The Potential Impact of the African Continental Free Trade Area on Trade in Kenya

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April 2025

Abstract

The African Continental Free Trade Area aims to reduce trade barriers across Africa, foster trade, capital and labor mobility, and promote industrial development. Kenya's exports are significantly reliant on African markets and was among the first countries to ratify the agreement. On average, Kenya exports 40 percent of total exports and 70 percent of its manufactured exports to African markets annually. While previous studies have investigated the potential impact of African Continental Free Trade Area on trade, most of the studies are not country specific and primarily uses Armington trade model. This study uses a heterogeneous firm's Global Trade Analysis Project model (GTAPHET) to investigate the potential impact of African Continental Free Trade Area on trade in Kenya. The model provides a structure to compare results from Armington, Krugman, and Melitz trade models in a general equilibrium model. The study found that, first, African Continental Free Trade Area will boost Kenya's exports and imports and the Melitz model projects double the increase under the Armington and Krugman models. Second, rubber and plastic trade will increase significantly. Second, export of rubber and plastic will experience significant growth compared to other sectors. Third, Kenyan trade with Central Africa and Southern Africa will increase significantly due to the agreement. In light of these results, policymakers should prioritize support to firms in key sectors poised for growth under the agreement and strategically enhance trade with Central Africa and Southern Africa.

KEYWORDS: AfCFTA, Regional Trade Agreement, GTAPHET, exports, imports

JEL CLASSIFICATION: F12, F15

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1. INTRODUCTION

Regional trade agreements (RTAs) have seen significant expansion since 1990. Globally, the number of RTAs in force has grown from 22 in 1990 to 373 as of 2023 (WTO, 2024). In Africa, this growth is particularly notable, with the number of RTAs increasing from 3 in 1990 to 47 in 2023. In 2019, the African Continental Free Trade Area (AfCFTA) was officially launch with the goal of unifying the existing RTAs across Africa into a single comprehensive RTA. Specifically, the primary objective of the AfCFTA is to establish a unified single market for goods and services with a population of 1.3 billion people and an aggregate GDP of USD 3.4 trillion. Moreover, it aims to promote capital and labor mobility, socioeconomic development, competitiveness, industry development, and lay the groundwork for establishing a continental customs union in the future.

The AfCFTA member countries plan to progressively eliminate tariffs on goods and services, that is, removing tariffs for 97 percent of goods and services. However, the time frame for tariff elimination differs for Least Developed Countries (LDC) and non-Least Developed Countries (non-LDC). Member countries are required to classify 90 percent of tariff lines as non-sensitive products, seven percent as sensitive, and they can exclude no more than three percent from tariff line. Non-LDC will eliminate tariffs imposed on non-sensitive goods within five years and on sensitive items within ten years. On the other hand, LDC will eliminate tariffs on non-sensitive goods within ten years and thirteen years for non-sensitive items. While eliminating tariffs is not required for excluded products, their share must not exceed 10 percent of the intra-African imports.

Africa is an important market for Kenya's goods and services. Kenya exported an average of 40 percent of its total exports and a staggering 70 percent of its manufactured exports to African countries between 1995 and 2023. During this period, Kenya's exports to Africa was valued at USD 50 billion compared to the USD 75.35 billion it exported to the rest of the world. In 2023, five African countries[1] were in the top ten of Kenya's export destinations for all products, and eight[2] were in the top ten destinations for its manufactured products. In contrast, during the same period, Kenya's share of imports from Africa is relatively small – only 10 percent of its total imports and 8 percent of its manufactured imports came from the continent. This translated into import goods worth USD 33.23 billion from African countries versus an astounding USD 276.70 billion from the rest of the world. Furthermore, only two African countries were in the top ten Kenya import sources for all products[3] and manufactured products[4] in 2023.

[1] Uganda, Tanzania, Rwanda, Egypt, and South Sudan.
[2] Uganda, Tanzania, Rwanda, South Sudan, DRC, Ethiopia, Burundi, Somalia.
[3] South Africa and Uganda
[4] South Africa and Egypt

The existing empirical studies have focused on the potential effects of AfCFTA on trade and welfare in Africa. Studies show that AfCFTA will lead to an increase in intra-Africa trade and welfare (Abrego, Amado, Gursoy, Nicholls, & Perez-Saiz, 2019; World Bank, 2020). Specifically for Kenya, studies show that its intra-Africa exports and imports will increase but its intra-Africa imports will have a larger increase than intra-Africa exports (Nechifor, Boysen, Ferrari, Simola, Nadelenga, Laichena, Malot, 2022; World Bank, 2020). The existing literature primarily employed Computable General Equilibrium (CGE) models with the Armington trade structure and do not focus on any particular country.

This study extends the existing literature by employing the heterogeneous firm's Global Trade Analysis Project model (GTAPHET) by Akgul, Villoria, Hertel, (2016) to evaluate the potential impact of the AfCFTA on trade in Kenya. The GTAPHET model introduces imperfect competition and firm heterogeneity into a Global Trade Analysis Project (GTAP) model. Therefore, while previous studies assumes that all sectors of the economy are perfectly competitive, this study assumes that some of the sectors are monopolistically competitive and have heterogenous firms. Additionally, firm productivity plays a crucial role as it determines whether a firm can enter both domestic and foreign market, domestic only, or its not productive enough to enter the domestic market. This study aggregates the GTAP Database into smaller number of sectors and regions. The model simulation uses a GTAP model with three trade structures – an Armington trade model, a Krugman trade model, and a Melitz trade model.

The remainder of the paper is structured as follows. Section 2 briefly provides an introduction on the African Continental Free Trade area. Section 3 describes the important features of Kenyan trade and its trade reforms. Section 4 looks into some related literature. Section 5 presents the methodology and model used in the study. Empirical results from the model simulations are discussed in section 6. Finally, section 7 concludes the paper.

2. AFRICAN CONTINENTAL FREE TRADE AREA

Regional integration has been a key policy initiative in Africa since the mid-20th century, and there have been earnest efforts to build a continental-wide trade block since 1990 (United Nations Economic Commission for Africa, 2004). The Abuja Treaty, signed by the African Heads of State and Government in 1991, provided economic, political, and institutional mechanisms to establish the African Economic Community (AEC) (United Nations Economic Commission for Africa, 2004; United Nations Economic Commission for Africa, African Union, & African Development Bank, 2012, 2017). The AEC was to be formed in six phases. In phase one, the African Union (AU) was to strengthen existing Regional Economic Communities (RECs) and build new ones in regions where they did not exist by 1999. Phase one was completed, and AU recognized eight RECs.[5] Phase two aimed to consolidate and harmonize tariff and non-tariff barriers (NTB) within

[5] The RECs included: Arab Maghreb Union (AMU), Economic Community of West African States (ECOWAS), East African Community (EAC), Intergovernmental Authority on Development (IGAD), Southern African Development

and between the RECs by 2007. Due to uneven progress by REC members, this phase has not been fully completed. In phase three, the RECs were to establish Free Trade Areas (FTAs) and Custom Unions (CUs) by 2017. Phase four aimed to coordinate and harmonize tariff and non-tariff systems across the RECs to create a continental CU by 2019. Phase five aimed to create an African Common Market (ACM) by 2023. Lastly, phase six aimed to establish an AEC, including an African Monetary Union and a Pan-African Parliament, by 2028.

While the African Continental Free Trade Area (AfCFTA) does not feature explicitly in the six phases, it is a crucial step in establishing a continental CU in phase four. The Agreement establishing the AfCFTA was signed on March 21, 2018, in Kigali, Rwanda, entered into force on May 30, 2019, and trading under the Agreement started on January 1, 2021 (African Union, 2018, 2024; The African Continental Free Trade Area Secretariat, 2023). The Agreement has been signed by 54 member countries of the AU, and 47 countries have ratified it as of October 2024 (African Union, 2024).

