaging 5.8 per cent for the period 2010 - 2020 which is way above the SSA average of 4.1 per cent during the same period (IMF, 2020). However, Kenya's GDP growth rate is below the expectations outlined in the Kenya Vision 2030 of an annual GDP growth rate of 10 per cent. As such, it is anticipated that with the entry of AfCFTA, Kenya will experience increased intra-trade that will accelerate economic growth to actualize the objectives of the Kenya Vision 2030. Although AfCFTA has been touted with lofty ambitions resulting in increased empirical analysis by policy makers, academics, and researchers, the Kenyan perspective has not been examined. Importantly, the focus has been on the continent's benefits with limited evaluation at the country level. In addition, most of the available information, although valuable, has merely been reported without rigorous empirical analysis.

---

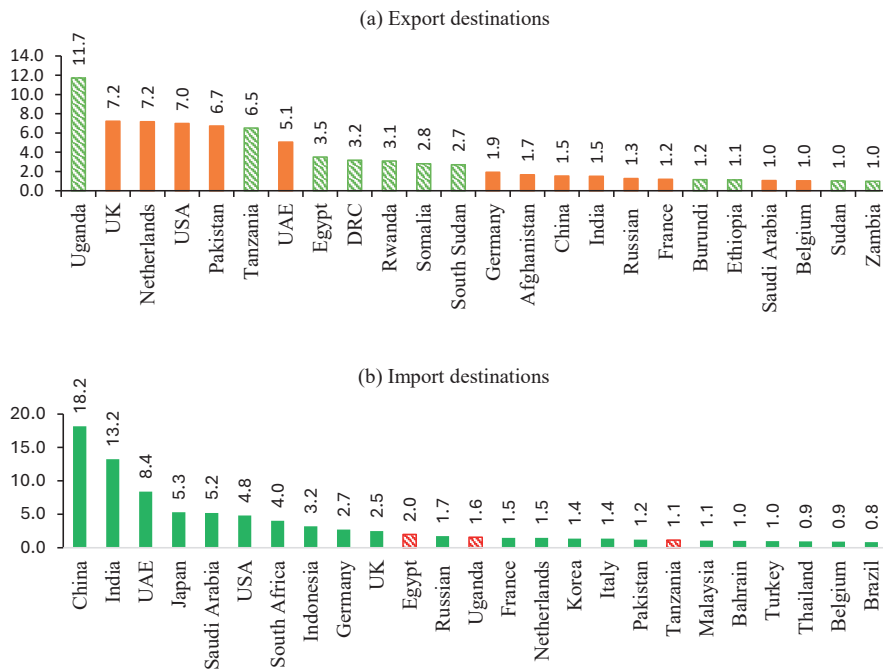
4 IMF (2020), World Economic Outlook Database, available at <https://www.imf.org/en/Publications/WEO/weo-database/2020/October/select-countries?grp=2603andsg=All-countries/Emerging-market-and-developing-economies/Sub-Saharan-Africa>. Last accessed on October 19, 2020.

## 2. Stylized Facts of Trade in Kenya

Figure 2.1 provides insights into the potential trade, with the analysis focusing on the main products traded. Figure 2.1(a) shows export destinations of Kenyan products for the period 2011-2020 (average) and illustrates that the bulk of exports are destined for Uganda, followed by the United Kingdom, The Netherlands, USA, and Pakistan. Within Africa, Kenyan exports account for 35 per cent of the total exports while the rest of the World is 65 per cent. The East Africa Community member States led by Uganda and Tanzania account for 28 per cent of the total exports with the rest of Africa taking a paltry 7.0 per cent, led by Egypt – a member of COMESA where Kenya is a member of the regional market. Outside Africa (during the period of analysis), the exports were destined for the United Kingdom, The Netherlands, the United States of America, Pakistan, and the United Arab Emirates.

On the import front, China is the leading market at an average of 18.2 per cent followed by India at 13.2 per cent, UAE at 8.4 per cent, and Japan at 5.3 per cent between 2011 and 2020 period. Imports from the African market performed dimly with only three countries (Egypt, Uganda, and Tanzania) out of 24 top import origin markets at about 4.7 per cent.

**Figure 2.1: Export and import markets of average value between 2011 and 2021 (%)**



Data source: International Trade Centre, ITC (2022) Trade Map

## 2.1 Kenya's Trade Performance in the African Continent

The Africa Continental Free Trade Agreement (AfCFTA) presents an opportune avenue for Kenya to enhance its product and market access within the African continent. This will also enhance the country's foothold and revenue returns. While the AfCFTA with a population of over 1.4 billion is a significant market, Kenya has not exploited this market structure. Between 2016 and 2020, Kenya only exported to 28 per cent of the 54 countries in Africa. The remaining 72 per cent of countries with zero exports have a population of about 0.574 billion people.

Table 2.1 shows the African countries with zero exports from Kenya and products produced in Kenya but imported by these countries from other markets. The 39 countries with no exports from Kenya import similar products outside Africa. For instance, while coffee and tea are export products from Kenya, these 39 countries (72%) import these products from markets outside Africa. Similarly, products such as cereals consisting of maize, rice, and wheat, which are produced in Kenya, are imported by the highlighted countries' markets outside Africa. The Articles and Apparel production, which is a source of manufactured products from Kenya, has not penetrated the 39 countries with which Kenya has not been trading. These products carry value addition and thus can generate more revenue. At the moment, Kenya supplies 0.38 per cent of the global market for Apparel, thus access to this group of African countries may increase its market share and offer sustainable sources of trade revenue. Additionally, the export of pharmaceutical products does not access these markets. To increase Kenya's market access in Africa, there is need to take advantage of the Africa Continental Free Trade Agreement and ensure increased uptake of Kenyan products in the member States.

While Kenya has not been exporting to 39 identified countries, it has received imports from several of these countries ranging between 0.1 per cent to 4.7 per cent. The main import products from the 39 countries as shown in Table 2.1 include sugar, paper and paperboard, fertilizers, and edible fruits, among others. The import of these products is attributed to filling the demand deficit of sugar (from Eswatini, Zimbabwe, and Madagascar) and meeting farm inputs such as fertilizer from Morocco used in the agriculture sector.

**Table 2.1: Kenyan exports to and imports from Africa as a share (%) of the total**

	Period	Kenyan exports related goods		Period	Kenyan imports
Country	2016 – 2020 < 1%	Goods produced in Kenya and imported from other markets	Import origin of (c)	2016 – 2020 %	Goods imported from (a)
(a)	(b)	(c)	(d)	(e)	(f)
Lesotho	0	Articles and apparel, cotton	S/Africa, China	0	

Tunisia	0	Articles and apparel, coffee	Italy, Brazil	0.1	Paper and paperboard
Equatorial Guinea	0	Coffee, tea and cereals	Spain, China, and Turkey	0	
Guinea Bissau	0	Beverages, salt	Portugal, Pakistan	0	
Cabo Verde	0	Cereals, dairy produce	Argentina and Portugal	0	
Sao Tome	0	Beverages, cereals	Portugal	0	
Mauritius	0.3	Plastics and articles, cereals	China and India	3.3	Sugar products
Zimbabwe	0.3	Cereals, plastics, and articles	South Africa	1.7	Sugar products
Ghana	0	Plastics and articles	China and Vietnam	0.1	Cocoa
Mozambique	0.4	Cereals, pharmaceutical products	Pakistan and India	1.4	Edible fruits
Djibouti	0	Animal vegetable fats and oil	France and India	0	
Morocco	0	Other vegetables, cereals, salt	France and Canada	1.1	Fertilizers, plastics
Côte d'Ivoire	0	Cereals, plastics, and articles	Vietnam and India	0	
Sierra Leone	0	Cereals and pharmaceuticals ..	Pakistan and China	0	
Senegal	0	Cereals and pharmaceuticals	India	0	
CAR	0	Pharmaceuticals..., cereals	Cameroon and France	0	
Botswana	0	Cereals and cotton	South Africa	0	
Madagascar	0	Cereals and pharmaceuticals..	China and India	0.7	Sugar products
Namibia	0	Plastics and articles, pharmaceutical ...	South Africa and India	0	
Chad	0	Pharmaceutical ..	India and South Africa	0	
Seychelles	0	Cereals, salt	Brazil and Turkey	0	
Burkina Faso	0	Pharmaceutical ..., salt	France and Togo	0	

Mali	0	Pharmaceutical ..., cotton	France and China	0	
Angola	0	Cereals, plastics, and articles	Thailand and China	0.1	Miscellaneous edibles
Congo	0	Meat and edibles, cereals	USA and Russia	0	
Comoros	0	Meat and edibles, cereals	Poland and Pakistan	0	
Mauritania	0	Cereals and sugar	France and Brazil	0	
Togo	0	Cereals, plastics, and articles	S. Arabia and India	0	
Niger	0	Cereals and pharmaceuticals ..	Thailand and Belgium	0.1	Plastics and articles
Eritrea	0	Cereals, plastics, and articles	S. Arabia	0	
Eswatini	0	Cereals, plastics, and articles	South Africa	4.7	Essential oils, sugar products
Cameroon	0	Cereals, plastics, and articles	Thailand and China	0	
Guinea	0	Cereals, plastics, and articles	India and S. Arabia	0.1	Other made-up textile
Libya	0	Cereals and Tobacco ...	Ukraine and UAE	0	
Benin	0	Cereals and pharmaceuticals..	India and France	0	
Algeria	0	Cereals, plastics, and articles	Argentina and S. Arabia	0	
Gabon	0	Meat and edibles, cereals	Brazil and India	0	
Gambia	0	Cereals, salt	Brazil and Turkey	0	
Liberia	0	Cereals, plastics, and articles	India and Saudi Arabia	0	
Average	0.0			0.4	

Data source: International Trade Centre - ITC (2022)

Notes: Goods in columns (c) and (e) are based on the top exports and imports from countries listed in column (a). The blank spaces in column (e) indicate no imported product from the countries in (a).

