SCHOOL OF GRADUATE STUDIES

DEPARTMENT OF ECONOMICS

The Potential Economy-wide Effects of Economic Integration in the African Continental Free Trade Area (AfCFTA): Evidence from Ethiopia.

A Recursive Dynamic Computable General Equilibrium (CGE) Model Approach

A thesis submitted to the Department of Economics in partial fulfillment of the requirement for the Master of Science in Economics

(Economic Policy Analysis)

By: Minda Tesga Hayles

Supervisor: Tadele Ferede (Ph.D.)

July, 2022

Addis Ababa, ETHIOPIA

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This is to certify that the thesis prepared by **Minda Tesga Hayles** entitled: **The Potential Economy-wide Effects of Economic Integration in the African Continental Free Trade Area (AfCFTA): Evidence from Ethiopia: A Recursive Dynamic Computable General Equilibrium (CGE) Model Approach**, and submitted in partial fulfillment of the requirements for the Degree of Master of Science in Economics (Economic Policy Analysis) complies with the regulations of the University and meets the accepted standards concerning originality and quality.

Signed by the Examining Committee:

External examiner: Arega Shumetie (Ph.D.) Signature_____ Date_____.

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Supervisor: Tadele Ferede (Ph.D.) Signature_____ Date_____.

DECLARATION

I, the undersigned, declare that this project paper (The Potential Economy-wide Effects of Economic Integration in the African Continental Free Trade Area (AfCFTA): Evidence from Ethiopia: A Recursive Dynamic Computable General Equilibrium (CGE) Model Approach) is my original work and has not been presented for a degree in any other university and that all sources of material used for the project have been duly acknowledged.

Declared by:

Name: Minda Tesga Hayles Signature _____ Date _____

ENDORSEMENT

This thesis submitted to the School of Graduate Studies of Addis Ababa University College of Business and Economics, Department of Economics for examination with my approval as a university supervisor.

Tadele Ferede (Ph.D.) _____ _____

Signature Date

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ACRONYMS

AfCFTA: African Continental Free Trade Area

AfDB: African Development Bank

AGOA: African Growth and Opportunity Act

AU: African Union

CEMAC: Communauté Économique et Monétaire de l'Afrique Centrale (Central African Economic and Monetary Community)

CES: Constant Elasticity of Substitutes

CGE: Computable General Equilibrium

COMESA: Common Market for East and Southern Africa

COVID-19: Corona Virus Disease 2019

EAC: East African Community

ECA: Economic Community for Africa

ECCAS: Economic Community of Central African States

ECOWAS: Economic Community of West African States

EDRI: Ethiopian Development Research Institute

EFTA: European Free Trade Association

ERCA: Ethiopian Revenues and Customs Authority

ESCAP: Economic and Social Commission for Asia and the Pacific

ETB: Ethiopian Birr

EU: European Union

FTA: Free Trade Area

GAMS: General Algebraic Modeling System

GATT: General Agreement on Trade and Tariff

GDP: Gross Domestic Product

GMM: Generalized Method of Moments

GTAP: Global Trade Analysis Project

IFPRI: International Food Policy Research Institute

IMF: International Monetary Fund

IO: Input-Output

ITC: International Trade Center

LDCs: Least Developed Countries

MoFEC: Ministry of Finance and Economic Cooperation

MPSGE: Mathematical Programming System for General Equilibrium Analysis

NAFTA: North Atlantic Free Trade Area

NBE: National Bank of Ethiopia

NTB: Non Trade Barrier

OCA: Optimal Currency Area

OLS: Ordinary Least Square

OUSTR: Office of the United States of Trade Representative

PSI: Policy Studies Institute

SACU: South African Customs Union

SADC: Southern African Development Community

SAM: Social Accounting Matrices

SMART: Single Market Partial Equilibrium Simulation Tool

U.A E: United Arab Emirate

UEMOA: Union Economique et Monétaire Ouest Africaine (West African Economic and Monetary Union; replaced UMOA in 1994

UNCTAD: United Nations Conference on Trade and Development

UNECA: United Nations Economic Commission of Africa

UNDP: United Nation Development Program

VECM: Vector Error Correction Method

WB: World Bank

WDI: World Development Indicator

WITS: World Integrated Trade Solution

WTO: World Trade Organization

ABSTRACT

Historically, economic integration, which has been an important structural feature in the international economy, is an integral part of the economic policy issue of global, continental, and regional economies such as Africa. Most of the literature on the potential economy-wide effects of economic integration in Ethiopia shows ambiguous results. Owing to this fact, the main aim of this study is to identify aspects of the sectoral, trade, revenue, and welfare effects of economic integration in Ethiopia, in particular, if the African continental free trade area (AfCFTA) implementation plays a role. This study adopted a theoretical framework and employed descriptive as well as simulation analysis. The simulation analysis employed a recursive dynamic computable general equilibrium (CGE) model and used a 2015/16 social accounting matrix (SAM) dataset. The simulation result shows that economic integration in the African Continental Free Trade Area (AfCFTA) is likely to have a positive effect on the Ethiopian economy, such that sectoral productivity of most economic sectors, trade flows, and welfare are improved (affected positively). However, government revenue decreased due to tariff reduction (cut); hence, it is one of the most important sources of government income, and such tariff reduction results in no more government income from import tariffs. In sum, Ethiopia is likely to benefit from joining the African Continental Free Trade Area (AfCFTA). Hence, it will have a positive effect on the Ethiopian economy by improving sectoral productivity, trade flows, and welfare. Ethiopia might face a revenue loss. Due to this, the way of reaction to structuring its tariff offer and negotiating with its African partners, it is necessary to retain a significant number of tariff lines for sensitive and excluded items over a longer period of liberalization, and subsidization programs or targeted tax incentives are required to help the transformation of those sectors that stand to lose as a result of trade liberalization. Moreover, multidimensional policy measures are vital, in addition to tariff reduction (cut), protection of the domestic infant industries, building the potential to produce (substitute) products that are largely imported from outside, and removing production side (infrastructural) constraints should also be a long-term policy or strategy for Ethiopia and other member countries of the AfCFTA.

Keywords: Economic integration, Economy-wide, Welfare, Trade, Sectoral, Revenue, AfCFTA, and Ethiopia

CHAPTER ONE

INTRODUCTION

1.1 Background

Economic integration enables the region's larger economies to enhance their economic welfare and facilitates and encourages economic expansion by eliminating various trade barriers (Castro et al., 2004; Snorrason, 2012). However, economic integration in Africa remains weak due to the absence of a basic state element of sovereignty (Shaw, 2009). The study by Zepeda, et al., (2011) reflects those countries in Africa face the challenges of accepting the conditionality of international regulatory reforms, and economic integration is considered to support inclusive growth in the African continent by sustaining human capital development. Open economies developed faster than closed ones (Edwards, 1993) so that when an economy flourishes and performs well, the overall economic agents will enjoy prosperity, and this will turn positively on the well-being of citizens and public welfare improvements (Hamdi and Hakimi, 2021). However, recent studies have anticipated that not all trade openness or reforms enhance development and growth (Singh, 2010).

Additionally, other challenges exist in Africa, such as low per capita densities of road and rail infrastructure, which negatively affect continental economic integration (Mothae, 2005). The absence of policy coherence, overlapping membership, lack of government commitment, and lack of consideration of private sector involvement are the main challenges in Africa's economic integration (Gada and Haile, 2002). Additionally, high regulatory policies are the main challenge in Africa; hence, they decrease competition and productivity (Beyene, 2014; Ariovich, 1979). The African geopolitical structure is mainly dominated by the western colonial hegemons, which resulted in small and disintegrated domestic markets; thus, economic welfare loss is recorded through the trade diversion effect (Baldwin and Seghezza, 1998; Claassen et al., 2016).

Furthermore, when comparing Africa's regional economic integration to that of other growing continents, such as Asia, a reduction in tariffs results in a slight improvement in the intra-African exports share from 10% in 2000 to 16.6% in 2017, and intra-Asian exports climbed from 52% to 59.4% within the same time period (UNECA, 2020). In 2017, Ethiopia's total share of exports to Africa was 19%, and imports were 6% (ITC, 2018).

Despite many challenges, African governments considered continental economic integration as a policy measure to tackle those challenges. Therefore, the African Union (AU) member countries signed the AfCFTA agreement on March 21, 2018. Among those signatory countries, one is Ethiopia. It provides an agreement for the liberalization of trade, expects that all 55 African countries will be involved, and addresses the tripartite FTA, i.e., the COMESA, EAC, and SADC. According to UNECA (2018), the AfCFTA likely improve intra-African trade by 52.3% by 2022 by reducing import tariffs by 90%. Moreover, AfCFTA is a strong way to unify Africa's political and cooperative work on the international level (Gérout et al. 2019). The expected gain from such economic integration is mainly dependent on consistent and sustainable efforts by the member countries and the potential to implement regulatory agreements. For Ethiopia, the justification for joining the AfCFTA is to improve intra-African trade, which enables the free movement of resources, attracts foreign investments, and shares common benefits.

Hence, it is clear in this context that this thesis aims to determine the welfare, trade, revenue, and sectoral effect of AfCFTA implementation on the Ethiopian economy. Understanding the potential welfare, trade, revenue, and sectoral implications of economic integration in the AfCFTA remains important to designing appropriate policies that could solve the challenges of weak economic integration. In Africa, economic integration creates huge market and resource potential to improve trade, and thus enhancing market share (continental or global) through this system may improve welfare and perhaps play part in mitigating the trade diversion that Ethiopia is facing.