The AfCFTA covers five key areas: trade in goods and services, investment, intellectual property rights, competition policy, and a dispute settlement mechanism (African Union, 2018). The Agreement will be negotiated in two phases; phase I will include negotiations on trade in goods and services, dispute settlement, and customs and trade facilitation. Phase II negotiation will focus on investment, competition policy, intellectual property rights, digital trade, and women and youth in trade.

The AfCFTA aims to address the low share of global trade and intra-Africa trade and lack of export diversification in Africa. First, although 17.6 percent of the global population lived in Africa in 2022, Africa accounted for 2.1 percent of global trade and 2.9 percent of the global Gross Domestic Product (GDP). Second, the share of merchandise exports in global exports for Sub-Saharan Africa (SSA) has declined from 2.02 percent in 1990 to 1.75 percent in 2017. Third, the share of intra-Africa trade is low compared to other regions— 17.5 percent in 2020 compared to over 50 percent in Europe and Asia. The low intra-Africa trade indicates the potential benefits of a continental trade agreement that can lower trade barriers and spur trade among African countries. Fourth, African exports to other continents are predominantly primary products likely to fetch low prices and face high price volatility compared to intra-African trade, which contains more manufactured content (Abrego et al., 2019).

The AfCFTA will create a single market of 1.3 billion people with a combined GDP of $3.4 trillion to encourage investments, diversification, regional value chain development, and structural transformation (World Bank, 2020). Kenya has drafted and launched a national AfCFTA implementation strategy for 2022-2027. The strategy prioritizes selected manufacturing, agriculture, livestock, and service sectors. AfCFTA will benefit Kenya by reducing trade barriers

Community (SADC), Common Market for Eastern and Southern Africa (COMESA), Economic Community of Central African States (ECCAS), and the Community of Sahel-Saharan States (CEN-SAD).

to the African market, complementing Kenya's industrialization efforts, and improving food security by expanding agricultural markets (Republic of Kenya, 2022).

3. Kenya Trade and Trade Reforms

Kenya's trade reforms can be divided into three phases: import substitution policies in 1960–1980, trade liberalization under structural adjustment programmes (SAPs) in 1980–2000, and investment climates policies since 2000. The import substitution policies in 1960–1980 involved stringent import licensing and prohibitively high wall of tariffs. The import substitution policies had mixed results (Chege, Ngui, & Kimuyu, 2014). Although the industrial sectors enjoyed high growth rates, the policies were strongly biased against exports.

Trade reforms in 1980–2000 focused on unilateral and multilateral trade liberalization and regional integration. Unilateral trade liberalization in the 1980s was unsuccessful due to noncompliance with SAPs conditions (Swamy, 1994). Measures enacted included automatic import licensing, removing quantitative restrictions, and tariff reduction (Chege et al., 2014). The share of imports affected by quantitative restrictions declined from 40 percent in 1987 to 22 percent in 1991. Moreover, the highest tariff rate was reduced from 135 percent to 60 percent, and the number of tariff bands was reduced from 25 to 12.

Unilateral trade liberalization in the 1990s was relatively successful. Import licensing was abolished in May 1993 for most products, the number of tariff bands was reduced from eight in 1994 to five in 1999, and the maximum ad valorem rate was lowered from 60 percent in 1992 to 25 percent in 1999 (World Trade Organization, 2000). Under multilateral trade liberalization, Kenya joined WTO in 1995. Kenya also joined several RTAs, including the Common Market for Eastern and Southern Africa (COMESA) in 1994, the Intergovernmental Authority on Development (IGAD) in 1996, and the East African Community (EAC) in 2000.

Since 2000, trade reforms have focused on investment climate as spelled out by Kenya Vision 2030 (Republic of Kenya, 2007). Vision 2030 aims to improve Kenya's global competitiveness by strengthening local production, exporting to regional markets, and developing niche products. Kenya has joined several RTAs, including AfCFTA, and has signed 21 bilateral investment treaties to expand access to regional markets (UNCTAD, n.d.).

Kenya has also developed several policies to guide trade, including the 2017 Kenya National Trade Policy and the 2018 Integrated National Export Development and Promotion Strategy (NEDPS) (Republic of Kenya, 2017, 2018). The National Trade policy envisions an efficient domestic market and export-led globally competitive economy. NEDPS argues that Kenyan exports have experienced poor growth due to a narrow export destination and product base. NEDPS aimed for an average annual export growth rate of 25 percent, an average annual import growth rate of zero between 2017-2022, and a positive trade balance by 2022.

Despite the trade reforms, Kenya has not emerged as a significant player in global trade, nor has it been able to meet its export and import targets. First, Kenya's share of merchandise exports in global merchandise exports has not changed from 0.03 percent since 1990. Second, Kenya primarily exports primary products, but imports manufactured exports. Between 1995 and 2019, the share of primary exports in total exports decreased from 70.7 percent to 65.6 percent compared to the primary import shares, which increased from 25.9 percent to 33 percent. On the other hand, the share of manufactured exports in total exports increased from 28.6 percent to 31.5 percent, compared to manufactured imports, which decreased from 73 percent to 67 percent.

Third, as Figure 1 shows, Kenya did not eliminate the trade deficit by 2022 as NEDPS targeted due to high import growth. Between 2017 and 2021, exports grew at an average rate of 3.2 percent per year compared to the NEDPS target of 25 percent, while imports grew at an annual average rate of 5.5 percent compared to the NEDPS target of zero. The figure also shows that average applied weighted import tariffs declined from 20.64 percent in 1994 to 9.32 percent in 2020.

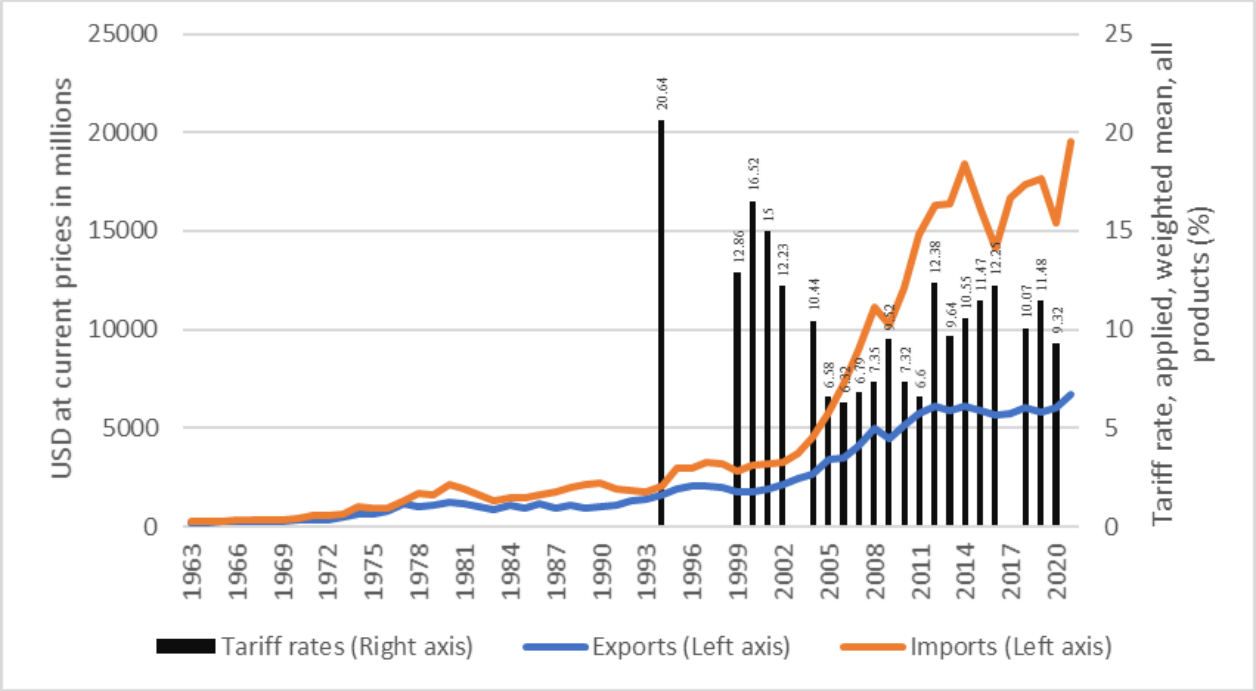

Figure 1: Import, exports, and applied import tariffs in Kenya, 1963-2021
Source: UNCTADstat database, World Development Indicator database.