### **3. Related Literature**

Free Trade Area (FTA) has for a long time been advocated as a catalyst for international trade and a core ingredient for economic development. Importantly, considerable attention has been given to the welfare effects of free trade theoretically and empirically.

#### **3.1 Theoretical Literature**

Several theories underscore this analogy with a view that the Free Trade Area and its application will result in the enhancement of welfare and socio-economic development. For example, Adam Smith's hypothesis posits that a country has an absolute advantage over a product if it uses fewer resources in the production of the output. In return increasing income levels and accelerating economic development.

##### ***3.1.1 The Theory of Absolute Advantage***

David Ricardo expanded upon Adam Smith's concept of absolute advantage in international trade by introducing the notion of comparative advantage. He argued that countries could still benefit from trade even if one country was superior in producing all goods, as long as there were differing absolute advantages for each country in producing different goods — indicating variations in production costs. Ricardo derived this principle from his labour theory of value, which posits that a commodity's value is determined by its labour cost. As a result, the proportion of labour invested in a commodity dictates its exchange rate with other goods. Therefore, Ricardo's doctrine of comparative advantage emphasizes the importance of countries specializing in the production of goods and services where they possess a considerable advantage or a relatively lesser comparative disadvantage compared to other nations, allowing for efficient exports.

##### ***3.1.2 The Heckscher-Ohlin (H-O) Theory***

Economists Eli Heckscher (1919) and Bertil Ohlin (1933) expanded upon Ricardo's theory of comparative advantage to formulate the Heckscher-Ohlin (H-O) Theory. This theory introduced the concept of capital as a factor input in production, diverging from Ricardo and Smith's exclusive focus on labour as the sole factor input. By including capital and labour as factors of production, the H-O model incorporated the endowment and cost of these resources, explaining how countries with varying factor endowments achieve a comparative advantage. The theory posits that if a country is abundant in a certain factor of production, its cost will be lower, leading to specialization in goods that use the abundant and less expensive factor. Conversely, the country would import goods requiring different factor combinations. This translates into capital-abundant economies such as the USA exporting capital-intensive goods and importing labour-intensive

ones, while labour-abundant economies import more capital-intensive products. However, the Leontief paradox emerged in 1953 when Leontief tested this theory using US trade data and found results contradictory to the H-O theory. This discrepancy prompted the development of alternative theories to explain trade phenomena unaccounted for by H-O, such as the persistence of trade between similarly endowed nations. Subsequent research suggested that the paradox could be reconciled by relaxing certain H-O assumptions, accounting for technological differences, and considering additional inputs such as knowledge capital. Nishioka (2006) extended the H-O model to include knowledge capital and found its importance in determining comparative advantage among developed nations specializing in high-tech products. Leamar (1995) further demonstrated that trade barrier elimination equalizes product prices and wages, influencing a countries' labour policies and trade strategies.

Stolper and Samuelson (1941), as advocates for free trade, argue that owners of abundant endowments shall support free trade with an increase in returns. Further, the new trade theory supports the view of free trade among countries. It is important to note that the theories share a common view that free trade generates benefits for countries and can enhance economic development.

From a theoretical standpoint, trade liberalization through Free Trade Areas (Agreements) is geared towards a reduction in trade tax revenue (Matlanyane and Harmse, 2002; Lang, 2006). Additionally, FTAs have been censured for accentuating inequality and advancing trade imbalance at the expense of less developed countries (LDCs) (Chang, 2002; Robinson and Joan, 1979; Dunn, 2009; and Valiente-Riedl, 2016). However, Epaphra (2014) opines that lower tariffs as a result of trade liberalization lead to cheaper imports and thus increase the import volumes resulting in increased tax revenues. In the same vein, Darku and Appau (2015) examine the effect of regional trade agreements in a dynamic gravity model and find that trading blocs result in increased intra-trade.

### **3.2 Empirical Literature**

When examining the repercussions of establishing a regional bloc, diverse methodologies come into play. In particular, the gravity model is used for ex-post analysis, serving as a tool to evaluate the trade implications of specific policies, such as joining a regional bloc. For ex-ante simulation, either partial or general equilibrium approaches are employed. These approaches concentrate on gauging the forthcoming influence of trade policies. Thus, this section delves into prior research works investigating the consequences of regional integration on African economies.

Several empirical works have been undertaken to test the efficacy of AfCFTA in advancing accelerated growth and enhancement of welfare. Lunenborg and Roberts (2021) investigated the short-term effects of tariff liberalization within the African Continental Free Trade Area (AfCFTA) on the Economic Community of West African States (ECOWAS) Customs Union using the TRIST model. The study focused on tariff revenue and import value implications, considering



scenarios of 97 per cent tariff liberalization (categories A and B) and 90 per cent tariff liberalization (Category A). The findings revealed that tariff revenue reduction projections were significant, reaching approximately US\$ 262.7 million for the former scenario and US\$ 201.9 million for the latter. On the impact on imports, the findings showed a modest increase in imports to the ECOWAS region between 1.3 per cent and 1.8 per cent.

Bayale et al. (2020) examine the potential implications of AfCFTA for Ghana. The authors used the 2018 dataset in the World Integrated Trade Solution-Single Market Partial Equilibrium Tool (WITS-SMART). The findings show that total trade will increase and result in enhanced consumer welfare and a reduction in tariff revenue and through the FTA, Ghana's trade balance will improve. Along the same lines, Simo (2020) examines the provisions of AfCFTA and how they contribute to the realization of a single market of services. Ndonga et al. (2020) undertake an exploratory examination of Malawi's intra-African trade position to determine the likely impact of AfCFTA in Malawi. They found that Malawi has experienced a trade deficit, with its reliance on tobacco exports, thus limiting its ability for diversification. They further found that the effect of AfCFTA on Malawi will be gradual, and there is need to consider inclusivity in the implementation of FTA as some countries rely heavily on trade taxes. Relatedly, Masiya (2019) examines the revenue implications of Malawi joining AfCFTA using liberalization and SMART techniques. The findings indicate that Malawi will benefit by joining the AfCFTA through trade creation despite the expected loss of trade revenue from capital goods. In addition, the study endorses liberalizing trade while holding specific tariffs for capital goods. Also, recent work by Obeng-Odoom (2020) examining the efficacy of the implementation of AfCFTA argues that without an explicit focus on the redistribution of resources, improved private sector and social development, and enhanced institutions to foster free trade, then the current agreement may result in increased inequality and poverty.

More analytical work has been undertaken using the WITS-SMART model on country-level analysis. Using the WITS-SMART model, Wonyra and Bayale (2020) analysed the impact of Togo joining the AfCFTA using 2018 disaggregated trade data. The findings of the study show improvement in trade balance for Togo during tariff liberalization under the AfCFTA. The findings show that joining AfCFTA expands trade revenue by US\$ 8.83 million and welfare improves by US\$ 1.09 million. Additionally, the findings suggest a revenue loss of US\$ 4.66 million during the same period. Oyelami (2020) examines the impact of AfCFTA on Nigeria using a WITS-SMART model. The findings reveal both trade creation and trade diverting features for Nigeria. In particular, petrochemicals and textiles are trade-creating while manufacturing is trade-diverting. Further, Nigeria experiences a trade effect of US\$ 145 million, a welfare of US\$ 13 million, and a revenue loss of US\$ 104 million due to tariff liberalization. Shinyekwa et al. (2020) investigate the impact of AfCFTA on East African member countries in a WITS-SMART model. The findings show a revenue loss with varying effects for all EAC countries. Additionally, Uganda and Burundi have positive welfare effects from AfCFTA while Kenya, Tanzania, and Rwanda experience negative welfare among their households.

Empirical analysis of Regional Economic Communities (RECs) has also been evaluated to establish their effect to enhance welfare and social economic development. Makochehanwa (2014) examines the impact of a tripartite free trade area (T-FTA) – that includes COMESA, EAC, and SADC – on the welfare of member countries. WITS-SMART was used in the analytical framework and the findings show that new trade equivalent to –2.0 billion will be created and the highest beneficiaries include DRC and Angola. Further, the tripartite will lead to trade diversion resulting in a positive net trade balance in the 26 member countries, although import revenue will be lost. Along the same line, Jensen and Sandrey (2011) use the Global Trade Analysis Project (GTAP) model in the tripartite arrangement. They found that South Africa and Mozambique will benefit more compared to other regional countries. Using the gravity model on East Africa Community Integration, Buigut (2012) states that Customs Union resulted in disproportionate impacts on intra-trade that varied between countries. Indeed, they establish that Kenya, Uganda, and Rwanda experienced increased intra-exports while intra-EAC imports increased in Kenya and Tanzania.