1.2 Statement of the problem

The significance of economic integration to enhance the economic welfare of Africa cannot be overemphasized, while it is a debatable issue (Mold and Mukwaya, 2015; Gurova, 2014; AfDB, 2014). Apart from the institutional structure in Africa, economic integration is generally determined by political commitment. African economic integration faces different economic, political, and institutional problems (Alesina et al., 2000; Mothae 2005; Büthe and Milner 2008; Hanieh 2010; Adesina, 2009). Delays in the ratification of economic integration due to lack of coordination among institutions, poor design, and weak commitment to implementation. On the other hand, ratified integration agreements are not timely distributed to the concerned stakeholders (Draper 2010; Hartzenberg 2011; Yang and Gupta 2007; Mattli and woods 2009; Krapohl 2020).

All these challenges lead to the collapse of the economic integration agreement, result which may in welfare loss.

African countries, including Ethiopia, face a problem related to the effect of neoliberalism through SAPs advocated by the Bretton Woods institutions and policies of the Washington Consensus, which opposes economic integration and results in welfare losses (del Cristo Monagas, Herrera, and Corral, 2015). A study by Makochekanwa (2012) on the welfare effects of the Tripartite Free Trade Area considered only the cereals. This study takes into account a variety of economic sectors to provide a more comprehensive analysis.

Moreover, the mechanism of economic integration in Africa has mainly targeted the avoidance of trade barriers rather than enhancing the productive potential for trade (UNCTAD, 2013). Additionally, variations in customs structures between countries impair regional trade and make economic integration more challenging (Hasse, 2013). The market is based on a Eurocentric conception of integration, far away from solving the problems of developing countries, mainly Africa (Gibb, 2009; UNDP, 2011). Africa's role in the world market as an exporter of primary products and Africa's inclusion in the global economy is limited by an unstable external trade environment (Oyejide 2005:19; Collier and Venables, 2008). Some studies have argued that for successful regional economic integration, there should be a convergence of macroeconomic variables (Mundell, 1961; Bernard et al., 1996; Wane, 2004; Phillips and Sul, 2007; Duede and Zhorin, 2016).

Other, even though there are many studies on economic integration, trade, revenue, and welfare, few studies appear to compressively analyze the AfCFTA. Among those Masiya 2019; Wonyra, and Bayale 2020; Bayale, Ibrahim, and Atta-Mensah 2022; and Zongo and Oyelami 2021) investigated the potential revenue, welfare, and trade effects of economic integration, specifically on AfCFTA. Others have investigated the trade effect of regional economic integration, such as SADC, COMESA, and EAC (see Otieno**,** 2011; Nnyanzi, Babyenda, and Bbale (2016); Mengesha, 2009). Moreover, this study will examine the welfare, trade, revenue, and sectoral effects of the AfCFTA and intend to apply an economy-wide analysis.

Furthermore, in the literature on welfare, trade, revenue, and economic integration, many studies have employed OLS, fixed or random effects, gravity models, GMM, and static CGE estimation

techniques to address the effect of economic integration on welfare, trade, revenue and sectors (Mevel and Karingi, 2012); Mureverwi, 2016; Ngepah and Udeagha, 2018; and Abrego et al., 2019). Aryeetey (2001), Page and Bilal (2001), Shams (2005), Hailu (2014), Kayizzi-Mugerwa et al. (2014), and Tuluy (2016) are a few additional investigations based only on descriptive analysis. However, these estimation techniques fail to address an economy-wide issue or effects of economic integration. As a result, a recursive dynamic computable general equilibrium (CGE) model is employed in this work.

Considering the previous literature, the issue of welfare improvement of the member countries has been less considered, but on factors that can improve trade among its member countries. Moreover, this study examined whether Ethiopia is justifiable on account of joining the AfCFTA through trade creation or trade diversion, which leads to welfare improvement or welfare loss, and this research will contribute to the literature in a variety of ways. Hence, there are no abundant studies that have tested the potential economy-wide effects of economic integration in the African Continental Free Trade Area (AfCFTA); in Ethiopia's instance, there are no previous studies. All these arguments motivated us to explore this linkage for this area.

1.3 Research Questions

The research problems mentioned above entail the need for the research questions. As a result, the research questions that must be analyzed and addressed are as follows:

i. What are the sectoral effects of the AfCFTA implementation in Ethiopia?
ii. What are the likely effects of the AfCFTA implementation on Ethiopian trade through either trade creation or diversion?
iii. What are the likely short-to-long-term welfare effects of the AfCFTA economic integration on Ethiopia? and
iv. What are the revenue implications of Ethiopia’s participation in the AfCFTA?

1.4 Objectives of the Study

1.4.1 General Objectives

The main objective of the study is to examine the potential economy-wide effects of the implementation of the African Continental Free Trade Area (AfCFTA) on the Ethiopian economy.

1.4.2 Specific Objectives

The specific objectives include the following.

a) To identify the likely sectoral effects of the AfCFTA implementation in Ethiopia;
b) To analyze the likely effects of the AfCFTA on Ethiopia trade through either trade creation or diversion;
c) To estimate the likely short-to-long-term welfare effect of the AfCFTA economic integration on Ethiopia; and
d) To examine the revenue implication of Ethiopia's joining the AfCFTA.

1.5 Hypothesis of the Study

Based on the empirical literature on the relationship between economic integration and welfare, the hypothesis will have built around the specific objectives and assess the following relationships.

i. Economic integration in the AfCFTA likely a positive potential effect on welfare, trade, and the growth of domestic products (or sectoral productivity) through trade creation (Abrego et al., 2019; ECA, 2019; Chauvin et al., 2016; Mevel and Karingi, 2012). Thus, we hypothesize that the trade creation effect of economic integration in the AfCFTA has a positive effect on welfare, trade, and various sectors of an economy. On the other hand, the trade diversion effect of economic integration has a negative effect on welfare, trade, and sector productivity. Then, we hypothesize that the trade diversion effect of economic integration has a negative implication on welfare, trade, revenue, and sectors.

1.6 Significance of the Study

Most importantly, the study will contribute to raising the interest of scholars as input for world research to work on economic integration, trade area, and welfare, since economic integration has a wide range of impacts on the current socio-economic and political system of every part of the world. Since scholars argued that analyzing the welfare, trade, revenue, and sectoral effects of economic integration will have a far-reaching role to play on that country's, regional and continental economic policy formulation as well as the consideration of economic integration. Therefore, this study seeks to fill in the gap that will help in such an area. Specifically, the findings may also help to show the likely effects of the economic integration on welfare, trade, revenue, and sector productivity in the Ethiopian economy.

Additionally, as improving welfare, trade, revenue, and sectors productivity; and integration effectiveness and sustainability are the aim of developing countries (i.e., Ethiopia) and international organizations, the outcomes of this study are crucial in developing and implementing appropriate policies. Moreover, this study contributes to the studies on the welfare, trade, revenue, and sectoral effect of economic integration in the African Continental Free Trade Area (AfCFTA).

1.7 Scope of the Study

This study mainly focused on the economy-wide (such that welfare, trade, revenue, and sectoral productivity) implications of Ethiopia's joining the African continental free trade area (AfCFTA), and it should be noted that studies of this sort focus on the African Continental Free Trade Area (AfCFTA) overall's economic impact on Ethiopia.

1.8 Limitations of the Study

For the development of this study, the main challenges were inconsistency between data reported by different institutions, lack of sufficient data and accurate records for the analysis of some issues, and organized and full data were also not found in each office. Despite this problem, a maximum effort is made to obtain the relevant information and to develop a better analysis.

1.9 Organization of the Study

The second chapter, which follows this introductory chapter, examines both the theoretical and empirical literature. In chapter three, the study's model specification and methodology are described. The fourth chapter is devoted to a descriptive analysis of the collected data, and chapter five presents a simulation result and analysis. Finally, Chapter six presents the conclusion and policy implications based on the findings of the study.

CHAPTER TWO

LITERATURE REVIEWS

This chapter mainly focuses on presenting the related literature review on welfare, trade, revenue, sectoral productivity, and economic integration, which is vital for understanding the issues concerned and in identifying gaps, planning, and execution of the experiences of previous studies. Hence, it is helpful to select a convenient method to answer the questions, fill gaps, and make a logical conceptualization of the study. Therefore, the chapter is organized as follows. Section 2.1 provides a theoretical literature review that explains concepts, measurements, data, and the relationships between economic integration, welfare, trade, and revenue. Section 2.2 discusses the empirical literature reviews used to examine previous studies related to welfare, trade, revenue, sectors, and economic integration. Section 2.3, through a review of the literature and evaluation, identifies research gaps. It provides detailed information on the methods employed in the data collection and analysis and the reason for the methods we chose. Finally, section 2.4 provides the conceptual framework, which provides a valid theoretical and graphical formulation of the relationship between welfare, trade, revenue, and economic integration.

2.1 Theoretical Literature Review

In this section, we explore the definition of concepts and theories related to the relationship between welfare, trade, revenue, and economic integration, including their specific explanation and measurement issues.

2.1.1 Welfare

The word welfare is used and defined in many and various ways, "*not only slippery and difficult but also promiscuous*" (George and Page, 1995). The word welfare derives from *wel-fare*, which is from "well as fine and fare, mainly considered as a travel or arrival, yet later as a source or supply of food" (Williams, 1976). The issues of welfare are linked to happiness and prosperity (Williams, 1976).