The poor performance of exports is related to a lack of diversification and sophistication. First, Kenyan exports are sold to a few geographical markets. Africa and the European market absorbed almost two-thirds of Kenyan exports in 2019. Eastern Africa absorbed 76.11 percent of Kenyan exports to Africa, while continental and western Europe absorbed 85.61 percent of exports to Europe. Moreover, Kenya's comparative advantage in the export market is concentrated in primary products. Eight of the top ten exports in Kenya ranked using the revealed comparative advantage

(RCA) index are primary products.[6] As Figure 2 shows, agriculture and extraction and food, beverage, and tobacco constitute the largest exports by sector. Market and product concentration increases the risk of external shocks since a negative shock in the export market or on the export product spills over to the local market.

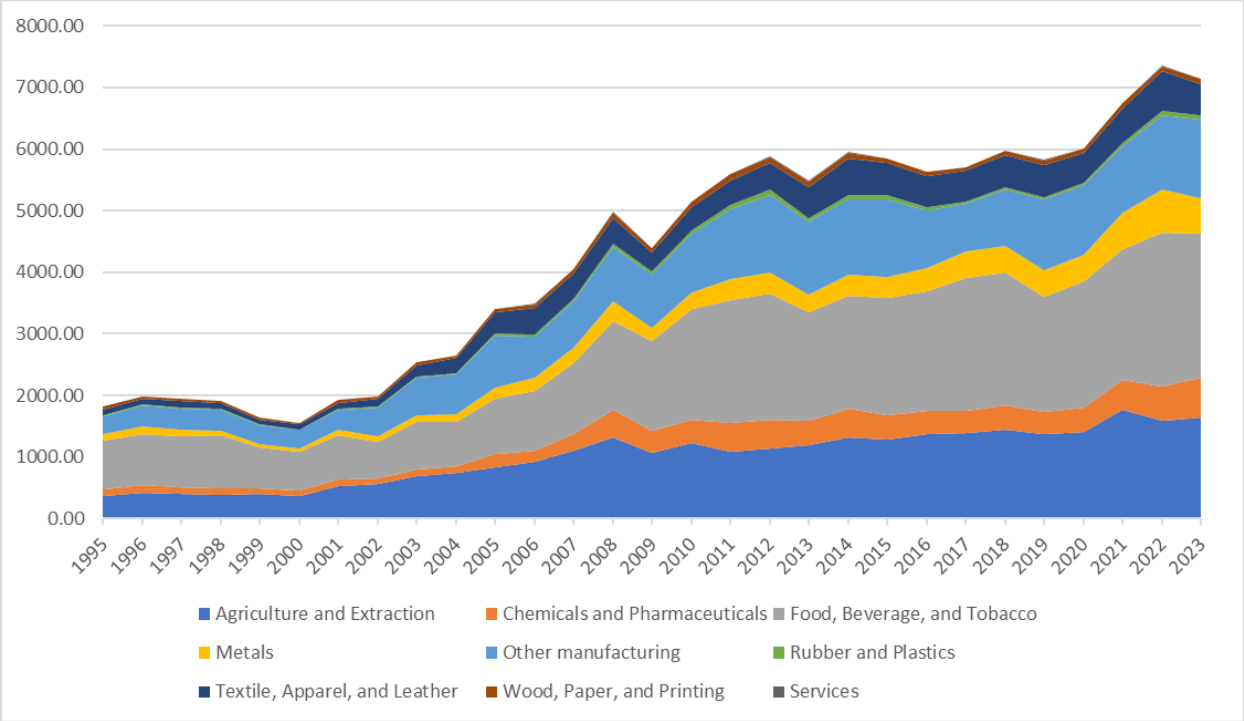

Figure 2: The trend of exports by sector in Kenya (USD Millions), 1995-2023
Source: UNCTADstat database

Second, Kenya primarily exports low-skilled products. The share of manufactured export in merchandise exports in Kenya was 30.87 percent in 2019 compared to 57.20 percent in lower-middle-income countries. Kenya's manufactured exports are dominated by low-technology products, which comprise around 60 percent of the total manufactured exports. The share of each category has barely changed since 1995 despite the trade reforms and compares poorly with other regions. For example, the percentage of high-technology manufactured exports in lower-middle-income countries increased from 8.80 percent in 1995 to 25.54 percent in 2019. Since Kenya is a lower-middle-income country, it is expected to follow a similar trend. According to Lall (2000), high-technology export structures offer a better prospect for future economic growth. The high-technology exports are highly income elastic, make it easier to enter new markets, are easily substituted for older products, enable firm technology upgrading, and have significant spillover effects.

[6] This includes Tea and mate; Jute, other textile bast fibre, n.e.s; Crude vegetable materials, n.e.s; Vegetable textile fibres, not spun; Cereals, unmilled (excluding wheat, rice, barley, maize); Ores and concentrates of base metals, n.e.s; Coffee and coffee substitutes; Margarine and shortening; Tobacco, unmanufactured; Sugar confectionery.

4. LITERATURE REVIEW

Jensen and Sandrey (2015) examined the likely impact of a continental free trade area in Africa using a GTAP model. The study assumed that AfCFTA will lead to complete tariff elimination. Th study found that the welfare gain or loss will differ by country. For example, South Africa will gain US$ 5.7 billion by 2025 while Zimbabwe losing US$1.5 billion by 2025. Kenya is projected to gain US$ 1.3 billion. Moreover, exports are expected to increase by 5.7 percent, while imports will increase by 4.5 percent in Kenya. The current study extends Jensen and Sandrey (2015) by using a heterogeneous firms GTAP model.

Chauvin, Ramos, and Porto, (2016) examined the trade, growth, and welfare impact of a continental free trade area in Africa using a recursive dynamic model. The study eliminated agricultural and manufacturing tariffs and reduced non-tariff barriers. The study found an asymmetric increase in trade due to tariff elimination, which varies widely, with Mozambique's trade increasing by 42 percent while Botswana's trade decreasing by 0.14 percent. The study also found that the greater the African integration, the larger the welfare gains. This study extends Chauvin et al. (2016) study by focusing on Kenya, which is missing from their study.

Abrego et al. (2019) examined the potential impact of AfCFTA on trade, revenues, and welfare for 45 African countries. The study used a static, multi-sector, multi-region quantitative general equilibrium model. The study found that intra-Africa trade will increase by 82 percent under perfect competition and 78 percent under imperfect competition. Overall trade will increase by 8.4 percent and 7.6 percent in perfect and imperfect competition respectively. The current study is similar to Abrego et al. (2019) as they use the Melitz (2003) model but differ in that it uses a Computable General Equilibrium model instead of a quantitative trade model.

Shinyekwa, Bulime, and Nattabi, (2020) examined the likely impact of AfCFTA on East African Community's (EAC) revenue, trade, and welfare. The study used a partial equilibrium model (World Integrated Trade Solution Simulation (WITS-SMART)). The study adopted Kenya's proposed tariff reduction under the AfCFTA for simulation purposes. The study found that Kenya will incur the largest tariff revenue loss in EAC while Kenyan trade will increase slightly. The current study extends Shinyekwa et al. (2020) by using the Computable General Equilibrium and Melitz trade model.