Fusacchia et al. (2022) examine the effect of trade liberalization in the AfCFTA framework on production and networks using a CGE model. The findings suggest the AfCFTA influences trade patterns and, in particular, value addition and intra (extra) regional market access. The results reveal differential benefits of AfCFTA across countries and widespread benefits across sectors. Ekobena et al. (2021) investigate the impact of AfCFTA on tax revenues, industrial production, trade flows, welfare, and consumption in seven Central African Countries in both CGE and WITS-SMART models. The findings show that the implementation of AfCFTA leads to a reduction in trade revenue in the medium term. However, this is offset by improved growth and welfare among member countries.

## 4. Methodology and Data

### 4.1 Analytical Framework

This section presents the analytical framework used in the analysis to answer the objectives of this study. Following the work of Brenton et al. (2009), this paper uses the TRIST model, a Single Market Partial Equilibrium Simulation Tool. The use of this model is motivated by the features it possesses that are relevant to our analytical framework and this includes:

- (i) Reliance on a few assumptions;
- (ii) Focus on disaggregated data and specifically taking into account individual products under consideration; and
- (iii) Provide detailed results at the country and product level to inform the effect of liberalization that is central to this study.

Brenton et al. (2009) and Bacchetta et al. (2012) provide a comprehensive simulation procedure for the model. As described by these authors, the TRIST trade model is grounded in five fundamental assumptions. First, it draws upon standard consumer demand theory, leveraging elasticities to gauge the extent of the demand response to price alterations resulting from tariff reforms. Second, calculations are predicated on the conventional Armington (1969) assumption, which posits imperfect substitution between imports originating from distinct trading partners. This stems from the understanding that consumers differentiate products based on their source of production. Third, the model precludes direct substitutions between products. Each product is modelled as a distinct market, isolated from other markets. Fourth, it posits that all tariff changes are entirely transmitted, while the world price remains unaltered. This assumption signifies an infinite supply elasticity of imports, implying that shifts in demand within the importing nation bear no influence on the global price of products. This assumption holds practical relevance for economies characterized by lower incomes, Kenya included.

The trade model employed in TRIST adheres to the conventional Armington (1969) presumption of imperfect substitution between imports stemming from various sources. This model precludes the direct substitution between distinct products. The trade reaction to alterations in tariffs for a specific product from a given exporter is computed based on the resultant percentage fluctuation in the price that includes the duty.

#### (a) Measuring tariff revenue

To estimate the impact on tariff revenue post-implementation of the AfCFTA, this study used a linear approximation of the changes in tariff revenue, which is expressed in equation 4.1 as follows:

$$TR_{m,k,i} = t_{m,k,i} M_{m,k,i} \{ (t_{m,k,j} P_{m,k,i} (1 + \varepsilon_{m,k,i})) \} \quad (4.1)$$

Where  $TR_{m,k,i}$  is the tariff revenue change by country  $m$  on commodity  $k$  exported from country  $i$ ;  $t_{m,k,i}$  is the percentage change in the tariff levied by  $m$  on commodity  $k$  exported from  $i$  and  $P_{m,k,i}$  is the percentage change in the world price of commodity  $k$  exported from  $i$ .

### (b) Measuring price and sector protection effects

To compute the change in the price of product  $k$  due to a tariff adjustment for exporter  $i$ , and sector level of protection while keeping the VAT and excise rate unchanged, Equation 4.2 is estimated. The model evaluates the change in commodity prices and sector protection by examining the immediate impact of trade reform.

$$\frac{\Delta p_j}{p_j^{\text{old}}} = \frac{t_j^{\text{new}} - t_j^{\text{old}}}{(1 + t_j^{\text{old}})} \quad (4.2^5)$$

### (c) Impact on imports

The import response to this price adjustment is depicted through a three-step modelling process. Initially, the model addresses the substitution effect among various exporters resulting from alterations in tariffs for different exporters. Subsequently, it analyses the substitution effect between imported goods and domestic products as the relative price between them changes. Lastly, the model considers the demand effect as a reaction to the overall price alteration for a product. To determine the change in imports post-AFTA, the following equation was estimated.

$$M_j^{\text{DS}} = M_j^{\text{ES}} + [M_{\text{imp}}^{\text{DS}} - M_{\text{imp}}^{\text{old}}] \left[ \frac{M_j^{\text{old}}}{\sum_{j=1, \dots, n} (M_j^{\text{old}})} \right] \quad (4.3)$$

Where:

- i.  $M_{\text{imp}}^{\text{old}}$  - is the initial total imported quantity;
- ii.  $M_{\text{imp}}^{\text{DS}}$  - is the total imported quantity after substitution with domestic output
- iii.  $M_j^{\text{DS}}$  - is the quantity imported from supplier  $j$  after substitution between imports and domestic output

### (d) Welfare effects

To determine the welfare effects, the simulations were reinforced with the WITS–SMART database. The theoretical framework begins with the assumption that agents have a quasi-linear utility function as shown in Equation 4.4. The welfare effects under the AfCFTA are given as follows.

<sup>5</sup> The superscripts “new” and “old” denote the prices and tariffs before and after the policy reform.

$$U(C_o, C_1, \dots, C_n) = C_o + \sum_{i=1}^n U(C_k^i) \quad (4.4)$$

Where  $C_o$  refers to a numeraire of composite goods consumed while  $C_k^i$  denotes consumption of  $k$  imported by country  $i$ , and the  $U(.)$  is the utility function that possesses assumptions that are increasing, concave, and similar in all countries. Further, the additive nature of the utility function ensures no presence of the substitution effects between goods  $k$ . Considering a representative good and prices explored by both the importer and exporter as follows:

$$M_k^{il} = M_k^i / M_k^l \text{ and } P_k^{il} = P_k^i / P_k^l$$

Where  $i$  and  $l$  are exporters of good  $k$  while  $P$  is goods' domestic price. There is an assumption of a similar elasticity of substitution  $\omega$  of good  $k$  or the two exporters given as  $\omega = (P_k^{il} dM_k^{il}) / (M_k^{il} dP_k^{il})$ . The indirect utility function can be represented as the sum of income ( $I$ ) and consumer surplus ( $u(C) - PC$ ), where  $P$  equals  $P^*$  multiplied by  $(1 + t)$ , with ' $t$ ' denoting the tariff rate. It is worth noting that the consumer does not derive any consumer surplus from 'good zero'. Additionally, the marginal utility of income is consistently equal to one. Therefore, at the consumer's optimal point, the derivative of  $u$  with respect to  $C$  ( $u'$ ) is equal to  $P$ . To estimate the effects on consumer welfare, equation 4.5 is estimated.

$$W_{ik}^l = 0.5(\Delta t_{ik}^l M_k^l) \quad (4.5)$$

Where  $W$  and 0.5 measure the consumer welfare and average difference of tariff before and after trade liberalization. From equation 4.5, the net welfare gain  $\Delta W$  resulting from the removal of a tariff  $t$  is determined by the own-price elasticity of demand and the tariff itself. The model results provide detailed individual results on market welfare by product code and offer an aggregate assessment for all products. The welfare effects provide insights into how consumers in importing countries benefit from reduced domestic prices resulting from the removal/reduction of tariff rates within the AfCFTA framework.

### (e) Exporter dynamics

To solve the exporter dynamics, post-AfCFTA, equation 4.5 was estimated. After resolving the determination of global prices, the following equation was estimated to calculate export quantities post-AfCFTA implementation.

$$E_{(i,v),r} = N_{(i,v),(r,r)} P_{(i,v),r} + \sum N_{(i,v),(r,s)} P_{(i,v),s} \quad (4.6)$$

Where,  $E_{(i,v),r}$  is the estimated quantity of exports from within product category  $i$  of goods from country  $r$ .  $P_{(i,v),r}$  is the internal price for goods from region  $r$  within country  $v$ , and  $P_{(i,v),s}$  is the price of other varieties.  $N_{(i,v),(r,r)}$  is the own price demand elasticity.  $N_{(i,v),(r,s)}$  is the cross-price elasticity.

## 4.2 Data Sources

The import data employed for this study is derived from the Kenya Revenue Authority's (KRA) 2021 customs data. The dataset was categorized into specific, non-overlapping country groups to facilitate analysis within the Kenyan context. Within the data aggregation tool, two distinct country/region groups were formulated. The 'Rest of Africa' category encompassed all partner states within Africa that have become signatories to the AfCFTA agreement, excluding Eritrea. The second group generated was designated as 'Rest of the World,' encompassing countries outside of Africa. The data used was substantially disaggregated at the HS 8 code level, a classification that enables indepth simulations at both product and country levels. These attributes underscore the significance of the findings for a country such as Kenya, offering insights into the identification of products yielding higher returns in terms of revenue, trade impacts, and overall welfare enhancement to bolster growth and sectoral development. The analysis adheres to the AfCFTA framework's long-term objective of 100 per cent tariff liberalization for all products within member states. The data used was for 2021, ensuring its relevance by capturing the most recent trade period.