The idea of welfare is linked to both individuals and collective groupings, and it takes into account both material and nonmaterial demands. Additionally, it is also linked with different analyses of social justice (George and Page, 1995). "Welfare" can also consider acts of altruism, channels for

the pursuit of self-motives, exercise of authority, transition to work, and moral regeneration (Deacon, 1992). Welfare has also been defined in a limited way by observing merely nature, such as how many calories are required to survive (Spicker, 1995). This evaluation explained in various ways the long history of poverty analysis. Others defined welfare as "the prominent characteristics of our common sense of moral value" (Sumner, 1996).

The standard approaches to welfare are mainly concerned with welfare in terms of the social state of investment, labor market transition, and life-course savings schemes. The modern thinkers of welfare are classified as the New Right, The Middle Way, Democratic Socialism, Marxism, Feminism, Postindustrial Greens, and Race/Anti-Racism (George and Page, 1995).

In general, welfare is an economic issue that is concerned with analyzing the nature of the world and formulating policies that enhance the well-being of people as a whole. It is the normative aspect of economics; hence, it relies on value judgments. Most of the time Economists put their concern on how well-off society is, which means that social welfare is determined by the well-being of the individuals.

2.1.2 Economics and Welfare

Historically, the welfare concept is traced back to Smith's (1776) definition associated with production. Thus, people's nature of self-interest and the invisible hand of the market move the collection of self-motives into the common good. As a result, if a government governs the least, that would be the best government policy for the growth of a nation's wealth. Moreover, Jeremy Bentham (1781), in the utilitarian concept, defined welfare as the sum of individual utilities or, in other words, it is a "social" utility.

According to Pigou (1920), the monetary unit is an excellent indicator of welfare. This definition violates some aspects of issues such as justice, freedom, and rights that are not determined by monetary units. However, this concept was not widely used until Amartya Sen introduced it in the 1970s, who explained the term welfare as a general approach of no use of any information regarding social states; only personal welfare gained was considered (Sen 1977, 1979a, 1979b).

Welfare is the level of well-being of a group such as community members. Economic changes such as prices, income, product innovation, and market opening affect the welfare of the group. In general, there are three most applicable welfare change measures; such are (i) consumer surplus,

which is the difference between what consumers are willing to pay and what they actually paid (ii) compensating variation (CV), which is the amount of money income we would have to give to (or take away from) the consumer to get her back to the same level of utility that she/he had before the price changes, and (iii) equivalent variation (EV), which also refers to the amount of money a customer is willing to forego (or lose) to manage price changes. Mathematically,

$$EV^{hh} = \left(\frac{U_{new}^{hh} - U_{old}^{hh}}{U_{old}^{hh}}\right) I_{new}^{hh} \quad \text{or} \quad CV^{hh} = \left(\frac{U_{old}^{hh} - U_{new}^{hh}}{U_{new}^{hh}}\right) I_{old}^{hh} \ldots\ldots\ldots\ldots\ldots (2.1)$$

Generally, in various economic theories, welfare is equivalent to utility. Therefore, welfare is determined by the individual's income and the contribution to our well-being from a bundle of products purchased with money (Van Praag & Frijerts 1993, 31); welfare also means a utility or satisfaction that is quantifiable (Tinbergen 1991, 7).

In economics, welfare is associated with an individual's perception and utility of the use of income. It makes it very challenging to measure welfare at the macro level, as utility is subjective, while most of the time consumers' preference is defined by the market, it has been considered a proxy and it shows that GDP per capita is considered a good indicator. Individual welfare represents the micro level; social welfare is the aggregate of all individual welfare (Walker, 2011).

For classical economists, welfare is examined through individuals' utility, and there is no government's role, mainly to deal with market failure (Barr, 2007). This idea of classical economists was challenged by behavioral economists (Wilkingson, 2008) and psychologists who were more concerned with happiness and satisfaction (such as Layard, 2005). Such economic analysis of an individual's utility justifies that money is considered an indicator of welfare.

2.1.3 Concepts and measurements of trade

The concept of trade is the most important theoretical concept in international economics and the seemingly never-ending policy debate or issue (Obstfeld and Krugman, 2003). Since the formation of modern nation-states in the 16th century, governments have been concerned about the impact of international competition (or trade) on domestic industry prosperity and have attempted to either protect domestic industries from foreign competition by imposing import restrictions or to assist them in global competition by subsidizing exports. International economics' single most consistent objective has been to study the impacts of these so-called protectionist measures and, in most cases,

but not always, to critique protectionism and demonstrate the benefits of freer international commerce (ibid).

The exchange of capital, products, and services across international borders or territories is known as foreign trade. It accounts for a major portion of the gross domestic product in most nations. While international trade has existed for a long time, its economic, social, and political significance has increased in recent years (Obstfeld and Krugman, 2003). Both export and import trades are significant in principle. To widen its production base and promote export growth, a country must import the necessary inputs, capital goods, and technologies. Imports of consumer products are also necessary to meet domestic demand. Export trade, on the other hand, is essential for a country's foreign exchange gap to be filled, increasing import capacity and reducing reliance on foreign aid. As a result, expanded global trade involvement is regarded as the single most crucial weapon for achieving rapid economic growth and development (Rahman, 2009). No country in the world can become self-sufficient; hence, governments must rely on international trade to compensate for their lack of self-sufficiency (Negussie, 2015). Foreign commerce, in general, leads to labor division and specialization, optimal resource allocation and utilization, price equality, the maintenance of the balance of payment positions, and the promotion of world peace (Agrawal and Khan, 2011).

Countries engage in international trade for two main reasons, both of which benefit their overall economic standing. First, countries trade because they are distinct from one another. Nations, like people, may benefit from their diversity if they can come to an agreement where each does what it does best. Second, countries trade to gain manufacturing economies of scale. That is, if each country only produces a limited variety of goods, each of these goods can be produced on a larger scale and hence more efficiently than if it attempted to produce everything (Salvatore, 2013). Patterns of international commerce in the actual world show the interplay of both of these incentives.

2.1.4 Concepts and measurements of revenue

All income received by a government from the collection of taxes, social security contributions, and other fees and charges is referred to as revenue. A tax is a financial charge or other levy imposed by a state, or the functional equivalent of a state, on a taxpayer (an individual or legal

entity). Direct taxes on income and wealth, such as personal and corporate income taxes and property taxes, as well as indirect taxes collected on consumption, such as Value Added Tax (VAT), excise duties, and taxes on foreign trade, are all addressed in this book (customs and export taxes). Fees and charges for governmental services, as well as licensing and one-time earnings, such as gains from privatization, are examples of nontax revenues (Granger, 2013).

The consequences on growth can be considered using typical macroeconomic models to the extent that tax encourages public spending. The multiplier effect causes an increase in government spending to have a positive influence on output at first. However, when income rises, the demand for money rises, putting higher pressure on interest rates (with a fixed money supply), potentially crowding out private investment (Chrystal and Price, 1994).

Moreover, with low-income countries continuing to push for more trade liberalization and economic integration, the trend of lower tariffs and lower trade tax collections is likely to continue. Despite the potential for increased efficiency and welfare from trade liberalization, the loss of revenue poses a challenge to development by restricting available resources for investment finance. Low-income countries have had a harder time replacing lost revenues than middle-income countries (Keen and Mansour, 2010). In most developing nations, Ebrill et al. (1999) looked into the impact of trade openness on fiscal balance. They also claimed that the loss of trade earnings could exacerbate fiscal challenges in developing nations, which are already plagued by significant budget deficits, tax limits, and increased non-development government spending. As a result, successful trade liberalization implies that it has no negative influence on developing countries' revenue creation.

2.1.5 Economic Integration

Economic integration refers to a multifaceted component of economic, political, and social integration through increased trade openness, investment, and capital mobility among nation-states with different economic policies designed to avoid barriers in the economy of sovereign states (Balassa, 1987). Plummer et al. (2009) mainly identify that economic integration is a customs union that seeks to unify tariff regimes and create a free trade area, i.e., common objectives to remove tariffs and achieve economic welfare across member states. This shows that the citizens of a given nation can participate in economic activities outside of their boundaries (Sindzingre, 2007).

Economic cooperation is a short-term economic agreement among two or more countries on a specific project, while economic integration exists permanently in a specific geographical location. Economic integration is a policy instrument to remove trade barriers among member states irrespective of whether member states are contiguous or even close to each other (Winter, 1996). It also aims at integrating economies in a common geographical region, and it also aims to remove discrimination between domestic and foreign products, services, and factor input (Salvatore, 1997).

Moreover, integration refers to the cooperation of economic activities among states with the aim of enhancing the development of those member states (Mutharika, 1972). Biswaro (2013) explained that economic integration is an institutional structure in which member countries share common economic benefits. In an economically integrated region, trade is opened, and there are free movement factors of production and products. Economic integration, according to Balassa (1991), comprises five stages: Stage 1, free trade area; Stage 2, customs union; Stage 3, common market; Stage 4, economic union; and finally, Stage 5, complete regional integration.

Most economic unions employ such a search for regional economic integration, while some aren't successful like SADC. This shows that the SADC's integration plan was either too ambitious or may have a problem with some form of institutional coordination. On the other hand, the EU is an example of successful regional economic integration in the world, and its model is in line with the theory. Until the late 1960s, it was common to evaluate customs unions while extending conclusions to free trade areas, preferential agreements, or common markets (Tovias, 1992).