World Bank (2020) examined the potential economic and distributional effects of AfCFTA. The recursive dynamic Envisage CGE model was calibrated to a GTAP database, and the Global Income Distribution Dynamics (GIDD) microsimulation module was used to simulate the distributional effect of AfCFTA. The study simulated the full implementation of AfCFTA. The study found that intra-AfCFTA exports for Kenya will increase by 66 percent while imports will increase by 89 percent. This study differs from the World Bank (2020) study as it focuses on Kenya instead of the whole of Africa while using the Melitz trade model instead of the Armington trade model.

Nechifor et al. (2022) examined the potential impact of AfCFTA on the Kenyan economy. The study used a dynamic economy-wide CGE model. The study simulated a reduction in tariff and non-tariff measures. The study found that aggregate imports will increase by 1.2 to 2.1 percent while exports will increase by 0.5 to 1.2 percent. The Nechifor et al. (2022) study uses a top-down simulation approach using a Dynamic Equilibrium Model for Economic Development Resources and Agriculture (DEMETRA) and Modular Applied General Equilibrium (MAGNET) CGE models. In contrast, the current study will use a heterogeneous firms GTAP model.

5. METHODOLOGY

The study uses a GTAP model with a Melitz trade structure (GTAPHET) by Akgul et al. (2016). Akgul et al. (2016) study introduces heterogeneous firms into the standard GTAP model. The study assumes two types of sectors exist in the economy – perfectly and monopolistically competitive. In perfectly competitive sectors, there is a representative firm with a constant return to scale technology. In the monopolistically competitive sectors, each heterogeneous firm produces a unique variety.

Following Akgul et al. (2016), the study assumes a Dixit and Stiglitz (1977) utility function in the monopolistically competitive sectors. A CES aggregator function for varieties available in region *r* and its associated price index can be written as:

$$Q_{ir} = U_{ir} = \left[\sum_s \int Q_{isr}(\omega)^{\frac{\sigma_i - 1}{\sigma_i}} d\omega\right]^{\frac{\sigma_i}{\sigma_i - 1}} \text{ and} \quad (3.1a)$$

$$P_{ir} = \left[\sum_s \int P_{isr}(\omega)^{\sigma_i - 1} d\omega\right]^{\frac{1}{\sigma_i - 1}} \quad (3.1b)$$

Where Q_{ir} is the aggregate commodity *i* demanded in region *r*, $Q_{isr}(\omega)$ is the demand in region *r* for variety ω of product *i* sourced from *s*, and $\sigma_i > 1$ is the elasticity of substitution among varieties. P_{ir} is the price index for Q_{ir}. Akgul et al. (2016) use Melitz's (2003) definition of the average firm to rewrite equations (3.1a and 3.2b) in a discrete form:

$$Q_{ir} = \left[\sum_s N_{isr} \tilde{Q}_{isr}^{\frac{\sigma_i - 1}{\sigma_i}}\right]^{\frac{\sigma_i}{\sigma_i - 1}} \text{ and} \quad (3.2a)$$

$$P_{ir} = \left[\sum_s N_{isr} \tilde{P}_{isr}^{\sigma_i - 1}\right]^{\frac{1}{\sigma_i - 1}} \quad (3.2b)$$

Where N_{isr} is the number of varieties of commodity *i* in region *r* sourced from *s*, and the tilde implies average industry values. Maximizing equation (3.2a) subject to (3.2b) gives the demand for the average commodity *i* in *r* sourced from *s*.

$$\tilde{Q}_{isr} = Q_{ir}\left(\frac{P_{ir}}{\tilde{P}_{isr}}\right)^{\sigma_i} \quad (3.3)$$

Multiplying the average demand by the number of varieties of commodity *i* in *r* from *s* (N_{isr}) gives the demand for commodity *i* in region *r* from *s*.

$$Q_{isr} = N_{isr} Q_{ir} \left(\frac{P_{ir}}{\tilde{P}_{isr}}\right)^{\sigma_i} \tag{3.4}$$

The average industry price for a commodity i in region r from s can be written as

$$\tilde{P}_{isr} = \frac{\sigma_i}{\sigma_i - 1} \frac{C_{ir}}{\tilde{\Phi}_{ir} T_{isr}} \tag{3.5}$$

Where C_{ir} is the cost of the input bundle that is needed to produce a unit of commodity i in country r, $\tilde{\Phi}_{ir}$ is the average productivity level in industry i in country r and T_{isr} refers to trade and transportation costs of moving commodity *i* from *s* to *r*. Equation (3.4) shows that demand for commodity *i* from *s* to *r* (Q_{isr}) increases as the good becomes cheaper relative to the average firm price (P_{ir}) in the destination market. Equation (3.4) and (3.5) shows that a decline in trade costs (T_{isr}) due to AfCFTA leads to an increase in demand for commodity i in region r from *s* - Q_{isr}.

There are nine commodities/sectors (*i*) in the model – an agricultural sector (agriculture, livestock, and extraction), a service sector (utilities and construction), and seven manufacturing sectors, i) food, beverages, and tobacco, ii) textile, apparel, and leather, iii) wood, paper, and printing, iv) chemical and pharmaceuticals, v) rubber and plastics, vi) metal, vii) other manufacturing. The study assumes that textile, apparel, and leather, wood, paper, and printing, chemicals and pharmaceuticals, and rubber and plastics are Melitz sectors i.e. they have heterogeneous firms. There are five regions (*s*==*r*) in the model – Rest of the World (ROW), Northern and Western Africa (NAWA), Central Africa and Southern Africa (CASA), East Africa, and Kenya.

The GTAPHET model requires estimates of two structural parameters – the shape parameter of productivity distribution and elasticity of substitution for Melitz sectors (Ahmad & Akgul, 2018). According to Akgul and Ahmad (2020), if firm productivity (φ) is Pareto distributed with parameters (x_{min}) and (γ) i.e. $\varphi \sim Pareto(x_{min}, \gamma)$, then firm size is Pareto distributed with parameters, ($x_{min}^{1-\sigma} A$) and $\left(\frac{\gamma}{\sigma-1}\right)$ i.e. $S_i \sim Pareto(x_{min}^{1-\sigma} A, \frac{\gamma}{\sigma-1})$. Where x_{min} is the lower bound of the power law model, γ and $\frac{\gamma}{\sigma-1}$ are the power law exponents, σ is the elasticity of substitution, and A is a constant. Assuming $\zeta = \frac{\gamma}{\sigma-1}$, the firm size distribution can be rewritten as $S_i \sim Pareto(x_{min}^{1-\sigma} A, \zeta)$. Therefore, with an estimate of γ and ζ, it is possible to impute the value of σ i.e. $\sigma = \frac{\gamma}{\zeta} + 1$ for sectors with heterogeneous firms.

The study follows Akgul and Ahmad (2020), which assume a power-law (Pareto) probability distribution function for a continuous variable (e.g., firm productivity or size) of the form:

$$p(x) = \frac{\alpha - 1}{x_{min}} \left(\frac{x}{x_{min}}\right)^{-\alpha} \tag{3.6}$$

Where α equal to either γ or ζ. The first step in estimating the α, is to determine the value of x_{min}. The study uses Clauset, Shalizi, and Newman (2009) numerical method to select x_{min}. Clauset, et. al., (2009) uses a Kolmogorov-Smirnov (KS) statistics to measure the distance the between the empirical distribution of firm productivity/size and a theoretical power law distribution. The KS statistic is given by:

$$D = \max |S(x) - P(x)| \quad (3.7)$$

Where S(x) is the cumulative density of empirical data, and P(x) is the theoretical power-law distribution. The estimated x_{min} minimizes the KS statistic. With the estimated value of x_{min}, we can use the maximum likelihood method to estimate the α. Taking the log of equation (3.6) gives the log-likelihood function L:

$$L = \ln p(x|\alpha) = ln \prod_{i=1}^{n} \frac{\alpha-1}{x_{min}} \left(\frac{x}{x_{min}}\right)^{-\alpha} \quad (3.8)$$

Differentiating equation (3.8) with respect to α and rearranging give us:

$$\hat{\alpha} = 1 + n \left[\sum_{i=1}^{n} ln \frac{x_i}{x_{min}}\right]^{-1} \quad (3.9)$$

Where x_i is the observed firm productivity or size with $i = 1, \dots, n$ such that $x_i \geq x_{min}$. Equation (3.9) is used to estimate the shape parameters for the firm productivity (γ) and firm size (ζ).