## 4.3 Descriptive Statistics

The descriptive statistics show trade dynamics within the African context, with Tanzania emerging as the foremost contributor to Kenya's imports. In 2021, Tanzania took the lead by exporting a substantial volume of goods valued at Ksh 53 billion to Kenya, solidifying its prominent role as a significant trade partner in the region. Egypt and South Africa made notable contributions to Kenya's import landscape; Egypt's exports to Kenya amounted to Ksh 53 billion, and South Africa's sizeable export value of Ksh 48 billion underscored their significance in fostering economic ties with Kenya. Importantly, among the top exporters to Kenya, the majority are members of regional economic blocs such as the East African Community (EAC) and the Common Market for Eastern and Southern Africa (COMESA), which signifies the importance of regional integration. However, South Africa and Morocco also play pivotal roles in contributing to Kenya's imports, even though they are not members of the EAC and COMESA regions. The collected tariffs in 2021 were Ksh 142 billion, accounting for 29.3 per cent of the total, and the simple average tariff rate was 7.0 per cent. The import values and tariff collections showcase the nature of Kenya's trade landscape within the African continent.

**Table 4.1: Descriptive statistics**

	<b>Collected tariff</b>	<b>Excise tax</b>	<b>VAT</b>
<b>Total value</b>	142,702,243,318	111,190,135,658	232,502,879,238
<b>Share of total</b>	29.3%	22.9%	47.8%
<b>Weighted average</b>	7.0%	5.1%	10.2%
<b>Top 10 import partners</b>	<b>Import value</b>	<b>Share of total imports</b>	
Rest of the world	1,812,427,500,118	89.2%	
Tanzania	53,169,839,462	2.6%	
Egypt	48,446,972,479	2.4%	
South Africa	41,416,549,099	2.0%	
Uganda	31,312,524,882	1.5%	
Swaziland	12,254,528,005	0.6%	
Mauritius	6,381,468,445	0.3%	
Zambia	6,138,935,005	0.3%	
Morocco	3,055,385,307	0.2%	
Democratic Republic of Congo	2,955,491,107	0.1%	

*Data source: Calculations based on Kenya Revenue Authority (2021) data*

---

## 5. Results and Discussion

### 5.1 Revenue Effects

The full implementation of the African Continental Free Trade Area (AfCFTA) following tariff liberalization is anticipated to generate a substantial reduction in revenue from import duties within the Kenyan economy. This challenge poses a significant hurdle in the AfCFTA's implementation as tariff revenues assume critical importance as a source of revenue stream. Simulation results show that, on average, Kenya could experience a potential loss of Ksh 22.53 billion due to comprehensive liberalization under the AfCFTA framework, as highlighted in Table 5.1.

**Table 5.1: Impact of AfCFTA implementation on tariff revenue**

<b>Impact on revenue</b>	<b>100 per cent liberalization scenario</b>
Tariff revenue pre	142,702,243,318
Tariff revenue post	120,169,038,155
Change in tariff revenue	-22,533,205,163
% change in tariff revenue	-15.8%
<b>Collected tariff rate</b>	
Collected applied tariff rate pre	7.0%
Collected applied tariff rate post	5.9%
% change in collected applied tariff rate	-15.9%

*Data source: Simulation results*

Specifically, addressing the revenue effects at the level of individual product tariff lines, Table 5.2 presents the ten most substantial potential losses among Kenyan products within the AfCFTA framework. The findings show that various products demonstrate sensitivity to the AfCFTA, subsequently leading to reduced trade revenue. Simulation results show that cane or beet sugar and chemically pure sucrose exhibit the highest revenue loss at Ksh 3.52 billion, followed by motor cars and other motor vehicles principally designed for transport at Ksh 1.85 billion. Notably, other products that experience significant revenue loss include mixtures of odoriferous substances, road tractors for semi-trailers, milk and cream in solid forms, finishing ceramics, cement clinkers, and fresh apples.



**Table 5.2: Change in tariff revenues at tariff line in Ksh billion**

Product code	Product name	Pre	Post	Change
17019990	Cane or beet sugar and chemically pure sucrose, in solid form (excl. cane and beet sugar containing ...	3.52	0.00	- 3.52
87033390	Motor cars and other motor vehicles principally designed for the transport of ...	1.85	-	- 1.85
87012090	Road tractors for semi-trailers: Other	1.25	-	- 1.25
33021000	Mixtures of odoriferous substances and mixtures, incl. alcoholic solutions, with a basis of ...	0.85	0.15	- 0.69
4021000	Milk and cream in solid forms, of a fat content by weight of <= 1.5%	0.70	0.06	- 0.64
4012000	Milk and cream of a fat content by weight of > 1% but <= 6%, not concentrated nor containing ...	0.62	0.00	- 0.62
69074000	Finishing ceramics (excl. refractory) (detailed label not available)	0.53	-	- 0.53
25231000	Cement clinkers	0.67	0.19	- 0.48
8081000	Fresh apples	0.41	0.01	- 0.40
88021200	Helicopters of an unladen weight > 2.000 kg	1.78	1.39	- 0.39

*Data source: Simulation results*

The enhanced efficiency resulting from the elimination of tariffs within the African Continental Free Trade Area (AfCFTA) would ultimately yield benefits for consumers. This process of tariff removal not only has the effect of reducing the prices of commodities, but it also curtails the degree of protectionism that was put on certain sectors through the imposition of higher tariffs. Table 5.3 shows that the sphere of protectionism of manufacture of dairy products would reduce by 0.02 per cent while motion picture, radio, television, and other entertainment activities would reduce by 0.15 per cent following tariff elimination. Other sectors include the manufacture of products of wood, saw milling, fishing, and the manufacture of beverages.

## 5.2 Price and Sector Protection Effects

Liberalization reduces import tariffs on import products, and this lowers the cost of importing goods and services. The lower import costs are reflected by the change in commodity prices for the imported products, with other service activities exhibiting the highest import price change of 0.15 per cent followed by the manufacture of dairy products at 0.14 per cent (Table 5.3). This finding is consistent with the results by UNECA and TMEA (2020). It is worth noting that the benefit to consumers that arises from these price changes should be balanced with the decline in imports from the rest of the world, which might be more efficient, to avoid the problem of trade diversion.

**Table 5.3: Percentage change in commodity prices and sector protection**

ISIC classification	Protection		Price change (%)
	Pre	Post	Imports
930 - Other service activities	0.25%	0.06%	-0.15 %
152 - Manufacture of dairy products	0.19%	0.02%	-0.14 %
921 - Motion picture, radio, television, and other entertainment activities	0.21%	0.15 %	-0.04 %
202 - Manufacture of products of wood, cork, straw, and plaiting materials	0.22%	0.06%	-0.03 %
201 - Sawmilling and planing of wood	0.03%	0.00%	- 0.02 %
050 - Fishing, operation of fish hatcheries and fish farms; service activities incidental to fishing	0.27%	0.24%	-0.02 %
155 - Manufacture of beverages	0.20%	0.14%	- 0.02 %
269 - Manufacture of non-metallic mineral products n.e.c.	0.15%	0.09%	- 0.01 %
011 - Growing of crops; market gardening; horticulture	0.24%	0.23 %	- 0.01 %

*Data source: Simulation results*

## 5.3 Impact on Import Trade

The AfCFTA is expected to lead to increased trade among African countries. As tariffs are eliminated, it becomes more attractive for member States to trade with each other. The simulation results show that tariff elimination could result in a 0.1 per cent rise in imports of goods from other AfCFTA members from Ksh 2.032 billion to Ksh 2.035 billion (Table 5.4).

**Table 5.4: Impact of tariff liberalization on import trade**

<b>Impact on imports</b>	<b>100 per cent liberalization scenario</b>
Imports pre	2,032,753,981,028
Imports post	2,035,156,410,288
Change in imports	2,402,429,261
% change in imports	0.1%

*Data source: Simulation results*

Most of the import sectors to Kenya resulting from the tariff elimination across the borders are composed of the manufacturing of dairy products increasing by 0.06 per cent (Ksh 0.57 billion), followed by the growing of crops by 0.004 per cent (Ksh 0.45 billion). Other commodities that will benefit the Kenyan market include the manufacture of non-metallic mineral products, the manufacture of other food products, the manufacture of products of wood, cork, and straw, the manufacturing of beverages, saw milling and planing of wood, and the manufacturing of other chemical products (Table 5.5).