The aim of economic integration is to create a good economic capacity for the member countries by (i) improving trade flows with specialization and production efficiency, (ii) increasing the markets, enhancing economies of scale, and competition (iii) creating a favorable economic environment for practicing economic activities (Gbaguidi et al., 2013).

Measuring economic integration and assessing the evolution of integration can be verified by an integration index; such as (i) Openness, which refers to whether an economy is more open, the more integrated, and vice versa; (ii) Balanced relationships, which refers to the direct relationships between various economies, being balanced in proportion to country size, leading to a higher stage of economic integration. (iii) indirect relationships: if third-country contacts develop, a deeper

level of economic integration may emerge. (iv) size: The larger an economy is, the more important; such economic integration will be from globalization.

2.1.6 Theories on Economic Integration

Initially, Viner (1950) and Meade (1955) made contributions to the literature on economic integration, and several theories have been used to explain economic integration.

Viner's Custom Union Theory

According to Lipsey (1987), economic integration and customs union theories are mainly focused on welfare gains and losses, which proceed to the formation of economic union. These gains and losses are the results of specialization, economies of scale, terms of trade change, efficiency in production due to the existence of competition, and economic growth. Customs Union refers to the removal of intra-trade barriers and the balance of tariffs on imports from nonmember states. trade creation and trade diversion are different, arguing that custom unions are post-World War II features of the international economy, the result of integration (Viner, 1950).

In reference to Viner's framework, trade creation is all about the possible improvement in a country's total import with bilateral or preferential trade arrangement, which results in the enhancement of economic welfare as expensive domestic products are substituted by the cheapest products that are produced abroad, it results in a trade creation. Trade diversion also occurs in the situation where there are high-cost imports from the member countries (ibid).

Therefore, Viner concludes that although the objective of economic unions is to improve political and socioeconomic development, this is not commonly the successful result because this would only happen when trade creation is promoted through the removal of barriers to free trade among the member countries. On the other hand, if trade flow is diverted from efficient nonmember countries to less efficient member countries in a bid to improve cooperation among member countries, it results in a decrease in well-being since countries are presumed to be in a way to maximize returns and increase welfare, trade-creating customs unions should be strengthened. However, while Viner focused on customs unions established by small trading countries, Meade (1955) justifies that when pre-structured tariffs for the members of the union are high, this proceeds to increase in trade diversion, and in other cases, the previous conditions for trade diversion in the regional organizations may adopt a significant decline because establishing a common tariff

against third parties will provide less coverage for the removal of imports from external sources with regional production. Moreover, the main focus on markets, goods, and input in customs union theory ignores the role of the political environment and the supranational institutions in the integration process (DeRosa and Gilbert, 2004).

Optimal Currency Area Theory

This theory was established by Mundell (1961) argument against a floating exchange rate system. Moreover, it provides a detailed concept of monetary integration with a cost and benefit evaluation of a common currency. The optimal currency area approach is an independent currency with independent monetary policy that is a potentially useful stabilization instrument, and other stabilization tools are inappropriate. OCA theory has the objective of assessing ways in which lower costs can be employed to achieve internal and external balances without compromising fiscal and monetary policy. The OCA is organized into four main phases with two main arguments by its argument to achieve both internal and external stability and achieve macroeconomic equilibrium through the implementation of fixed exchange rates to reduce the fluctuation in currency.

Despite the above arguments, neither fixed nor flexible exchange rate systems will fulfill OCA theory aims such as full employment and low inflation, leading to a single currency. Additional benefits include the stability of the macroeconomic environment, improvement in trade, and savings on regional exchange reserves. Moreover, for single currency implementation, the member states are required to fulfill three conditions: first, the region should not experience asymmetric shock; second, free movement of factors; and finally, the regions' fiscal and monetary policies must be coordinated (Mundell, 1961).

The Classical Theory

The main concern of classical economists is the division of labor, specialization, industrialization, and economic integration through uneven development (Mill, 1920; Haas, 1958; Napoleoni, 1975; Ricardo, 1817; Viner, 1937). The free trade school advocators mainly focus on the concept of perfect competition in which perfect factor markets are not a challenge in the allocation process among the countries; such markets are faced with the lowest opportunity cost with perfect

allocative capacity. As a result, such conditions maximize world productivity, which reflects the effective demand of consumers (Gray, 1998).

The classical theories argue that free trade reduces import and export challenges and is the most effective approach for enhancing economic growth. Economic growth comes from two ends: first, due to productivity gains through comparative advantage, and, second, due to gains in consumption via increased choices at lower prices (Beyene, 2014a; Ujupan, 2009; Napoleoni, 1975). This theory mainly developed during the phase of industrialization and with the concepts of division of labor, specialization, and integration of operations and trade (Mill, 1920; Ricardo, 1817; Smith, 1776; Coats, 1975).

2.1.7 Revenue, Trade, and Welfare effect of economic integration

Economic integration is generally seen as trade creation, welfare improvement, and revenue loss due to the removal of the tariffs. Hence, revenue loss is associated with import tariff income (or revenue). The belief exists that economic integration will improve trade and welfare. Economic integration increases import and exports through trade creation. However, the revenue shortfall would taper off as long as these countries have indirect taxes such as a value-added tax (VAT) (Lang, 2006).

The aggregate welfare, trade, and revenue effects of economic integration are considered the aggregate effects on various countries. Economic integration results in both trade creation and trade diversion. An improvement in trade results in trade creation. However, trade diversion occurred when an economic integration imported more from a less efficient supplier rather than from a more efficient supplier. Thus, national welfare loss occurs. The welfare improvement (or gains) occurred when trade creation was greater than (or exceeded) the trade diversion. Therefore, a country would only enter into economic integration (or free trade agreements) if it results in welfare improvement (or gain) (Suranovic, 1997).

In the 20th century, there was generally considered that the formation of preferential trading agreements was necessarily a trade liberalizing condition, and it resulted in welfare gain (Krueger 1997a, p. 175). Then, regional integration agreements move toward free trade. Viner's (1950) customs union (or economic integration) has an impact that is either trade creation or trade diversion. This theory suggests that developing countries also engage in trade with developed

countries to gain new knowledge in research and new technologies. Therefore, we discuss how the effect of economic integration is distributed or affects various economic indicators (see Figure 2.1).

To show the relationship in a simple way; Adopted from Ehigiamusoe and Lean (2019)

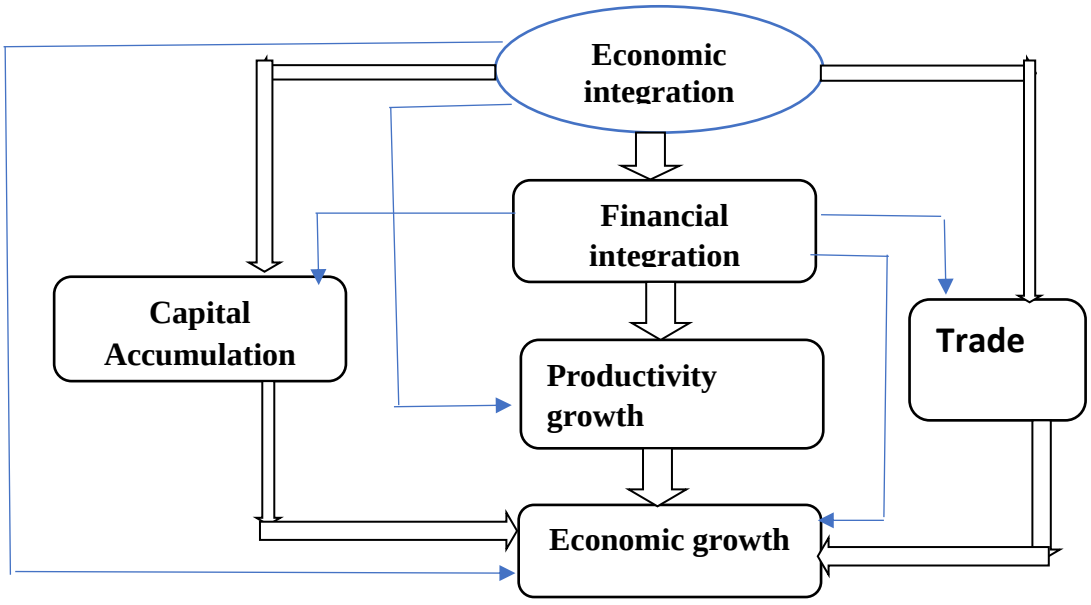


Figure 2.1: An economy-wide effect of economic integration

From the above figure (2.1), economic integration has an effect on various economic indicators such as welfare, growth, and productivity (through trade creation or diversion) (Wacziarg, 2001; Benhabib and Farmer, 1999).

2.1.8 Free Trade Area (FTA)

Free Trade Area is considered as the policy option; it refers to countries in a given geographical region that have signed a free trade agreement and established to remove trade barriers. FTA enhances trade and gains from trade. A free trade area exists when the neoliberal aims to remove trade barriers and capital mobility across the globe Nieman (2000). If countries are geographically closer, the more successful the establishment of a free trade area is (Baier and Bergstrand, 2004).

Many pieces of literature argue that Free Trade Area improves member countries' trade through the trade creation effect; in case a member country's local production declines, it is replaced by the low-cost production by a partner country (Baier and Bergstrand, 2007). Krueger (1997) argued that the Fee Trade Area enhances each member country's external trade barriers but avoids

constraints on trade among the member states, which creates different outcomes; for example, (i) there may be trade defection. (ii) export protection between countries. (iii) and because of the differences in protection rates, producers in partner nations charged varying prices.