The study uses a test proposed by Urzua, C., M., (2020) to test for power law behavior for the firm productivity and size. The test assumes a null hypothesis of power law behavior and an alternative hypothesis of lack of power law behavior.

6. DATA AND EMPIRICAL RESULTS

6.1 Firm Heterogeneity Parameters for the GTAPHET Model

The study uses a global CGE model that requires a global social accounting matrix (SAM). The source of the global SAM is GTAP database version 11C. The GTAP database gives detailed information on production, consumption, transportation margin, trade, tariffs, investment, and factor use in 141 regions. The study uses the 2017 reference year. The study uses a modified GTAP model by Akgul, et al., (2016) - Firm heterogeneous GTAP model (GTAPHET).

The GTAPHET requires two key parameters – the shape parameter of power law (Pareto) distribution of firm's productivity (γ) and elasticity of substitution across varieties (σ). The size of γ affects the impact of trade liberalization in the heterogeneous firm model. A low γ implies that incumbent firms are large and control a disproportionately large share of sales in the industry, i.e., there is high productivity dispersion. Hence, in sectors with low γ, trade liberalization leads to the expansion of a few large incumbent firms in domestic and export markets, while less productive

firms exit the markets. The reallocation increases average sectoral productivity, consumer welfare, and the variety of goods available in foreign markets. The study will use the 2022 Kenya census of industry production data to estimate the firm productivity shape parameter and elasticity of substitution for subsectors with heterogeneous firms.

As noted above, the distribution of firm productivity and firm size are related. If firm productivity (γ) has a Pareto/power law distribution, the firm size is also Pareto/power law distributed, with a shape parameter ζ. The firm size shape parameter (ζ), firm productivity shape parameter (γ), and elasticity of substitution (σ) are related through $\zeta = \frac{\gamma}{\sigma-1}$. The heterogeneous firm GTAP model requires that $\gamma > \sigma - 1$ (Akgul et al., 2016). Hence, the firm size shape parameter must be greater than 1($\zeta > 1$).

The study assumes some of the manufacturing subsectors in Kenya has heterogeneous firms and estimates the shape parameter for firm productivity and firm size for them. The study aggregates the 65 GTAP sectors into nine sectors - an agriculture and extraction sector, a service sector and seven manufacturing subsectors – i) food, beverage, and tobacco; ii) textile, apparel, and clothing; iii) wood, paper, and printing; iv) chemical and pharmaceutical products; v) rubber and plastic products; vi) metal; and vii) other manufacturing. The study uses the 2018 Kenya Census of Industrial Production (CIP) survey data. The study uses two main variables from the CIP survey data – sales and the number of employees in an establishment in 2017. We derive firm labor productivity by dividing sales by the number of employees in each establishment. Sales and the number of employees are commonly used to measure firm size, while labor productivity is commonly used to measure firm productivity in the literature (Ahmad & Akgul, 2017, 2018; Akgul & Ahmad, 2020).

The study uses the procedure proposed by Ahmad and Akgul (2017, 2018):

- First, estimate the firm size shape parameter (ζ) using sales and number of employees.
- Second, estimate the firm productivity shape parameter (γ) using labor productivity.
- Third, use the relationship between shape parameter of firm size and productivity $\zeta = \frac{\gamma}{\sigma-1}\ or\ \sigma = \frac{\gamma}{\zeta} + 1$ to impute the values for elasticity of substitution σ.

The study implements the procedure for the seven GTAP manufacturing subsectors. Tables 6.1 to 6.3 show shape parameter estimates for firm size (sales (ρ) and number of employees (θ)) and firm productivity (γ). Each Table shows the number of observations in the subsector (n), the maximum (max) and minimum (min) value, the lower bound (X_min), the number of remaining observations after dropping observations less than the lower bound (n_tail), a power law test statistic using Urzua C. M., (2020) approach (PWL), its associated p-value (P-Value), shape parameter estimates

using Clauset et al. (2009) approach (rho – ρ for sales, theta – θ for number of employment, gamma – γ for labor productivity), and the last column (Pareto) indicates whether the data follows a power law (Pareto) distribution according to Urzua C. M., (2020) test.

Tables 6.1 and 6.2 show the shape parameter estimates using sales and number of employees, respectively. Table 6.1 shows that food, beverages, and tobacco; textile, apparel, and leather; chemical and pharmaceuticals; and other manufacturing sales are Pareto distributed. However, sales of wood, paper, and printing; rubber and plastic; and metal subsectors are not Pareto distributed. For the Pareto distributed subsectors, the chemical and pharmaceutical subsector has the highest shape parameter (2.88), while textile, apparel, and leather have the lowest shape parameter (1.88). Hence, firms in the chemical and pharmaceutical subsector have very similar sales, i.e., there is low sales dispersion.

In contrast, firms in the textile, apparel, and leather subsector have high sales dispersion, i.e., a few large firms control most of the sales. Sales in the food, beverages, and tobacco subsectors (shape parameter of 2.05) are also more dispersed than sales in textile, apparel, and leather (shape parameter of 1.86) and other manufacturing (shape parameter of 1.92) subsectors. Table 4.1 also shows that the total sales of the manufacturing sector are not Pareto distributed.

Table 6.1: Tests of Power Law behavior - Firm sizes (ρ - sales)

No	GTAP sector	n	max	min	X_min	n_tail	PWL	P-value	Rho (ρ)	Pareto
1	Food, Beverage, and Tobacco	935	3.8E+10	35000	8.3E+08	198	1.84	0.399	2.05	Yes
2	Textile, Apparel, and Leather	179	1.1E+10	47600	2.3E+08	60	2.33	0.312	1.86	Yes
3	Wood, Paper, and printing	268	5.9E+09	500000	3E+07	177	11.3	0.004	1.51	No
4	Chemical and Pharmaceuticals	202	1.7E+10	552992	1.8E+09	21	0.34	0.842	2.88	Yes
5	Rubber and plastics	160	5.7E+09	3500000	1.3E+08	96	10.1	0.006	1.74	No
6	Metal	185	2E+10	1200000	1.3E+08	85	7.85	0.020	1.60	No
7	Other Manufacturing	357	1.9E+10	600000	2.7E+08	91	0.11	0.946	1.92	Yes
8	Total Manufacturing	2286	3.8E+10	35000	1.1E+09	302	7.61	0.022	2.15	No

Source: Author's computation using Kenya Census of Industrial Production survey data, 2022.

When using the number of employees to measure the firm size (Table 6.2), textile, apparel, and leather; wood, paper, and printing; chemical and pharmaceuticals; and rubber and plastic subsectors are Pareto distributed. Moreover, the manufacturing sector as a whole is Pareto distributed. However, the number of employees for food, beverage, and tobacco; metals; and other manufacturing subsectors are not Pareto distributed. Table 6.2 shows that for the Pareto distributed subsectors, the rubber and plastic subsector has the highest shape parameter (2.76), while the textile, apparel, and leather subsector have the lowest (1.52).

Hence, firms in rubber and plastic subsector have very similar numbers of employees, i.e., there is low dispersion in the number of employees. In contrast, firms in the textile, apparel, and leather subsector have high dispersion in the number of employees, i.e., a few large firms have a large share of the employees. Wood, paper, and printing (shape parameter of 2) and chemical and

pharmaceutical subsectors (shape parameter of 2.02) have a higher shape parameter than the textile, apparel, and leather subsector. This implies that firms in wood, paper, and printing, and chemical and pharmaceuticals subsectors have a lower dispersion in the number of employees than the textile, apparel, and leather subsector.