**Table 5.5: Change in the value of imports by ISIC classification**

<b>ISIC</b>	<b>Product name</b>	<b>Value change in Ksh billion</b>	<b>% Change in imports</b>
152	Manufacture of dairy products	0.57	0.0696%
11	Growing of crops; market gardening; horticulture	0.45	0.0045%
269	Manufacture of non-metallic mineral products	0.15	0.0055%
154	Manufacture of other food products	0.14	0.0030%
202	Manufacture of products of wood, cork, straw	0.11	0.0132 %
155	Manufacture of beverages	0.10	0.0083 %
201	Sawmilling and planing of wood	0.10	0.0120 %
242	Manufacture of other chemical products	0.09	0.0006 %
341	Manufacture of motor vehicles	0.07	0.0008 %
369	Manufacturing n.e.c.	0.05	0.0034 %

*Data source: Simulation results*

## 5.4 Welfare Effects

The formation and implementation of AfCFTA are envisioned to enhance welfare and trade revenue among member countries in the trade agreement. While in the interim, the findings point to a loss of revenue, the analysis reveals that individual

households would benefit through improved welfare due to lower prices. Table 5.6 reports the top 15 products with the highest potential to improve welfare. It is envisaged that trade liberalization in the AfCFTA will benefit households through reduced export and import prices for goods and services. This will lead to improvement in consumer surplus and Kenyans will be able to purchase products from other African countries at reduced prices, leading to improved living standards. The results of the study show that motor cars and other motor vehicles, mixtures of odoriferous substances, cashew nuts, fresh apples, maize (excluding seed for sowing), and prefabricated structural components for buildings have the highest welfare effects.

**Table 5.6: Top 15 products with the highest welfare potential in AfCFTA (Ksh million)**

Product code	Product name	Trade value in Ksh	Welfare effects
870332	Motor cars and other motor vehicles principally designed for the transport of persons, incl. ...	2,430.70	922.41
330210	Mixtures of odoriferous substances and mixtures, incl. alcoholic solutions, with a basis of ...	6,112.63	408.95
80132	Fresh or dried cashew nuts, shelled	18.57	293.54
80131	Fresh or dried cashew nuts, in shell	13.57	214.86
80810	Fresh apples	1,324.24	143.42
100590	Maize (excluding seed for sowing)	2,276.72	120.45
681091	Prefabricated structural components for building or civil engineering of cement, concrete, or ...	80.49	70.40
220429	Wine from fresh grapes, incl. fortified wines, and grapes whose fermentation has been arrested ...	313.91	64.98
480300	Toilet or facial tissue stock, towel or napkin stock, and similar paper for household or sanitary ...	3,078.70	54.51
854370	Electrical machines and apparatus, having individual functions, n.e.s. in chapter 85	36.51	53.19
210390	Preparations for sauces and prepared sauces; mixed condiments and seasonings (excluding soya ...	120.82	40.11

Product code	Product name	Trade value in Ksh	Welfare effects
80510	Fresh or dried oranges	352.30	38.16
180631	Chocolate and other preparations containing cocoa, in blocks, slabs, or bars of <= 2 kg, filled	203.71	36.49
80610	Fresh grapes	281.56	34.62
480411	Unbleached kraftliner, uncoated, in rolls of a width > 36 cm	1,819.13	33.51

Data source: Simulation results

### 5.5 Change in Kenya Exports Post-AfCFTA

Most of Kenya's exports within the African continent are covered by the existing free-trade agreements (EAC and COMESA). The simulations in Table 5.7 capture Kenya's export changes followed by tariff liberalization within the AfCFTA framework. Analysis shows a significant increase in Kenya's exports to the countries where Kenya currently has no functional regional trade agreement. Most of the countries exhibiting a high export change are in West Africa where previously, little or no trade occurred. The simulations' significant increase in Kenyan exports to Nigeria is 44 per cent, Lesotho 40 per cent, Niger 39 per cent, Angola 34 per cent, and Senegal 33 per cent. The AfCFTA agreement will lead to Kenyan exports penetrating more to the West African market unlike before.

**Table 5.7: Kenya's top export destinations post-AfCFTA**

Partner name	Exports before in KSh million	Exports after in KSh million	Export change in KSh million	% Change in exports
South Africa	44,504.42	51,669.17	7,164.75	16.10
Eswatini	6,280.69	6,983.90	703.20	11.20
Mozambique	2,140.12	2,656.54	516.42	24.13
Tunisia	583.28	721.86	138.58	23.76
Nigeria	186.07	268.34	82.27	44.22
Ethiopia	880.64	919.00	38.35	4.35
Morocco	2,167.49	2,191.59	24.10	1.11
Namibia	64.82	83.03	18.21	28.10
Ghana	234.04	250.61	16.57	7.08
Cameroon	45.33	59.22	13.89	30.64

Cote d'Ivoire	33.90	43.84	9.94	29.32
Somalia	51.70	61.33	9.63	18.62
Angola	22.18	29.65	7.47	33.69
Niger	9.80	13.67	3.87	39.51
Algeria	16.20	18.40	2.20	13.60
Sierra Leone	22.31	23.78	1.47	6.60
Botswana	31.34	32.74	1.40	4.48
Mali	13.36	14.65	1.29	9.67
South Sudan	42.75	43.84	1.10	2.56
Senegal	3.21	4.27	1.05	32.81
Lesotho	2.32	3.25	0.94	40.36

*Data source: Simulation results*

## 5.6 Sensitivity Analysis and Robustness Check

Given the inherent uncertainty surrounding both exporter substitution and demand elasticity values, it is considered prudent to undertake a sensitivity analysis when examining the potential short-term repercussions of tariff liberalization regimes. Unfortunately, the TRIST model lacks a built-in tool for sensitivity analysis, and obtaining precise estimates for the three model elasticities – exporter substitution, domestic substitution, and the demand effect – is challenging, with such information not readily accessible within the existing literature (Cheelo et al., 2012).

As previously noted, the utilized default elasticities in this study are as follows: 1.5 for the exporter substitution effect, 1.0 for domestic substitution, and 0.5 for the demand effect's elasticity. To assess the robustness of the results, a sensitivity analysis was conducted manually. This involved running a baseline simulation scenario with the default elasticities as the foundation. Subsequently, a high-value elasticity scenario was simulated, following the approach outlined by Brenton et al. (2009).

Table 5.8 presents the outcomes of both robustness and sensitivity analyses concerning Kenya's tariff liberalization's impact on tariff revenue and imports following the implementation of the AfCFTA. By elevating the elasticity for exporter substitution from 1.5 to 5.0, a foreseen shift in tariff revenue and import figures emerged. Raising the exporter substitution elasticity from 1.5 to 5.0 led to anticipated decreases in projected tariff revenue. Specifically, in using default elasticities, there was a projected reduction of Ksh 22.5 billion, while employing the higher elasticity resulted in a reduction of Ksh 26 billion, equating to losses of 15.8 per cent and 18.6 per cent, respectively. This modification in elasticities also led to an approximate 17 per cent escalation in tariff revenue loss. Furthermore, as indicated by the sensitivity results, the manipulation of a higher export substitution elasticity of 5.0 had an inconsequential impact on Kenya's total

imports, demonstrating minimal change.

**Table 5.8: Robustness and sensitivity analysis of tariff revenue imports**

<b>Results</b>	<b>Default elasticity</b>	<b>High elasticity</b>
<b>Impact on imports:</b>		
Imports pre	2,032,753,981,028	2,032,753,981,028
Imports post	2,035,156,410,288	2,035,421,799,327
Change in imports	2,402,429,261	2,667,818,299
% change in imports	0.1%	0.1%
<b>Impact on Revenue:</b>		
Tariff revenue pre	142,702,243,318	142,702,243,318
Tariff revenue post	120,169,038,155	116,141,703,206
Change in tariff revenue	-22,533,205,163	-26,560,540,112
% change in tariff revenue	-15.8%	-18.6%

---

## **6. Conclusion and Policy Recommendations**

### **6.1 Conclusion**

The study aimed to analyze the impact of tariff liberalization on the Kenyan economy within the African Continental Free Trade Area (AfCFTA) using the TRIST partial equilibrium model. The objective of the analysis was to establish the impact of tariff liberalization on revenue streams, trade, export and import impacts, and welfare impacts on the Kenyan economy. The study used Kenya Revenue Authority (KRA) data for the year 2021 to simulate the potential impacts of the elimination of import tariffs between Kenya and other African nations in alignment with the AfCFTA's framework. Eritrea was excluded from the analysis since it is the only country remaining to sign the agreement establishing the AfCFTA.

The implementation of the AfCFTA and comprehensive tariff liberalization are projected to result in a substantial decline in Kenya's tariff revenue, with an estimated average loss of Ksh 22.53 billion. This loss is primarily due to the elimination of import tariffs between Kenya and other African nations. The decline in tariff revenue reflects the dual impact of tariff removal—reducing commodity prices and mitigating protectionism enforced by higher tariffs.

Tariff liberalization significantly lowers the prices of imported products, especially in categories such as other service activities and manufactured items. Consumers stand to benefit from reduced commodity prices, enhancing overall economic efficiency. Lower prices for essential goods and services can potentially alleviate the cost of living for Kenyan citizens.