As a result, the evaluation of FTAs and customs unions with a reference factor welfare is that with an FTA, it is not possible to achieve trade creation. On the other hand, similar to customs union trade creation conditions, it will also occur under a Free Trade Area. However, countries' tariff structures, for instance, a mean of tariff rates, have the consequence of higher effective protection under a customs union than under a Free Trade Area; under a customs union, trade diversion is higher than under a Fee Trade Area. Even though there is a greater welfare gain under customs unions, countries may not agree to join customs unions. While trade-diversion effects of customs unions can increase countries' interest that previously opposes partnership to join, then it increases the size of the customs union (Baldwin, 1993).

2.1.9 African Continental Free Trade Area (AfCFTA)

According to Vamvakidis (1998b), Africa has experienced weak intra-trade and economic growth despite some improvement toward regional economic integration. Africa is mainly explained by many small weak markets and countries whose trading activities have very little impact on the world market (Simwaka, 2011; Njinkeu and Fosso, 2006; Cattaneo, 2009; Longo and Serkkat, 2004).

Forty-four (44) African heads of state signed a framework to establish a single continental market for goods and services in March 2018 at Kigali, Rwanda. As of January 2021, all African countries except Eritrea signed the AfCFTA agreement, but only 35 countries have completed the ratification process. Moreover, by improving the efficiency of the market and reducing the cost of doing business, the AfCFTA could improve trade flows, factor mobility, and sectoral productivity in African member countries. It is a win-win approach for all African nations in terms of intra-African export growth and overall welfare or GDP (ECA, 2018). By abolishing import duties, the AfCFTA implementation has the potential to increase intra-African commerce by 52.3 percent and double this effect if non-tariff barriers are also eliminated (Karingi and Mevel, 2012).

The main aims of AfCFTA are as follows: (i), integrating the African economies (or Agenda 2063); (ii), encouraging a continental customs union; (iii), decreasing the problems in

memberships of RECs; (iv), intra-African trade liberalization; (v), improving competitiveness; (vi), encouraging consistent and inclusive socio-economic development; (vii), free movement of resources and finances; and finally, $(viii)$, encouraging industrialization. To achieve those aims, the AfCFTA harmonizes tariff and non-tariff policies and creates a common continental market.

2.2 Empirical Literature review

This part focuses on the economic integration literature, in which assessing the welfare, trade, revenue, and sectoral effect of economic integration is very important. In the past, several studies have attempted to assess the welfare, trade, revenue, and sectoral effect of economic integration agreements such as the formation of Free Trade Areas. Viner (1950) argued that when there is more trade creation than a diversion, it implies welfare gains, and the reverse is true. Such an argument will review other empirical findings that have examined the welfare, trade, revenue, and sectoral effects of economic integration.

2.2.1 Welfare, revenue, and economic integration

Abrego et al. (2019) examine the AfCFTA's welfare impacts in 45 African countries and employ a multi-country, multi-sector general equilibrium model. The study runs simulations with the complete abolition of import tariffs and a 35 percent decrease in tariff-equivalent non-tariff barriers (NTBs). In a perfectly competitive situation, the results suggest that eliminating tariffs increases welfare by 0.05 percent and reduces NTBs by 1.7 percent for all nations. Furthermore, for simulations incorporating both tariff elimination and NTB reduction, welfare improves by 2.1 percent for all nations. Guei et al. (2017) investigate how the European Union free trade agreement affects South Africa's revenue, welfare, and trade. The study employed the WITS-SMART model using 2012 data and found an improvement in overall trade, revenue, and consumer surplus. Similar results were seen in Iran and its northern neighbors, demonstrating that regional economic integration enhances welfare and growth (Naveh et al., 2012).

Dion’s (2004) regional integration and economic growth were approached from a theoretical perspective. Endogenous growth models and economic geography are combined. Regional economic integration has an influence on economic growth through interregional technology transfer, according to the study, as knowledge gaps from leading nations spread to laggards. Other research suggests that economic integration promotes growth. see Henrekson et al. (1997),

Coulibaly (2004), Carrère (2004), Amurgo-Pacheo and Pierola (2007), Jong-Wha, (2008), Nwosu et al., (2013), Ndong and Mboup (2015). A study of how extensive and regional economic integration influences long-term economic growth across countries. The model included both the individual indigeneity of the regional integration agreements and magnitude coupled with shares on broad trade, geography, and institutions. Therefore, regional integration can improve the long-run real per capita GDP (Yamarik and Ghosh, 2015).

Moreover, Mevel and Karingi (2012); Ngepah and Udeagha (2018); Türkcan, & Saygılı (2018) argued that by removing all trade barriers in African nation trade, the African continental free trade area (AfCFTA) is expected to boost intra-African trade. Regarding the economic integration performance in Sub-Saharan Africa, Kamau (2010) found the unfavorable conditions of countries relative to other developing countries, due to weak cooperation among countries and the absence of an effective mechanism for establishing regional productive capacities, and identified that country's incapability to participate in larger markets and the costs of trade are high among the member countries. It is possible to improve trade flows among a partner in the SSA regional economic community. For instance, a study on Ethiopia and COMESA member countries by Makonnen and Lulie (2014) showed that Ethiopia's accession to the COMESA free agreement has a trade creation effect between Ethiopia and its partners, mainly the opening of new trade routes, which improves economic growth and welfare.

Recent research reveals that, contrary to the results above, economic integration has a negative or no impact on economic welfare and growth. Among them, Ogbuabor, Anthony-Orji, Ogbonna, and Orji (2019) investigate regional integration and growth: Using a system GMM with a cross-country growth model and panel data from 2000 to 2015, recent empirical evidence from WAEMU showed no empirical evidence for a positive growth effect of WAEMU integration in West Africa. Tumwebaze and Ijjo (2015), in an article published in the African Development Review, looked into the relationship between regional economic integration and economic development in the COMESA region. The study employed the annual panel dataset from 1980 to 2010 and instrumental variables (GMM) and a cross-country growth model. The result demonstrates that there is no considerable empirical support for regional economic integration having a beneficial growth effect on the area.

Models of regional integration and Africa's growth in the twenty-first century have also been studied by Golit and Adamu (2014). The study conducted a fitness evaluation using a Johansen and Juselius approach of co-integration and vector error correction (VECM) and found that intra-African trade has been ineffective in encouraging economic growth. Poor policies, such as trade liberalization, drive African countries to focus on intra-African commerce with exports of the same or identical products or factors of production and therefore reflect the trade diverting effect. Then, the study proved that regional economic integration characterized by trade plays a weak role in improving economic welfare; African nations should reconsider their economic integration ambitions by putting in place vital infrastructure, enhancing human capacity, and growing physical capital stock. Similarly, Vamvakidis (1999) argued that economic integration had a detrimental influence on growth and welfare, which might be because economic integration occurs largely among small, poor, and comparable economies.

Authors such as Chang et al. (2005), Winters (2004), Bolaky and Freund (2004), and Baldwin (2003) all performed comparable investigations to improve economic welfare and achieve development, agreeing with the policy suggestions of Golit and Adamu, such as the development of human resources, proper infrastructure, and the establishment of institutions. Some other researchers also add their contribution to the general consideration of the effect of economic integration on economic welfare and growth in Africa, such as Tuluy (2016), Kayizzi-Mugerwa et al. (2014), Hailu (2014), Aryeetey (2001), Shams (2005), and Page and Bilal (2001). On the other hand, those studies are based exclusively on descriptive evaluations of Africa's trade statistics.

Generally, many studies on African economic integration argue that regional economic integration is not sufficient to improve African trade, while there is strong evidence of the trade creation effect of economic integration in Africa (Mevel and Karingi 2012; Mureverwi 2016; and Ngepah and Udeagha 2018). There are welfare advantages from trade liberalization in Africa, but the degree of welfare in each nation is not equal; thus, some countries suffer welfare losses (Sawkut and Boopen 2010).

2.2.2 Trade, sector, and economic integration

Deme and Ndrianasy (2017) explored the impact of regional trade agreements on trade creation and trade diversion in low-income countries. They used the panel gravity model, and the results

revealed that the Economic Community of West African States (ECOWAS) has a significant trade creation and a beneficial influence on its member nations' economic welfare. Similarly, Nguyen, (2015) argues that trade liberalization has a significant impact on poverty reduction, creates equality, and improves the per capita GDP and trade of countries in low and middle income. Additionally, Molinari, (2003) examined sectoral border effects through an analysis of implicit EU trade integration. The study employed a gravity trade model and assessed the level and trend of sectorial integration effects among the member countries of an economic bloc since the 1970s. trade integration or preferential trade arrangements (PTAs), for instance, EU, EFTA, and NAFTA are positively correlated with the levels of trade that create trade and then achieve welfare gains.

Krugman (1990), rethinking international trade, employed a model where nations and exogenous trading blocks are symmetrical and argued that few trading blocs engaged in limited trading among each other, trade is improved by the strength and expansion of intra-bloc trade. Collie, (1997) found that bilateralism is good: trade blocs and strategic export subsidies. The study used a multi-country framework and found that bilateralism and economic integration are good for countries as a way to improve trade. Freund, (2000) assessed different paths to free trade: the gains from regionalism, with a two-period three-country model, and found that regional trade has a robust and permanent impact on trade and economic welfare within member countries. Jayasinghe and Sarker (2007) used an enhanced gravity model with disaggregated data to study the effects of regional trade agreements on trade in agri-food products. The finding shows a significant trade gain among NAFTA members in grains, red meat, vegetables, and sugar. The finding also confirms that economic integration processes such as the creation of free trade areas will likely create more trade than divert it, creating economic welfare gains among member countries.