The estimated shape parameters for firm sizes compare favorably with Akgul and Ahmad's (2020) estimates for European Union (EU) manufacturing subsectors. Akgul and Ahmad's (2020) estimates of shape parameters for firm size for EU manufacturing subsectors range between 1.5 and 2.66 when using operating revenues and 1.5 – 3.5 when using the number of employees. The shape parameters are close to Kenya's manufacturing subsector estimates of between 1.51 and 2.88 when using sales and 1.52 and 2.76 when using the number of employees. However, the Akgul and Ahmad (2020) manufacturing subsectors' upper bound estimate of 3.5 is higher than Kenya's upper bound estimate of 2.88. Overall, the upper bound estimates show that firm size in Kenya's manufacturing subsectors has a higher dispersion than in the EU manufacturing subsectors.

Table 6.2: Tests of Power Law behavior - Firm sizes (θ - Number of employees)

No	GTAP sector	n	max	min	X_min	n_tail	PWL	P-value	Theta (θ)	Pareto
1	Food, Beverage, and Tobacco	935	142149	1	103	246	4.78	0.091	1.90	No
2	Textile, Apparel, and Leather	179	12238	1	28	110	3.34	0.188	1.52	Yes
3	Wood, Paper, and printing	268	2413	1	53	97	3.70	0.157	2.00	Yes
4	Chemical and Pharmaceuticals	202	3423	1	58	68	2.62	0.270	2.02	Yes
5	Rubber and plastics	160	1391	1	219	29	1.83	0.401	2.76	Yes
6	Metal	185	1068	1	20	128	17.00	0.000	1.67	No
7	Other Manufacturing	357	1284	1	40	145	11.11	0.004	1.95	No
8	Total Manufacturing	2286	142149	1	741	86	0.07	0.968	2.25	Yes

Source: Author's computation using Kenya Census of Industrial Production survey data, 2022.

Table 6.3 shows shape parameter estimates for labor productivity (used as a proxy for firm productivity). The Table shows that manufacturing subsectors' labor productivity is Pareto distributed except for food, beverage, and tobacco, and total manufacturing. For the Pareto distributed subsectors, chemical and pharmaceutical and wood, paper, and printing subsectors have the highest shape parameter (2.63), while textile, apparel, and leather have the lowest shape parameter (2.11). This implies that labor productivity dispersion is lower in chemical and pharmaceutical and wood, paper, and printing subsectors than in the textile, apparel, and leather subsectors. Therefore, the textile, apparel, and leather subsector have a few productive firms alongside many less productive ones. Labor productivity in rubber and plastic (shape parameter of 2.61), metals (shape parameter of 2.27), and other manufacturing (shape parameter of 2.22) subsectors are also more dispersed than labor productivity in textile, apparel, and leather (shape parameter of 2.11).

The estimated shape parameters for firm productivity are lower than Akgul and Ahmad's (2020) estimates for European Union (EU) manufacturing subsectors. Akgul and Ahmad (2020) estimate

that the labor productivity shape parameters for EU manufacturing subsectors range between 2 and 3. The lower bound shape parameter is close to Kenya's manufacturing subsectors estimates of between 2.11. However, the Akgul and Ahmad (2020) manufacturing subsectors' upper bound estimate of 3 is higher than Kenya's upper bound estimate of 2.63. Therefore, labor productivity in Kenya's manufacturing subsectors is more dispersed than in the EU manufacturing subsectors.

Table 6.3: Tests of Power behavior - Labor productivity (γ – Sales/Number of employees)

No	GTAP sector	n	max	min	X_min	n_tail	PWL	P-value	Gamma (γ)	Pareto
1	Food, Beverage, and Tobacco	935	3.1E+08	0.246	5272728	303	9.24	0.010	2.12	No
2	Textile, Apparel, and Leather	179	1.9E+08	11900	4766667	32	0.22	0.894	2.11	Yes
3	Wood, Paper, and printing	268	9.7E+07	45454.6	5847989	63	1.33	0.513	2.63	Yes
4	Chemical and Pharmaceuticals	202	7.6E+07	78998.86	6723185	76	0.74	0.689	2.63	Yes
5	Rubber and plastics	160	6.2E+07	45275	4875000	53	0.44	0.803	2.61	Yes
6	Metal	185	2.4E+08	44000	7626900	48	1.85	0.397	2.27	Yes
7	Other Manufacturing	357	4.4E+08	21202.36	5384616	94	0.74	0.688	2.22	Yes
8	Total Manufacturing	2286	4.4E+08	0.246	5760000	639	6.74	0.035	2.24	No

Source: Author's computation using Kenya Census of Industrial Production survey data, 2022.

The study uses the relationship between firm size and firm productivity to impute the elasticity of substitution. The firm's size and productivity in a subsector must have a Pareto distribution for the study to impute the elasticity of substitution for that subsector. Since sectors with Pareto distribution for firm size using sales and number of employees differ, the study uses the number of employees to measure firm size. The number of employees (Table 6.3) gives more sectors with Pareto distribution compared to sales (Table 6.1). Tables 6.2 and 6.3 show that four subsectors have Pareto distribution for the number of employees and firm productivity – textile, apparel, and leather; wood, paper, and printing; chemical and pharmaceuticals; and rubber and plastics.

Table 6.4 shows the imputed elasticity of substitution using the estimates of firm size and firm productivity shape parameters in Tables 6.2 and 6.3. The study imputes the elasticity of substitution using $\sigma = \frac{\gamma}{\theta} + 1$. Table 6.4 shows that the imputed elasticity of substitution ranges between 1.95 (rubber and plastic) and 2.39 (textile, apparel, and leather). This indicates that textile, apparel, and leather products are more responsive to price changes than rubber and plastic products. The imputed elasticities are close to Akgul and Ahmad's (2020) estimates for European Union (EU) manufacturing subsectors, which ranged between 1.9 and 2.8.

Table 6.4: Implied elasticity of substitution per sector

No	GTAP sector	Shape parameter for the firm size (number of employees) ($\boldsymbol{\theta}$)	Shape parameter for the labor productivity ($\boldsymbol{\gamma}$)	Imputed elasticity of substitution ($\boldsymbol{\sigma}$)
1	Textile, Apparel, and Leather	1.52	2.11	2.39
2	Wood, Paper, and printing	2.00	2.63	2.32
3	Chemical and Pharmaceuticals	2.02	2.63	2.30
4	Rubber and plastics	2.76	2.61	1.95

Source: Author's computation

Hence, the GTAPHET model will have four subsectors with heterogeneous firms – textile, apparel, and leather; wood, paper, and printing; chemical and pharmaceuticals; and rubber and plastic. In these subsectors, the study will use Akgul, et al., (2016) study approach to incorporate the estimates in Table 4.4 (γ and σ) into the standard GTAP model.

6.2 Simulation results for the potential impact of AfCFTA on exports in Kenya.

Table 6.5 shows the percent change in Kenya's exports due to tariff reductions across Africa due to AfCFTA. Columns (1) – (3) show the potential impact of a 100 percent reduction in import tariff on Kenyan exports under perfect competition, monopolistic competition, and heterogeneous firm model, respectively. The perfect competition model adopts the Armington trade model, monopolistic competition adopts the Krugman trade model, and the heterogeneous firm model adopts the Melitz trade model. The results are presented for total exports (Panel A), exports by sectors (Panel B), and exports by destination (Panel C). The Table shows the simulation results based on a GTAPHET model for qs(*i*,*s*,*r*) – percent change in demand for commodity *i* (nine commodities) from Kenya (*s*) to other regions (*r*).