While Kenya anticipates a loss in tariff revenue, the elimination of tariffs under AfCFTA will lead to an improvement in consumer welfare. Households will experience increased consumer surplus, driven by reduced export and import prices for goods and services. Motor cars and other motor vehicles stand out with the highest welfare effects, indicating substantial benefits for consumers.

The elimination of import tariffs within the AfCFTA is expected to lead to increased exports and imports for Kenya within the AfCFTA framework. While the increase in imports from African countries is projected to be marginal and primarily focused on manufactured dairy products and crops, Kenya's export trade will expand within the region, particularly in countries where Kenya previously lacked functional trade agreements. This expansion of trade is a positive outcome for Kenya, signifying the potential for economic growth and broader market access.

### **6.2 Policy Recommendations**

From the findings, the paper suggests the following policy implications geared towards the realization of optimal returns from the AfCFTA framework:



- (i) Diversify revenue streams in response to the anticipated loss in tariff revenue. The Government of Kenya could diversify its revenue sources by exploring alternative taxation methods such as VAT and income taxes, increasing efforts to combat tax evasion, and expanding the tax base. Additionally, the government could closely monitor the impact of revenue loss and make necessary adjustments.
- (ii) Develop sector-specific interventions given the sensitivity of certain sectors to the AfCFTA's framework. Policy makers could focus on targeted interventions to support industries that would be adversely affected by increased competition. Providing incentives for innovation, research and development, and value addition can enhance the competitiveness of vulnerable sectors.
- (iii) Continuous monitoring of trade dynamics to understand how Kenya's exports and imports are evolving within the AfCFTA. This can be done by closely tracking trade patterns and identifying emerging trends, to ensure timely adjustments to trade strategies and policies.
- (iv) Enhance the implementation of strong consumer protection measures and transparent pricing. While the removal of tariffs is anticipated to enhance overall welfare, there might be segments of the population that could be negatively impacted. Implementing measures to cushion vulnerable communities from potential adverse effects, such as targeted social safety nets, will ensure that the benefits of trade liberalization are more inclusive.
- (v) Kenya could explore opportunities to establish or strengthen trade agreements with other AfCFTA member States and regional economic communities (RECs). This could lead to mutually beneficial trade partnerships that help balance the potential losses from tariff liberalization.

---

## References

- Aniche, E.T. (2020), "African Continental Free Trade Area and African Union Agenda 2063: the roads to Addis Ababa and Kigali". *Journal of Contemporary African Studies*, 41(4): 377–392. <https://doi.org/10.1080/02589001.2020.1775184>.
- Armington, P.S. (1969), "A theory of demand for products distinguished by place of production". *International Monetary Fund Staff Papers*, 16(1): 159-178.
- Bacchetta, M., Behar, A. and Gallezot, J. (2012), "The TRIST trade model: Assumptions and procedures". *Journal of International Trade and Economic Development*, 21(4): 567-589.
- Bayale, N., Ibrahim, M. and Atta-Mensah, J. (2022), "Potential trade, welfare and revenue implications of the African Continental Free Trade Area (AfCFTA) for Ghana: An application of partial equilibrium model". *Journal of Public Affairs*, 22: e2385. <https://doi.org/10.1002/pa.2385>
- Brenton, P., Piermartini, R. and van der Marel, E. (2009), "A comprehensive simulation procedure for trade models: The TRIST model". *World Trade Review*, 8(2): 275-298.
- Buigut, S. (2012), "The effects of East African Community integration on intra-regional trade: A gravity model analysis". *East African Journal of Economics*, 13(4): 302-318.
- Chang, H.J. (2002), *Kicking away the ladder: Development strategy in historical perspective*. Anthem Press.
- Darku, A.B. and Appau, A.B. (2015), "Analysing Sub-Saharan Africa trade patterns in the presence of regional trade agreements—the case of COMESA, SADC, ECCAS and ECOWAS". *The African Finance Journal*, 17(1): 41-66.
- Dunn, B. (2009). *Global Political Economy*. Pluto Press.
- Ekobena, C., Momo, B. and Simo, P. (2021), "The impact of AfCFTA on tax revenues, industrial production, trade flows, welfare, and consumption in Central Africa: A CGE and WITS-SMART model analysis". *Central African Economic Review*, 19(3): 221-239.
- Epaphra, E. (2014), *The revenue implications of trade liberalization in Tanzania*.
- Flavin, T.J, Hurley, J. and Rousseau, F. (2002), "Explaining stock market correlation: A gravity model approach". *The Manchester School*, 70(S1): 87-106. <https://doi.org/10.1111/1467-9957.70.s1.6>.
- Fusacchia, L., Rinaldi, A. and Scarpa, M. (2022), "The effect of trade liberalization within the AfCFTA framework on production and networks: A CGE model analysis". *Journal of African Trade*, 10(1): 75-92.
- Heckscher, E.F. (1919), "The effect of foreign trade on the distribution of income". *The theory of international trade* (pp. 1-40). Oxford University Press.
- Helpman, E., Melitz, M. and Rubinstein, Y. (2008), "Estimating trade flows: Trading partners and trading volumes". *The Quarterly Journal of Economics*, 123(2): 441-487. <https://doi.org/10.1162/qjec.2008.123.2.441>.
- Jensen, H.G. and Sandrey, R. (2011), *The tripartite free trade agreement: A computer analysis of the impacts*.
- Jensen, H. and Sandrey, R. (2011), "The impact of the tripartite free trade area (T-FTA) on Southern Africa: A GTAP model analysis". *South African Journal of Economics*, 79(2): 236-257.
- Johnson, C., Smith, D. and Lee, E. (2018), "Free trade agreements and consumer welfare: A comprehensive review". *International Journal of Trade Economics*, 15(2): 112-130.
- Jones, A. and Brown, B. (2019), "Implications of tariff liberalization within the AfCFTA framework". *Journal of Trade and Economic Development*, 23(4): 567-589.
- Lin, F. (2015). "Estimating the effect of the Internet on international trade". *The Journal of International Trade and Economic Development*, 24(3): 409-428. <https://doi.org/10.1080/09638199.2014.881906>.

- Lunenburg, E. and Roberts, T. (2021), "Short-term effects of tariff liberalization within the AfCFTA on the ECOWAS customs union: An analysis using the TRIST model". *Journal of African Trade and Development*, 18(2): 45-62.
- Makochekanwa, A. (2014), "The impact of the tripartite free trade area (T-FTA) comprising COMESA, EAC, and SADC on welfare in member countries". *African Development Review*, 26(1): 124-137.
- Makochekanwa, A. (2014), Welfare implications of COMESA-EAC-SADC tripartite free trade area". *African Development Review*, 26(1): 186-202. <https://doi.org/10.1111/1467-8268.12073>
- Masiya, T. (2019), Revenue Implications of Continental Free Trade Area: A short-run perspective of Malawi". *African Development Review*, 31(4): 529-538. <https://doi.org/10.1111/1467-8268.12420>
- Matlanyane, A.R. and Harmse, C. (2002), *Revenue implications of trade liberalization in South Africa*.
- Nath, H.K. and Liu, L. (2017), "Information and communications technology (ICT) and services trade". *Information Economics and Policy*, 41: 81-87. <https://doi.org/10.1016/j.infoecopol.2017.06.002>
- Ndonga, D., Laryea, G. and Chaponda, T. (2020), "Assessing the potential impact of the African Continental Free Trade Area on Least Developed Countries: A case Study of Malawi". *Journal of Southern African Studies*, 1-20. <https://doi.org/10.1080/03057070.2020.1824416>.
- Obeng-Odoom, F. (2020), "The African Continental Free Trade Area". *American Journal of Economics and Sociology*, 79(1): 167-197. <https://doi.org/10.1111/ajes.12332>
- Odijie, M. E. (2019). The need for industrial policy coordination in the African Continental Free Trade Area. *African Affairs*, 118(470), 182-193. <https://doi.org/10.1093/afraf/ady046>
- Ohlin, B. (1933), *Interregional and international trade*. Harvard University Press.
- Oyelami, A. (2020), "The impact of the African Continental Free Trade Area (AfCFTA) on Nigeria: An analysis using the WITS-SMART model". *African Economic Review*, 22(1): 89-104.
- Robinson, J. and Joan, R. (1979), *Aspects of development and underdevelopment*. CUP Archive.
- Shinyekwa, I., Mbowe, S. and Kato, B. (2020), "The impact of the African Continental Free Trade Area (AfCFTA) on East African member countries: An analysis using the WITS-SMART model". *East African Journal of Economics*, 14(3): 233-250.
- Simo, L. (2020), "Trade in services in the African Continental Free Trade Area: Prospects, challenges and WTO compatibility". *Journal of International Economic Law*, 23(1): 65-95. <https://doi.org/10.1093/jiel/jgz038>.
- Stolper, W.F. and Samuelson, P.A. (1941), "Protection and real wages". *The Review of Economic Studies*, 9(1): 58-73. <https://doi.org/10.2307/2967638>.
- Valiente-Riedl, E. (2016), "To be free and fair?: Debating fair trade's shifting response to global inequality". *Journal of Australian Political Economy*, (78): 159.
- World Bank (2020), Making the most of the African Continental Free Trade Area: Leveraging trade and foreign direct investment to boost growth and poverty reduction. <https://www.worldbank.org/en/topic/trade/publication/free-trade-deal-boosts-africa-economic-development>
- Xing, Y. (2018), "The impacts of information and communications technology (ICT) and E-commerce on bilateral trade flows". *International Economics and Economic Policy*, 15(3): 565-586. <https://doi.org/10.1007/s10368-017-0375-5>.
- .