Similarly, Karim and Ismail (2007), a comparative study of Sudan, Egypt, and Kenya, looked at the possibilities for agricultural trade in the COMESA area. Comparative advantage was disclosed by a variety of trade indicators, including the production similarity index, the instability index, and comparative production performance. The study argued that COMESA member states, especially Sudan, should establish policies that encourage integrating their markets regionally because it can make use of the region's potential for commerce and comparative advantage. Sunde, Chidoko, and Zivanomoyo (2009) explored the factors that influence intra-industry trade between Zimbabwe and its trading partners in the Southern African development community region (1990-2006) using

the gravity model in an ordinary least squares (OLS) framework. The study indicated that distance, trade intensity, income per capita, exchange rate, and GDP significantly explain intra-industrial trade between Zimbabwe and SADC members. The welfare gains or losses from the integration process mainly depend on the above factors. However, Sunde et al. (2009) found contrasting evidence to the study of Karim and Ismail (2007) and argued that most countries traded similar goods due to the colonial era subject them to the setting up of similar economic structures.

Moreover, Carrere (2004) investigated African regional agreements: the impact of trade with or without currency unions employed a panel 'augmented' gravity model, and the author argued that agreements UEMOA and CEMAC, which incorporate trade and currency instruments, are more successful in increasing intra-regional trade. This indicates that even though Free Trade Agreements are effective in improving intra-trade, more gains can be derived when trade agreements are deepened, such as those involving currencies. Musila (2005) also investigated the intensity of trade creation and diversion in COMESA, ECCAS, and ECOWAS: A comparative analysis with the gravity model approach and the results indicated that the trade creation intensity was greater in the ECOWAS followed by COMESA. Therefore, it improves trade and economic welfare. Similarly, based on cross-country findings, Levine and David (1992), Baldwin and Seghezza (1998), and Wacziarg (2001) suggested that the investment rate is an important channel linking trade and growth and that trade liberalization fosters growth partly due to its effect on physical capital accumulation. Lewis, Robinson, and Thierfelder (2003) used a multi-country computable general equilibrium (CGE) model to analyze free trade agreements and the SADC economies, finding that free trade agreements boosted imports from member countries and decreased imports from non-FTA states, which resulted in an improvement in trade and welfare.

In contrast, Vamvakidis, (1999) looked at whether regional trade agreements or wide liberalization lead to higher growth. A fixed-effects growth model was used. According to the study, regional economic integration has a negative impact on trade and economic growth. This is because regional economic integration is typically between small, poor, and comparable economies. Levy (1997) conducted a political-economic analysis of free trade agreements. The study, which used a Hecksher-Ohlin model, found that bilateral FTAs had harmed political involvement and stifled further international trade liberalization. This limits the ability of governments to fully engage in further trade arrangements and other economic programs. Longo and Serkkat (2004) investigated

the economic obstacles to expanding intra-African trade. The study employed a gravity model and identified that mismanagement of economic policies, internal political unrest and infrastructures are the major challenges to African trade. Similarly, Limao and Venables (2001) argued that week infrastructure contributed 40% of predicted transportation expenditures for coastal economies and approximately 60% for landlocked ones and concluded that volumes of trade were substantially small and the costs of intra-trade are higher in Sub-Saharan Africa compared to non-SSA countries. Additionally, the author argued that lack of competitiveness is the main challenge to regional trade and that economic integration could play a significant role in improving efficiency and economic welfare. Moreover, Rojid (2006) analyzed the COMESA trade protocol: using a gravity approach with a Tobit estimation technique, the study found that COMESA was a trade formation and that the region liberalized trade among the member countries and then diverted from outside the region. However, the results suggested that there was a limited trade capacity because most COMESA member countries were in overtrading.

In conclusion, although several studies have looked at the impact of economic integration on welfare, trade, revenue, and sectoral effects, the empirical literature reveals that there is still much to learn. None of the recent studies have specifically focused on the welfare, trade, revenue, and sectoral effects of AfCFTA integration in Ethiopia. Furthermore, the literature evaluation and gap analysis section are discussed in detail below.

2.3 Evaluation of the literature and gap analysis

Many works have examined the effectiveness of regional trade agreements, i.e., customs unions, on African economic growth using a panel econometrics model, and few studies have employed a simulation method. Most studies' empirical findings suggested that regional trade agreements have a favorable impact on African countries. While some studies have found that African economic integration has a detrimental (or negative) impact on welfare, trade, revenue, and sectors, this indicated that regional economic integration is among small (or poor) with very similar economies, and due to wrong policies, trade liberalization, for example, causes African countries to focus on trade among themselves, exporting the same or similar items, resulting in a trade diversion impact. The study went on to say that regional economic integration based on trade plays a smaller role in improving welfare and that African countries should rethink their regional economic integration goals by establishing important infrastructure, increasing human capacity, and increasing physical

capital stock. However, the negative effect of economic integration in Africa may not show the reality of economic integration ineffectiveness but rather the shortcomings in the model specification. The problem is that economic integration, trade, and welfare have an economy-wide effect that is difficult to explain by linear, static, and partial frameworks and requires a model that assesses all economic activities and sectors.

Previous studies on economic integration have tried to address how regional economic integration is linked with trade and economic growth in different customs unions, and studies have assessed the various factors that affect economic growth and trade in different parts of Africa. Many studies have focused on particular regional customs unions and sector-specific analysis. To the best of our knowledge, no research has sought to analyze the likely welfare, trade, revenue, and sectoral effects of Ethiopia's joining the African Continental Free Trade Area (AfCFTA). There has been less research on the free trade area in Africa, but to the researcher's knowledge, most of them are conducted on the trade effect of regional economic integration on particular custom unions, and very few case studies have been conducted to investigate the welfare, trade, and revenue effects of economic integration, specifically in the African continental free trade area. Moreover, many studies focus on ex-post analysis. Therefore, this study fills this gap by performing an economy-wide, ex-ante, and multivariate analysis on the potential welfare, trade, revenue, and sectoral effects of the African continental free trade area implementation in Ethiopia through a recursive dynamic computable general equilibrium (CGE) simulation technique.

2.4 Conceptual Framework

The conceptual framework explains the significant variables, which are both the outcome and explanatory variables, and the conceptual map is given in figure (2.2). There has been a set of prescribed movements, and the development of different welfare, trade and economic integration theories over the years has emerged. The theoretical framework would be used to distinctly explain the relationship between welfare, trade, revenue, and economic integration in the African continental free trade area. Economic integration is a form of agreement in that different countries establish or form free trade areas with the aim of removing trade barriers (Venables, 2000). Furthermore, trade diversion can be prevented even if the low-cost manufacturer is not a member of the union; if the common external tariff is low enough for non-member countries to still offer a

selling price below that of member countries, then it creates a production effect leading to more efficient use of economic resources (Hodgson et al, 2003).

Economic integration is one instrument that countries use to achieve their trade creation and welfare. It broadens domestic markets to include regional, continental, and worldwide markets. Like globalization, economic integration can be considered as international embeddedness and as one of the ways that integrate with the rest of the world (Balassa and Stoutjesdijk, 1975). It may either have trade creation or diversion effects, which have a positive or negative economy-wide impact (Viner, 1950).

When economic integration shifts demand away from inefficient, uncompetitive local producers and toward efficient producers in a partner nation, an FTA or customs union results in more effective resource allocation and higher trade between member nations, resulting in trade creation. Trade diversion, on the other hand, happens when trade from a non-member nation is redirected to a member country due to preferential treatment of the member's goods, although the nonmember country's producers are more efficient and can offer more competitive prices with nondiscriminatory tariffs (Viner 1950; Balassa 1963).

The relationship between welfare, trade, revenue, and economic integration mostly cited in the theoretical and/or empirical literature is included in the figure below, keeping in mind that the main objective of this study is to examine the potential economy-wide effects of economic integration in the AfCFTA evidence from Ethiopia.

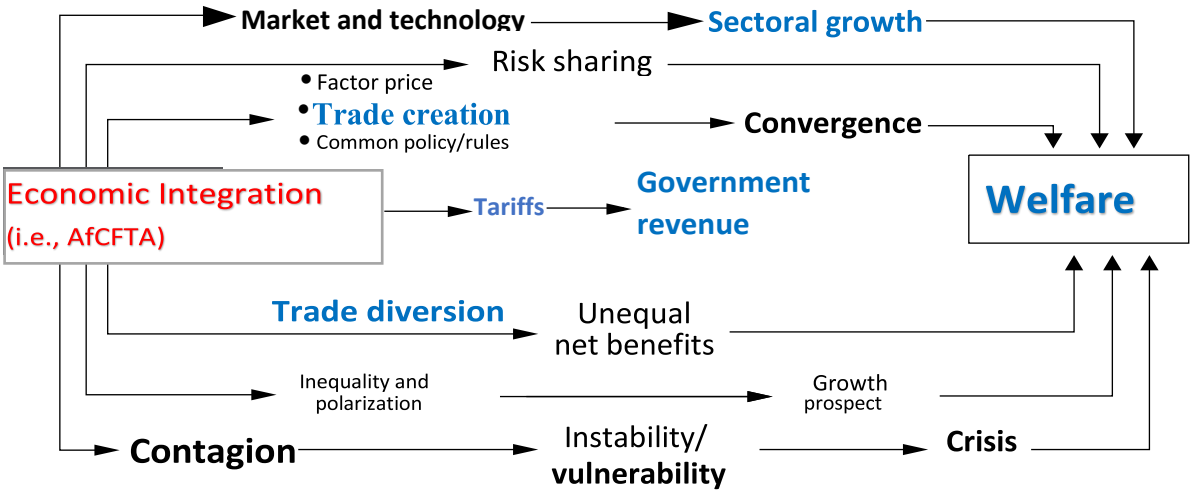


Figure 2.2: Own formulation based on theoretical and empirical literature: The potential economy-wide effects of economic integration: A conceptual framework

CHAPTER THREE

METHODOLOGY

This research intends to examine the potential economy-wide effects of economic integration, i.e., the implementation of the African continental free trade area in the Ethiopian economy, by applying a recursive dynamic CGE model. This model considered various economic agents in the economy (household, producers, government, and the foreign sector), and the model is based on the optimization decisions of those economic agents. Demand for products is derived from the household's preferences, the supply side is derived from the producer's decisions, and a country's economy is linked to the rest of the globe through trade. Within the restrictions of their budgets, every agent in an economy attempted to maximize their goals (Bhattarai 2016).