Table 6.5 shows that a 100 percent tariff reduction across Africa due to AfCFTA boosts Kenya's total exports by between 7.70 percent and 20.44 percent, depending on the trade model. The perfect competition model (Column (1)) predicts an 8.17 percent increase in exports, the monopolistic model (Column (2)) predicts a 7.7 percent increase, and the heterogeneous firm model (Column (3)) predicts 20.44 percent. The estimated impact on exports is higher than the Nechifor et al., (2022) study, which estimated a potential impact of between 0.5 and 1.2 percent, and the Jensen and Sandrey (2015) study, which estimated a potential impact of 5.7 percent. The difference between the simulated potential impact might be due to differences in the models used – the current study uses a GTAP model with heterogeneous firms, while Nechifor et al., (2022) use a combination of MAGNET and DEMETRA models while Jensen and Sandrey (2015) use the standard GTAP model.

Table 6.5 shows that for perfect and monopolistic competition models (Columns (1) and (2) – Panel B), exports for all sector will increase. For the perfect competition model, food, beverage, and tobacco; rubber and plastic; metal; and other manufacturing exports will experience the highest increase at more than 10 percent. On the other hand, textile, and apparel, and leather and services experience the lowest increase at 3.11 percent and 1.19 percent, respectively. Similarly, under the monopolistic model, food, beverage, and tobacco; chemical and pharmaceuticals; rubber and plastics; metal; and other manufacturing exports will experience an increase of more than 10 percent. However, textile, apparel, and leather and services exports will experience a marginal increase of 3.90 percent and 0.38 percent, respectively. Therefore, the perfect and monopolistic competition models predict that the subsectors that will hugely benefit from AfCFTA include food,

beverage, and tobacco; chemical and pharmaceuticals; rubber and plastics; metals and other manufacturing.

For the heterogeneous firm model (Column (3) Panel B), while exports of most products will increase, exports for textile, apparel, and leather and services will decline by 5.89 percent and 8.55 percent, respectively. Food, beverage, and tobacco; chemical and pharmaceuticals; rubber and plastics; and other manufacturing exports will increase by more than 10 percent. Rubber and plastics exports see the highest increase at 1786.78 percent. The substantial increase in rubber and plastic exports is due to the decline in the initial high tariff facing Kenya's rubber and plastic products, especially in North Africa and Western Africa (NAWA) and Central Africa and Southern Africa (CASA) regions. Moreover, the initial exports of rubber and plastic products are relatively low pre-AfCFTA.

For exports by destination, Table 6.5 (Panel C) shows that Kenyan exports increase across the three models in all regions except in the rest of the world. For the perfect competition and monopolistic competition (Column (1) and (2) Panel C), Central Africa and Southern Africa regions experience the highest increase in Kenyan exports while the rest of the world experience only a marginal increase. East Africa will also experience a significant increase in exports from Kenya. This has several implications – first, AfCFTA, under perfect and monopolistic competition on average, does not divert Kenyan exports from the rest of the world to the African region. Second, AfCFTA deepens trade in the East Africa region.

For the firm heterogeneous model (Column (3) Panel C), Kenyan exports to the rest of the world (ROW) will decline by 5.33 percent. In comparison, exports to Central Africa and Southern Africa (CASA) region will increase by 289.12 percent, East Africa by 86.83 percent, and North Africa and Western Africa (NAWA) by 48.72 percent. Hence, as expected, Kenyan exports will experience the highest increase in CASA regions where they face the highest import tariffs. The results also indicate that AfCFTA will divert some Kenyan exports from the ROW region to the African region. Moreover, AfCFTA will further deepen trade in East Africa. Surprisingly, the increase in Kenyan exports to NAWA regions is lower than in East Africa, although Kenyan exports to NAWA region face substantially higher tariffs than in East Africa. While the reasons are unclear, the study speculates that this might be due to lower connectivity between Kenya and the NAWA region compared to East Africa regions.

Table 6.5: Potential impact of AfCFTA on exports in Kenya

qs(i,r,s) – Sales of commodity i from source r to destination r	Perfect Competition (Armington Trade Model) Tariff: 100% (1)	Monopolistic Competition (Krugman Trade Model) Tariff: 100% (2)	Heterogeneous Firm Model (Melitz trade model) Tariff: 100% (3)
Panel A: Total Exports			
Total export	8.17	7.70	20.44
Panel B: Kenya Exports by Sector (%)			
Agriculture and Extraction	9.28	8.56	0.26
Food, Beverage, and Tobacco	24.29	23.12	11.24
Textile, Apparel, and Leather	3.11	3.90	-5.89
Wood, Paper, Printing	7.46	8.51	6.73
Chemical and Pharmaceutical	7.15	10.19	17.02
Rubber and Plastic	12.43	18.03	1786.78
Metal	21.24	20.31	9.97
Other Manufacturing	34.97	33.71	19.98
Services	1.19	0.38	-8.55
Panel C: Kenya Exports by Destination Region (%)			
Rest of the World (ROW)	3.76	3.12	-5.33
North Africa and Western Africa	13.99	13.28	48.72
Central Africa and Southern Africa	60.56	60.39	289.12
East Africa	18.45	18.69	86.83

Source: Author's computation using GTAPHET and GTAP Database v11

6.3 Simulation results for the impact of AfCFTA on imports in Kenya

Table 6.6 shows the percent change in Kenya's imports due to tariff reduction under AfCFTA. Columns (1) – (3) show the potential impact of a 100 percent reduction in tariff on Kenyan imports under perfect competition, monopolistic competition, and heterogeneous firm models, respectively. Panel A shows the results for total imports, Panel B for imports by sectors, and Panel C for imports by destination. The Table shows the simulation results based on a GTAPHET model for qs(*i*,*s*,*r*) – percent change in demand for commodity *i* (nine commodities) from regions (*s*) to Kenya (*r*).

Table 6.6 shows that a 100 percent tariff reduction due to AfCFTA increases Kenya's total imports by between 3.42 percent and 6.18 percent, depending on the trade model. The perfect competition model (Column (1)) and monopolistic model (Column (2)) predict a 3.42 percent increase in imports, while the heterogeneous firm model (Column (3)) predicts 6.18 percent in imports. The estimated impact on imports is higher than the Nechifor et al., (2022) study that estimated a potential impact of between 1.2 and 2.1 percent but closer to the Jensen and Sandrey (2015) study that estimated a potential impact of 4.5 percent. The difference between the simulated potential impact might be due to differences in the models used – the current study uses a heterogeneous firms GTAP model, while Nechifor et al., (2022) uses a combination of MAGNET and DEMETRA models. However, Jensen and Sandrey (2015) use the standard GTAP model. The study results indicate that for the three models used in the study, Kenya will see a marginal increase in imports, and the firm heterogeneity model predicts higher increase in imports than the other models. Moreover, the increase in imports is lower than the increase in exports.

Table 6.6 shows that, for the perfect competition model (Column (1) – Panel B), all sectoral imports will increase except for textile, apparel, and leather and services. For the monopolistic competition model (Column (2) – Panel B), all sectoral imports will increase except for textile, apparel, and leather; chemical and pharmaceuticals; and rubber and plastic subsectors. However, in both models, the increase in imports is marginal except for agricultural and extraction and food, beverage, and tobacco subsectors. Therefore, the perfect and monopolistic competition models predict that the subsectors that will face stiff import competition due to AfCFTA are agricultural and extraction and food, beverage, and tobacco.

For the heterogeneous firm model (Column (3) Panel B), imports across all subsectors increase except for the rubber and plastic subsector. The imports of agricultural and extraction; food, beverage, and tobacco; textile, apparel, and leather; and wood, paper, and printing will increase by more than 10 percent. This implies that these sectors will face more import competition due to AfCFTA. On the other hand, rubber and plastic imports will decline by 80 percent, which indicates that the sector will face less import competition due to AfCFTA.

For imports by destination, Table 6.6 (Panel C) shows Kenyan imports from other regions will decrease across the all model except for imports from Central Africa and Southern Africa. Across the three models, imports from Central Africa and Southern Africa regions experience a sizeable

increase of between 177 and 209 percent. Kenya imposes substantially higher import tariffs on Central Africa and Southern Africa imports. Hence, removing tariffs due to AfCFTA will boost imports from the region. Import from East Africa to Kenya will experience the largest decline – between 13 and 17 percent.