## Appendix

**Appendix Table 1: Simulation results by the ISIC classification**

ISIC	Protection		Price Change	Imports	
	Pre	Post	Imports	Value Change	% Change in imports
011 - Growing of crops; market gardening; horticulture	23.78%	22.56%	-0.94%	447,746,309	0.45%
012 - Farming of animals	2.43%	2.20%	-0.20%	1,921,168	0.10%
020 - Forestry, logging, and related service activities	1.21%	0.02%	-0.02%	59,771	0.01%
050 - Fishing, operation of fish hatcheries and fish farms; service activities incidental to fishing	27.21%	24.21%	-2.25%	988,820	1.09%
101 - Mining and agglomeration of hard coal	0.00%	0.00%	0.00%	0	0.00%
103 - Extraction and agglomeration of peat	191.41%	191.41%	0.00%	0	0.00%
111 - Extraction of crude petroleum and natural gas	223.89%	223.89%	0.00%	0	0.00%
120 - Mining of uranium and thorium ores	0.00%	0.00%	0.00%	0	0.00%
131 - Mining of iron ores	0.00%	0.00%	0.00%	0	0.00%
132 - Mining of non-ferrous metal ores, except uranium and thorium ores	0.00%	0.00%	0.00%	0	0.00%
141 - Quarrying of stone, sand and clay	0.13%	0.13%	0.00%	0	0.00%
142 - Mining and quarrying n.e.c.	5.62%	0.10%	-0.02%	320,665	0.01%

ISIC	Protection		Price Change	Imports	
	Pre	Post	Imports	Value Change	% Change in imports
151 - Production, processing, and preservation of meat, fish, fruit, vegetables, oils, and fats	1.36%	1.19%	-0.05%	29,294,368	0.03%
152 - Manufacture of dairy products	19.02%	2.17%	-13.98%	565,041,905	6.96%
153 - Manufacture of grain mill products, starches and starch products, and prepared animal feeds	27.00%	26.42%	-0.11%	19,583,358	0.05%
154 - Manufacture of other food products	14.17%	4.34%	-0.62%	141,542,032	0.30%
155 - Manufacture of beverages	19.81%	13.52%	-1.73%	102,624,883	0.83%
160 - Manufacture of tobacco products	0.94%	0.85%	-0.01%	50,937	0.01%
171 - Spinning, weaving, and finishing of textiles	21.32%	17.30%	-0.03%	2,116,568	0.02%
172 - Manufacture of other textiles	6.00%	5.41%	-0.09%	13,548,593	0.04%
173 - Manufacture of knitted and crocheted fabrics and articles	25.69%	23.69%	-0.89%	18,522,616	0.44%
181 - Manufacture of wearing apparel, except fur apparel	30.17%	27.09%	-0.60%	44,492,935	0.29%
182 - Dressing and dyeing of fur; manufacture of articles of fur	3.32%	2.73%	0.00%	0	0.00%
191 - Tanning and dressing of leather; manufacture of luggage, handbags, saddlery and harness	31.36%	30.55%	-0.25%	2,800,237	0.13%
192 - Manufacture of footwear	23.34%	22.35%	-0.15%	5,524,192	0.07%

ISIC	Protection		Price Change	Imports	
	Pre	Post	Imports	Value Change	% Change in imports
201 - Sawmilling and planing of wood	3.23%	0.28%	-2.43%	96,932,838	1.20%
202 - Manufacture of products of wood, cork, straw, and plaiting materials	22.10%	6.10%	-2.67%	111,782,840	1.32%
210 - Manufacture of paper and paper products	6.12%	5.37%	-0.23%	49,054,644	0.12%
221 - Publishing	1.50%	1.31%	-0.01%	386,248	0.01%
222 - Printing and service activities related to printing	22.87%	20.85%	-0.55%	1,075,626	0.27%
231 - Manufacture of coke oven products	0.00%	0.00%	0.00%	0	0.00%
232 - Manufacture of refined petroleum products	0.60%	0.57%	-0.02%	25,858,756	0.01%
233 - Processing of nuclear fuel	0.00%	0.00%	0.00%	0	0.00%
241 - Manufacture of basic chemicals	0.36%	0.27%	0.00%	2,933,896	0.00%
242 - Manufacture of other chemical products	3.37%	2.35%	-0.12%	92,771,609	0.06%
243 - Manufacture of man-made fibres	1.01%	1.00%	0.00%	10,867	0.00%
251 - Manufacture of rubber products	11.78%	10.98%	-0.22%	29,117,183	0.11%
252 - Manufacture of plastics products	12.76%	11.36%	-0.32%	40,911,612	0.16%
261 - Manufacture of glass and glass products	10.80%	9.15%	-0.24%	10,678,446	0.12%
269 - Manufacture of non-metallic mineral products n.e.c.	14.92%	9.18%	-1.19%	148,377,154	0.55%
271 - Manufacture of basic iron and steel	3.22%	2.98%	-0.02%	15,093,131	0.01%

ISIC	Protection		Price Change	Imports	
	Pre	Post	Imports	Value Change	% Change in imports
272 - Manufacture of basic precious and non-ferrous metals	4.15%	3.78%	-0.08%	5,283,785	0.04%
281 - Manufacture of structural metal products, tanks, reservoirs, and steam generators	12.22%	11.55%	-0.22%	26,750,166	0.11%
289 - Manufacture of other fabricated metal products; metal working service activities	12.94%	11.54%	-0.14%	22,641,450	0.07%
291 - Manufacture of general-purpose machinery	4.66%	4.42%	-0.10%	34,065,290	0.05%
292 - Manufacture of special-purpose machinery	1.15%	1.09%	-0.01%	3,053,631	0.00%
293 - Manufacture of domestic appliances n.e.c.	16.68%	16.57%	-0.04%	2,885,171	0.02%
300 - Manufacture of office, accounting, and computing machinery	0.70%	0.39%	0.00%	172,100	0.00%
311 - Manufacture of electric motors, generators and transformers	0.22%	0.22%	0.00%	112,964	0.00%
312 - Manufacture of electricity distribution and control apparatus	7.82%	7.22%	-0.36%	28,047,844	0.18%
313 - Manufacture of insulated wire and cable	17.56%	17.04%	-0.20%	7,376,715	0.10%
314 - Manufacture of accumulators, primary cells, and primary batteries	15.64%	15.16%	-0.07%	2,946,815	0.04%
	Protection		Price Change	Imports	

<b>ISIC</b>	<b>Pre</b>	<b>Post</b>	<b>Imports</b>	<b>Value Change</b>	<b>% Change in imports</b>
315 - Manufacture of electric lamps and lighting equipment	15.82%	13.56%	-0.15%	6,901,348	0.08%
319 - Manufacture of other electrical equipment n.e.c.	9.18%	8.27%	-0.50%	19,820,815	0.25%
321 - Manufacture of electronic valves and tubes and other electronic components	1.33%	1.24%	0.00%	61,959	0.00%
322 - Manufacture of television and radio transmitters and apparatus for line telephony and line telegraphy	0.93%	0.00%	0.00%	1,015	0.00%
323 - Manufacture of television and radio receivers, sound or video recording or reproducing apparatus, and associated goods	14.37%	12.86%	-0.04%	2,695,396	0.02%
331 - Manufacture of medical appliances and instruments and appliances for measuring, checking, testing, navigating, and other purposes, except optical instruments	0.16%	0.16%	0.00%	108,367	0.00%
332 - Manufacture of optical instruments and photographic equipment	4.72%	4.39%	-0.08%	524,871	0.04%
333 - Manufacture of watches and clocks	24.16%	23.44%	-0.11%	142,761	0.06%
341 - Manufacture of motor vehicles	17.01%	13.28%	-0.17%	73,822,827	0.08%
342 - Manufacture of bodies (coachwork) for motor vehicles; manufacture of trailers and semi-trailers	5.86%	5.75%	-0.01%	112,537	0.00%