3.1 Theoretical Framework

There has been a set of prescribed movements and development of different economic integration or free trade areas theories over the years as several models and theories of integration have emerged. The theoretical framework is employed to demonstrate the link between economic integration, trade, revenue, and welfare. To examine the impact of trade agreements, Hamanaka (2013) employed both the CGE and the gravity model.

The CGE model mainly emphasized assessing the potential economy-wide effects of free trade agreements among countries. Rumpf et al. (2010) identify the importance of the CGE model in examining the free trade implications. The model is highly consistent with microeconomic theories, highly convenient for ex-ante analysis, and provides a clear quantitative outcome that helps policymakers identify the benefits and losses from free trade areas.

Moreover, the CGE model is appropriate to examine the potential economy-wide welfare effect through compensating variations, equivalent variation, returns for factors of production (such as wages, rents, profits, and interest), trade volumes, imports, exports, changes in trade balances, impact on dynamic variables such as capital flows, and others.

However, according to Rumpf et al. (2010), a gravity model was proposed for an ex-post examination of trade agreements. Hamanaka (2013) is the pioneer of the gravity model, in which he compared the bilateral trade among two countries. It affects import demand and makes use of

various variables to explain it, such as the income of importing and exporting countries, per capita income of the importing exporting country, and country distances (Plumer et al., 2010).

Therefore, to measure the potential economy-wide effects of economic integration in the AfCFTA, this study found that CGE theory is the appropriate theoretical framework. The consistency of the CGE model with the microeconomic theories and its convenience in explaining economic integration through trade to the theories that could be included in the model for examining the welfare, trade, and sectoral effects of economic integration through different policy scenarios (i.e., "what if?").

3.2 Research design

This study conducted a descriptive and ex-ante research design and used trade data from the Ethiopian revenues and customs authority (ERCA) dataset of the 2015/16 import and export account, the national bank of Ethiopia (NBE) dataset of 2015/16 for factor payments, and other data and incorporated it into recent Ethiopia's social accounting matrices (SAM) of 2015/16.

3.3 Data Used

SAM data: This study used or was mainly based on a 2015/16 multi-sectoral Social Accounting Matrix (SAM) dataset of Ethiopia.

Trade data: This study used import-export data that capture Ethiopia's trade with African nations and other non-African rest of the world. In this study, have to rest of the world accounts, i.e., the rest of Africa, and the rest of the non-Africa world, both of which are trading partners with Ethiopia. Thus, disaggregating the trade records (both import and export) with Ethiopia's trade with Africa and the non-Africa world is one feature of this study.

Elasticities: It measures the degree of responsiveness to change in one variable (dependent) due to the change in other variables (independent). In this study, elasticity significantly affects Ethiopia's intra-Africa trade. As a result, elasticity data were employed in the simulation in this study.

Tariff data: Tariffs are taxes levied on goods and services imported from other countries. In this study tariff is a policy variable, and the scenario is based on the tariff reduction policy implementation in the AfCFTA implementation. Therefore, tariffs are policy variable.

Other data: data such as sector growth, factor productivity, and share

3.4 Source of Data

SAM data: The Ethiopian Development Research Institute (EDRI) (now Ethiopian Policy Studies Institute) data on social accounting matrices (SAM) are mainly used, which were retrieved in 2022.

Trade data: The trade data were collected from Ethiopian revenue and customs authorities (ERCAs). Specifically, the disaggregated share of Ethiopia's intra-Africa trade data were from ERCA.

Elasticities: This study used elasticities from previous studies, such as Armington and GTAP

Tariffs data: Tariffs data were also collected from Ethiopian Revenue and Customs Authority.

Additional data: Various other data sources are consulted in both the descriptive and simulation analyses, including NBE, WB, WTO, WDI, IMF, MoFEC, ITC, and WITS.

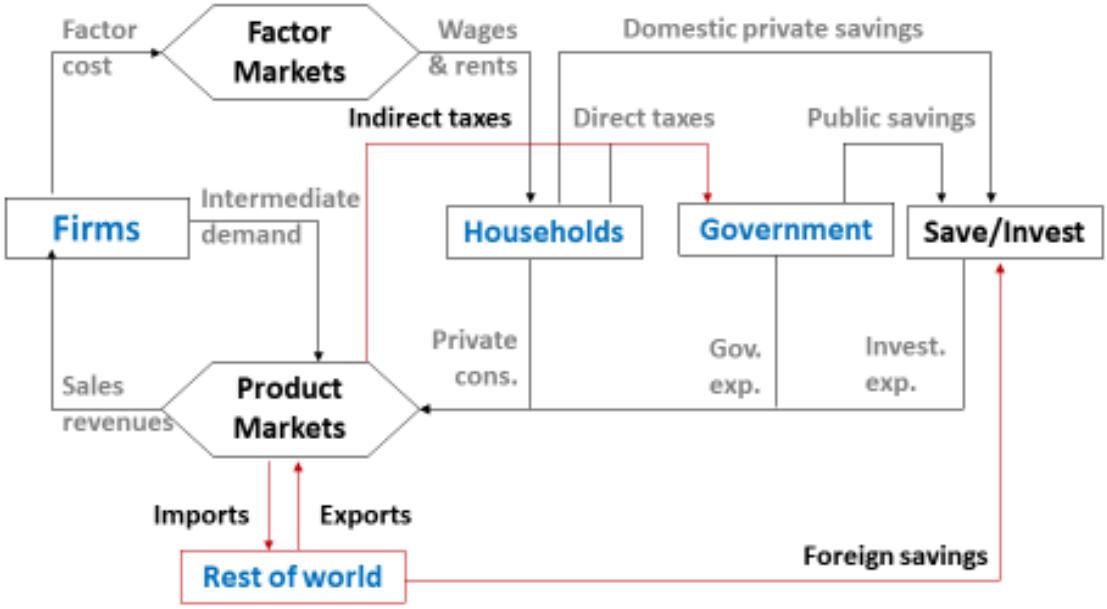
3.5 The Structure of the Social Accounting Matrix (SAM)

SAM is an economy-wide dataset that records the whole economic transaction (incomes and expenditures) of a given country or regional economy for a given fiscal year (Lofgren et al., 2002). The SAM is a square matrix, in which the columns indicate expenditures or payment accounts and the rows indicate receipts or income/revenue accounts. The main aim of SAM is to help researchers perform an economy-wide analysis that examines the effects of changes in economic policy and shocks or crises driving from the global economy; the disaggregated sectoral structure or various economic activities conducted by households, producers, government, and foreign sectors or rest of the world are part of SAM (EDRI, 2009).

The social accounting matrices (SAM) are a more advanced version of the input-output (IO) table. Hence, it incorporates other accounts that are not in the IO table; for instance, the government account (i.e., institution), savings-investment, and rest of the world accounts (i.e., in an open economy). In sum, many social accounting matrices have four main accounts, i.e., activities, commodities, factors, and institutions; moreover, government deficit, trade deficit, and savings-investment balance are part of social accounting matrices (SAM) and macroeconomic balances.

In the open economy model, the social accounting matrices (SAM) dataset includes all four economic actors: households (i.e., consumers), producers (or firms), governments (referring to institutions), and the rest of the world (or foreign sector). Foreign trade, i.e., imports and exports, is allowed in such an economy, and the economic interaction (or transaction) of an open economy across various countries' borders.

Figure 3.1: The circular flow of an open economy



Source: Krauss and Johnson (2017)

Since almost all countries around the world have government involvement in the economy and have foreign trade with other countries, this model is a more realistic one. Ethiopia's participation in the African continental free trade area likely has an economy-wide effect, which affects all economic sectors and agents. Therefore, the CGE model well captures the welfare, trade, revenue, and sectoral effects of economic integration in the AfCFTA on the Ethiopian economy.

3.6 Method of analysis and calibration

To analyze the collected data, this paper used both descriptive and empirical analyses that applied ex-ante analysis with some simulation techniques. The simulation analysis employed a recursive dynamic computable general equilibrium (CGE) model.

3.7 Model specifications

There are various policy measures in those designs in an economy, and the implementation of such policy has an economy-wide effect. Some policies change very slowly over time, and they also use a simple analysis method such as average calculation, ratio, charts, tables, and simple graphs. In this model, the rational economic actors' preferences were characterized by the constant elasticity of substitution (CES) function. Thus, the CGE model employed in this paper specified as follows by including the most important economic agents and accounts: so, the following model equations are discussed below.