Table 6.6: Potential impact of AfCFTA on imports in Kenya

qs(i,r,s) – Sales of commodity i from source r to destination r	Perfect Competition (Armington Trade Model) Tariff: 100% (1)	Monopolistic Competition (Krugman Trade Model) Tariff: 100% (2)	Heterogeneous Firm Model (Melitz trade model) Tariff: 100% (3)
Panel A: Total Imports			
Total import	3.42	3.42	6.18
Panel B: Kenya Imports by Sector (%)			
Agriculture and Extraction	26.27	26.61	29.36
Food, Beverage, and Tobacco	15.05	15.72	21.47
Textile, Apparel, and Leather	-0.10	-0.40	11.29
Wood, Paper, Printing	0.81	0.66	17.22
Chemical and Pharmaceutical	0.18	-1.23	6.08
Rubber and Plastic	0.31	-2.74	-80.93
Metal	1.69	1.81	3.81
Other Manufacturing	0.37	0.63	2.94
Services	-0.30	0.21	4.81
Panel C: Kenya Imports by Origin Region (%)			
Rest of the World (ROW)	-3.85	-3.88	-2.56
North Africa and Western Africa	-2.58	-2.70	-5.74
Central Africa and Southern Africa	177.10	177.65	209.85
East Africa	-17.79	-17.50	-13.09

Source: Author's computation using GTAP Database v11

7. CONCLUSION

The study investigated the potential impact of AfCFTA on trade in Kenya. The study found that AfCFTA will substantially increase Kenyan exports, and the Melitz trade model predicts a much higher increase in exports than Armington and Krugman trade models. Moreover, sectors like rubber and plastic will experience considerable export growth, especially under the Melitz trade model. Additionally, the result shows that Kenya will increase exports to all regions, although Central Africa and Southern Africa will experience much higher export growth. Therefore, the study concludes that AfCFTA will be crucial in addressing Kenya's persistent concentration of exports in a few primary products and regions. Diversifying exports to manufactured exports and other regions away from East Africa is crucial in reducing the risk of external shocks.

Moreover, the study found that AfCFTA will lead to a marginal increase in imports, although the Melitz trade model predicts a much higher increase in imports. However, the increase in imports is lower than the increase in exports. Therefore, the study concludes that AfCFTA will be crucial in addressing Kenya's negative trade balance, which has exploded since 2005. Moreover, the study concludes that some sectors like agriculture and extraction and food, beverage, and tobacco will face substantial import competition due to AfCFTA.

Several policy implications arise from the study findings. First, the study found that AfCFTA will substantially increase exports, especially for food, beverage, and tobacco, rubber and plastic, and chemical and pharmaceutical products. Textile, apparel, and leather products will experience a marginal export increase (Armington and Krugman models) or a decline in the Melitz trade model. Therefore, Kenya should prioritize support for the food, beverage, and tobacco; rubber and plastic; and chemical and pharmaceutical subsectors to help them expand in the African market. While the National AfCFTA implementation strategy 2022-2027 by the Republic of Kenya (2022) does include the above subsectors in the priority export sector, it does not include rubber products. The study recommends the inclusion of the rubber subsectors as one of the priority sectors in the AfCFTA implementation strategy.

Second, the study found that AfCFTA will significantly increase exports across all models, especially to Central Africa and Southern Africa. While the AfCFTA implementation strategy identifies the COMESA region as a priority region for exports, it does not include the SADC region. Therefore, the study recommends the inclusion of the SADC region as a priority region for Kenyan exports under the AfCFTA implementation strategy.

Third, the study found that AfCFTA will lead to a marginal increase in imports. However, agriculture and extraction; food, beverage, and tobacco; textile, apparel, and leather; and wood, paper, and printing subsectors will see an import surge of more than 10 percent. Therefore, providing support to these sectors will be crucial in preventing output and jobs loss as the subsectors adjust to AfCFTA shock.

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9. Appendix A: Empirical Results

Table F.1: Potential impact of AfCFTA on exports and imports in Kenya by products and regions (%)

Experiment		Perfect Competition (Armington trade model)					Monopolistic Competition (Krugman trade model)					Firm Heterogeneity (Melitz trade model)				
Exports	qs(j,r) sales of commodity i from source r to destination s	ROW	NAWA	CASA	East Africa	KEN	ROW	NAWA	CASA	East Africa	KEN	ROW	NAWA	CASA	East Africa	KEN
	Agriculture and Extraction	7.81	17.16	186.44	13.09	-2.41	7.09	16.37	184.65	12.36	-2.33	-1.17	6.75	164.25	5.44	-1.96
	Food, Beverage, and Tobacco	2.46	94.86	111.52	30.99	-0.68	1.5	93.04	109.52	29.74	-0.61	-8.77	71.48	91.98	17.37	-0.47
	Textile, Apparel, and Leather	0.58	26.99	51.16	9.39	0.08	1.32	28.24	52.92	10.33	0.54	-12.29	37.95	156.41	3.45	-3.37
	Wood, Paper, and Printing	0.25	29.51	23.72	7.05	0.04	0.6	29.92	24.15	8.17	0.26	-14.86	72.24	60.13	5.33	-2.63
	Chemical and Pharmaceutical	0.8	7.17	26.29	7.12	-0.16	3.6	10.03	29.76	10.18	1.17	-0.06	40.51	54.12	17.88	-0.41
	Rubber and Plastic	0.33	37.62	37.09	7.82	-0.1	5.01	43.99	43.14	13.37	1.42	761.48	6351.02	3296.89	1427.99	275.83
	Metal	2.31	4.11	133.87	29.52	0.82	1.49	3.3	132.15	28.55	0.61	-7.57	-7.24	111.66	18.01	-2.24
	Other manufacturing	2.86	96.14	136.97	33.03	0.38	1.85	94.26	134.79	31.78	0.19	-9.62	70.4	113.55	18.36	-2.34
	Services	1.19	1.2	1.64	0.96	-0.02	0.38	0.39	0.83	0.12	0.09	-8.56	-9.83	-5.74	-8.48	0.55
Imports	Agriculture and Extraction	-45.98	-45.21	541.34	-43.57	-2.41	-45.84	-45.07	542.96	-43.36	-2.33	-44.7	-41.95	555.03	-41.35	-1.96
	Food, Beverage, and Tobacco	-13.16	-8.26	726.99	-1.16	-0.68	-12.68	-7.72	731.87	-0.51	-0.61	-8.00	1.13	755.66	5.88	-0.47
	Textile, Apparel, and Leather	-0.50	3.99	57.04	0.27	0.08	-0.79	3.50	55.89	-0.14	0.54	9.59	51.12	215.85	23.00	-3.37
	Wood, Paper, and Printing	-0.32	-0.14	37.30	-0.46	0.04	-0.44	-0.12	37.43	-1.24	0.26	11.30	20.84	187.05	8.27	-2.63
	Chemical and Pharmaceutical	-1.01	-1.22	13.29	-1.14	-0.16	-2.45	-2.23	12.04	-2.83	1.17	-4.18	-38.98	132.97	-8.76	-0.41
	Rubber and Plastic	-0.48	-0.50	39.18	-0.43	-0.10	-3.52	-3.26	35.65	-4.18	1.42	-81.71	-94.16	-21.12	-84.73	275.83
	Metal	-0.02	0.18	12.08	-0.45	0.82	0.09	0.35	12.25	-0.21	0.61	2.35	8.84	11.78	3.25	-2.24
	Other manufacturing	-1.58	-1.37	81.81	-1.48	0.38	-1.33	-1.07	82.38	-1.12	0.19	1.03	5.86	80.52	2.43	-2.34
	Services	-0.23	-1.31	-2.16	-0.76	-0.02	0.27	-0.78	-1.62	-0.16	0.09	4.83	7.69	-0.76	5.25	0.55

Source: Author's computation