ISIC	Protection		Price Change	Imports	
	Pre	Post	Imports	Value Change	% Change in imports
343 - Manufacture of parts and accessories for motor vehicles and their engines	10.33%	9.62%	-0.42%	30,108,648	0.21%
351 - Building and repairing of ships and boats	0.02%	0.00%	0.00%	0	0.00%
352 - Manufacture of railway and tramway locomotives and rolling stock	0.00%	0.00%	0.00%	0	0.00%
353 - Manufacture of aircraft and spacecraft	9.52%	7.47%	-0.25%	23,605,681	0.12%
359 - Manufacture of transport equipment n.e.c.	2.99%	2.96%	-0.01%	1,068,620	0.00%
361 - Manufacture of furniture	25.72%	24.77%	-0.68%	31,322,587	0.34%
369 - Manufacturing n.e.c.	10.90%	9.78%	-0.68%	49,750,584	0.34%
401 - Production, collection, and distribution of electricity	0.00%	0.00%	0.00%	0	0.00%
742 - Architectural, engineering, and other technical activities	0.00%	0.00%	0.00%	0	0.00%
749 - Business activities n.e.c.	702.24%	702.24%	0.00%	0	0.00%
921 - Motion picture, radio, television, and other entertainment activities	21.29%	15.23%	-4.50%	1,777,736	2.24%
930 - Other service activities	25.00%	5.80%	-14.86%	2,270	7.43%
999 -	67.84%	67.22%	-0.12%	6,101,097	0.06%

## Appendix 2: Detailing the Calculation Steps in the TRIST Model

The trade model employed in TRIST adheres to the conventional Armington (1969) presumption of imperfect substitution between imports stemming from various sources. This model precludes the direct substitution between distinct products. The trade reaction to alterations in tariffs for a specific product from a given exporter is computed based on the resultant percentage fluctuation in the price that includes the duty. It is posited that any modifications in tariffs are entirely transmitted, while the global price remains unaltered (with an assumption of infinite supply elasticity). The determination of the price shift hinges upon a nation's application of tariffs, excise taxes, and VAT. In most nations, tariffs are levied as a proportion of the CIF import value, excise taxes are calculated on the tariff-inclusive CIF import value, and VAT pertains to the tariff and excise-inclusive CIF import value. Consequently, when considering a tariff alteration (with VAT and excise rates remaining constant), the percentage shift in the price of a specific good, denoted as "i," sourced from exporter "j," is computed as follows (with the subscript "i" omitted from all variables within the equation 1, 2 and 3):

$$\frac{\Delta p_j}{p_j^{\text{old}}} = \frac{\{p_j^{\text{new}} | P_{\text{wld}}\} - \{p_j^{\text{old}} | P_{\text{wld}}\}}{\{p_j^{\text{old}} | P_{\text{wld}}\}} \quad (1)$$

$$= \frac{(1 + t_j^{\text{new}})(1 + \text{ext}_j)(1 + \text{vat}_j) - (1 + t_j^{\text{old}})(1 + \text{ext}_j)(1 + \text{vat}_j)}{(1 + t_j^{\text{old}})(1 + \text{ext}_j)(1 + \text{vat}_j)} \quad (2)$$

$$= \frac{(t_j^{\text{new}} - t_j^{\text{old}})}{(1 + t_j^{\text{old}})} \quad (3)$$

Where:

$\Delta p_j$  - change in the price of imports from country j;

$p_j^{\text{old}}$  - price of imports from j before tariff reform;

$p_j^{\text{new}}$  - price of imports from j after tariff reform;

$P_{\text{wld}}$  - world market price;

$t_j^{\text{old}}$  - tariff rate applied to imports from country j before;

$t_j^{\text{new}}$  - tariff rate applied to imports from country j after;

$\text{ext}_j$  - the excise tax rate applied to imports from j; and

$\text{vat}_j$  - VAT rate applied to imports from j.

The trade response of a specific product is formulated through a sequence of three successive steps:

- (i) discerning the substitution between diverse exporters in response to variations in relative prices among various suppliers resulting from preferential tariff or duty adjustments;
- (ii) recognizing the substitution between imports and domestically produced output as the relative price of total product imports shifts in comparison to domestically manufactured goods; and
- (iii) accounting for a demand effect wherein alterations in the overall price of the product induce shifts in its consumption patterns.

In the initial phase, the focus is on the allocation of predetermined expenditure designated for importing a particular product from various country suppliers, and how this allocation undergoes modifications in response to alterations in tariffs and duties. The exporter substitution effect delineates the way imports from exporter A are interchanged for imports from exporter B when the price of imports from exporter A, relative to that of B, experiences a reduction. This scenario arises following a preferential trade reform encompassing exporter A but excluding exporter B. The degree to which a given shift in relative prices translates into a change in relative imports hinges upon the exporter substitution elasticity, as defined. To specifically analyze this substitution effect, the total imports remain constant throughout this phase. This is achieved within the model by normalizing the imports from each supplier after the modelling of substitution effects, using the ratio of total imports for this specific product before tariff reform divided by the sum of imports for this product from all trading partners after the substitution effects as per equation 4.

$$q_j^{ES} = \left[ \frac{\Delta p_j}{P_j^{old}} * \gamma_i^{ES} + 1 \right] q_j^{old} * \frac{\sum_{j=1, \dots, n} (q_j^{old})}{\sum_{j=1, \dots, n} \left[ \left[ \frac{\Delta p_j}{P_j^{old}} * \gamma_i^{ES} + 1 \right] q_j^{old} \right]} \quad (4)$$

Where:

$q_j^{ES}$  - is imported quantity from j after exporter substitution;

$q_j^{old}$  - is imported quantity from j before reform; and

$\gamma_i^{ES}$  - exporter substitution elasticity for imports from country j.

Moving on to the second phase, the comprehensive expenditure designated for the specific product is allocated between domestic origins and imports. This entails understanding the domestic substitution effect, which portrays the adjustments in demand between domestically produced goods and imports as the relative price of the latter changes. Adjustments in tariffs or other duties induce an effect on the overall import price of the product, precipitating a shift in the balance between

imports and domestically generated output. Consequently, the resultant alteration in imports stemming from this stage is subsequently apportioned across all importers in accordance with their respective market shares for imports. Notably, from a technical perspective, we adopt the assumption of a unitary expenditure elasticity for the various sources of imports.

$$Q_{\text{imp}}^{\text{DS}} = \left[ \frac{\Delta P_{\text{imp}}}{P_{\text{imp}}^{\text{old}}} * \gamma^{\text{DS}} + 1 \right] Q_{\text{imp}}^{\text{old}} \quad (5)$$

$$q_j^{\text{DS}} = q_j^{\text{ES}} + \left[ Q_{\text{imp}}^{\text{DS}} - Q_{\text{imp}}^{\text{old}} \right] * \left[ \frac{q_j^{\text{old}}}{\sum_{j=1, \dots, n} (q_j^{\text{old}})} \right] \quad (6)$$

Where:

$Q_{\text{imp}}^{\text{old}}$  - is the initial total imported quantity;

$Q_{\text{imp}}^{\text{DS}}$  - is total imported quantity after substitution with domestic output;

$q_j^{\text{DS}}$  - is quantity imported from supplier  $j$  after substitution between imports and domestic output; and

$\gamma^{\text{DS}}$  - is domestic substitution elasticity for imports from exporter  $j$

In the third and final step, we examine the demand effect. This entails considering how the shift in the import price triggers a comprehensive adjustment in the product's overall price. This adjustment is determined by the alteration in the aggregate import price, weighted by the proportion of imports in domestic consumption. Subsequently, this shift in the product's price leads to changes in the domestic consumption of the respective commodity. Similar to the previous stages, the augmented consumption stemming from this effect is allocated between imports and domestic production. This allocation is based on the initial distribution of total consumption of the product and the associated change in imports. Furthermore, the shift in imports is then distributed across individual suppliers in accordance with their respective import shares as shown in equation 7 and 8.

$$Q_{\text{imp}}^{\text{DS}} = Q_{\text{imp}}^{\text{DS}} + \left[ Q_{\text{TD}}^{\text{new}} - Q_{\text{TD}}^{\text{old}} \right] * \left( \frac{Q_{\text{imp}}^{\text{old}}}{Q_{\text{imp}}^{\text{old}} + Q_{\text{dom}}^{\text{new}}} \right) \quad (7)$$

$$q_j^{\text{new}} = q_j^{\text{DS}} + \left[ Q_{\text{imp}}^{\text{new}} - Q_{\text{imp}}^{\text{DS}} \right] * \left( \frac{q_j^{\text{old}}}{\sum_{j=1, \dots, n} (q_j^{\text{old}})} \right) \quad (8)$$

Where:

$Q_{TD}^{old}$  - is the initial total demand for product i;

$Q_{TD}^{new}$  - is total demand after the change in the overall price of product i;

$Q_{dom}^{old}$  - is the initial quantity of demand for domestic output;

$Q_{dom}^{new}$  - is the final demand for domestic output;

$Q_{imp}^{new}$  - is the final demand for imports of product i; and

$q_j^{new}$  - is the quantity imported from supplier j after all the three (3) effects from changes in import prices (the substitution between different sources of imports, between imports and domestic output, and the demand effect for the product as a whole).

**ISBN 978 9914 738 30 8**

**Kenya Institute for Public Policy Research and Analysis  
Bishops Garden Towers, Bishops Road  
PO Box 56445, Nairobi, Kenya  
tel: +254 20 2719933/4, 2714714/5, 2721654, 2721110  
fax: +254 20 2719951  
email: [admin@kippra.or.ke](mailto:admin@kippra.or.ke)  
website: <http://www.kippra.org>**