Demand Side of the Economy

Households

Households receive a reward of rent, wages, and interest, which is paid out by producers and consumed from the goods market; they are manufactured by businesses and provide happiness to households. Each sub-composite good is a domestic and imported product (see Hertel and Winters, 2005). The utility function is

$$U_{hh} = \sum_i (a_{i,hh} C_{i,hh}^{phh} + B_{hh} L_{hh}^{1-phh})^{\frac{1}{phh}} \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots (1)$$

From equation (1) U_{hh} refers households utility function, $C_{i,hh}$ refers consumption of household's commodity i, L_{hh} is leisure time of households, $\alpha_{i,hh}$ and $\beta_{i,hh}$ refers household income share spent on consumption of good i and share spent on leisure, respectively; and ρ is elasticity parameter; elasticity of substitution between consumption and leisure given by $\rho_{hh} = \frac{1}{1-\rho_h}$

The term "disposable income" refers to a household's income after tax deductions, as determined by:

$$Y_d = \sum_j \sum_i r_j (1 - t_{j,i}) \theta_{j,i} K_j + (1 - t_l) \omega L + TR \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots (2)$$

From equation (2), disposable income is represented by Y_d, the share of assets j in sector i $explained\ by\ \theta_{j,i}$, K_j is household capital endowment type j, the capital j rental rate is r_j, the labor endowment is L, the wage rate is w, the capital j tax rate in sector i is $t_{j,i}$, the labor income tax is t_l, and the transfer income is TR. In the other way, disposable income is:

$$P(1 + t_v)C + \omega(1 - t_l)L = Y_d \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots (3)$$

where C refers to the commodity, P is the price, and t_v is the consumption tax, which includes all taxes and subsidies.

By maximizing Equation (1) with regard to Equations (2) and (3), we obtain the demand function for consumption and leisure.

Consumption of goods is given by:

$$\mathrm{C} = \left(\frac{\alpha Y_d}{(\mathrm{P}(1+\mathrm{t_v}))^{1-\alpha}(\alpha(\mathrm{P}(1+\mathrm{t_v}))^{1-\alpha}+\beta(\omega(1-\mathrm{t_l}))^{1-\alpha}}\right) \ldots\ldots\ldots\ldots (4)$$

The consumption of leisure is given by:

$$L = \left(\frac{\beta Y_d}{(\omega(1-t_l))^{1-\alpha}(\alpha(P(1+t_v))^{1-\alpha}+\beta(\omega(1-t_l))^{1-\alpha}}\right) \ldots\ldots\ldots (5)$$

L_s refers to Labor supply, which is the difference between endowment of labor and demand for leisure L by households. Mathematically,

$$L_s = \bar{L} - L \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots (6)$$

When the total supply of labor meets the total demand for employment, the labor market reaches equilibrium. The final consumption function is given by:

$$C = \varphi\left(\left(\sum_i \left(\delta_i^c CC_i^{\frac{\sigma-1}{\sigma}}\right)\right)\right)^{\frac{\sigma-1}{\sigma}} \ldots\ldots\ldots\ldots\ldots\ldots\ldots\ldots (7)$$

where CC_i refers to consumption of the ith good (it includes both domestic and imported), φ stands for constant elasticity of substitution (CES), and the consumption share given by δ_i^c. The value of such consumption mathematically is

$$P.C = \sum_i P_i.CC_i \ldots\ldots\ldots\ldots\ldots\ldots\ldots (8) \text{ For } i = 1,2,3 \ldots \ldots N$$

Supply Side of the Economy

The CGE model considers production by a set of products (goods) to produce inputs that are needed. In the production sector, rational representative economic agents exercised their motives of profit maximization. We refer to the prices and factors of production as market signals for their decision on the level and amount of production. They purchase input from households and semi-finished goods from other firms and produce final products that are available in the market for sale. As a result, the supply side of the economy may be expressed mathematically as:

$$GVA_i = \Omega_i\{(1-\delta_i)(K_i)^{\gamma_i}) + \delta_i((L_i)^{\gamma_i})\}^{\frac{1}{\gamma_i}} \ldots\ldots\ldots (9)$$

where GVA_i is gross value added, Ω_i is a changing parameter, K_i and L_i are capital and labor used in sector i, δ_i is the CES of labor, and γi is the CES in both factors. The sector Y_i total output includes value-added, GVA_i, and other inputs (i.e., mainly intermediate) Bhattarai (2008).

$$PY_iY_i = PV_i.VA_i + \sum_j PA_i.\left(1 + t_{i,j}^d\right)DI_{i,j} + \sum_j PM_i.\left(1 + t_{i,j}^m\right)MI_{i,j} \ldots\ldots (10)$$

The demand for domestic and imported intermediate inputs is expressed in the preceding equation (i.e., equation 10) $DI_{i,j}$, and $MI_{i,j}$, respectively; PV_i is the price for value-added goods, and taxes on intermediate goods (domestic and imported) are explained by $t_{i,j}^d$ and $t_{i,j}^m$. Then, the profit function is given by:

$$\pi_i = PY_iY_i - \omega L_i - \sum_{i,j} r_j K_{i,j} - \sum_j PM_i.\left(1 + t_{i,j}^m\right)MI_{i,j} - \sum_j PA_i.\left(1 + t_{i,j}^d\right)DI_{i,j} \ldots (11)$$

In equation (11), π_i is profit from sector i; all other coefficients are explained above. When components are in equilibrium, their marginal products match their prices.

Trade and Aggregate Supply

The CGE model considered the trade among different countries, in which there are own sets of consumers, producers, and governments. As a result, imports and exports must be considered. Foreign and local products are not ideal equivalents, according to the CGE model; therefore, goods in international trade are heterogeneous in reference to the product's country of origin (the Armington assumption) Armington (1969). Mathematically, it is given by

$$A_i = \Phi\left((1-\delta_i^m)D_i^{\frac{\delta_m-1}{\delta_m}} + \delta_i^m M_i^{\frac{\delta_m-1}{\delta_m}}\right)^{\frac{\delta_m}{\delta_m-1}} \ldots\ldots\ldots (12)$$

From equation (12), A_i is the CES domestic supplies D_i and import supplies M_i, the supply elasticity of substitution is given by δ_i^m, and Φ is the shift parameter for aggregate supply. To recapitulate, the equilibrium of the products market is provided by:

$$A_i = CC_i + G_i + I_i \ldots\ldots\ldots\ldots (13)$$

G_i and I_i represent government consumption and investment, respectively, as shown in equation (13). We explained the value form as follows:

$$PA_iA_i = PD_iD_i + PM_iM_i \ldots\ldots\ldots\ldots (14)$$

In equation (14), D_i is domestic supplies and M_i is import supplies; these supplies are labeled PD_i and PM_i, respectively, in terms of price.

Public Sector

Governments provide public goods, social insurance, and transfer income to households collecting taxes and tariffs, disbursing subsidies, and purchasing goods and services. Hence, the government is a governing institution that seeks to achieve the welfare of the nation or people and uses policy instruments to manage exogenous shocks or any new policy issues such as continental integration agreements that lead to adjustments to the rest of the economy. The public sector explained by:

$$G + TR = \sum_j \sum_i t_{j,i}^{k} r_j K_{j,i} + \sum_i t_i^{vc} P_i CC_i + \sum_i t_i^{vg} P_i G_i + \sum_i t_i^{vk} P_i I_i + \sum_i t_l \omega LS + \sum_i t_i^{m} M_i + \sum_j \sum_i PA_j t_{i,j}^{m} MI_{j,i} + \sum_j \sum_i PA_j t_{i,j}^{d} DI_{j,i} \quad \text{...} \quad (15)$$

In equation (15), government expenditure is explained by G, and $t_{j,i}^{k}$ is the tax rate on capital income from asset j used in sector i. ad valorem tax rate on final consumption is represented by t_l^{vc}, where t_l^{vg} is the indirect tax rate on government consumption, t_i^{vk} is the rate of tax on investment, and t_i^{m} is the tariff (tax on imports). The following formula is used to determine the monetary worth of government consumption:

$$\mathrm{G} = \sum_{\mathrm{i}} \mathrm{PA_i GD_i} + \sum_{\mathrm{i}} \mathrm{PA_i GM_i} \ldots\ldots\ldots\ldots\ldots (16)$$

where government consumption of domestic and imported goods is denoted by $\mathrm{GD_i}$ and $\mathrm{GM_i}$, respectively.

Markets and the Relative Prices

Consumers have preferred a utility-maximizing basket of products given their budget or incomes, whereas producers have a decision on production levels and amounts that maximize their profits. With a CGE simulation, the policymaker tries to rank a policy option in consumer welfare.

$$Y_i = \Theta\left(\left(\left(\left(1-\delta_i^{e}\right)\right) D_i^{\frac{\delta_{y-1}}{\delta_y}} + \delta_i^{e} E_i^{\frac{\delta_{y-1}}{\delta_y}}\right)^{\frac{\delta_y}{\delta_{y-1}}}\right) \ldots\ldots (17)$$

In equation (17), E_i stands for exports, D_i is domestic supplies, elasticity of substitution given by δ_i; and δ_i^{e} and Θ stands for a share of exports and production shift parameter, respectively. The total worth of a country's gross domestic product (GDP), which includes both domestic and foreign sales.

$$PY_i Y_i = PD_i Y_i + PE_i E_i \ldots\ldots\ldots\ldots\ldots\ldots \text{(18)}$$

The export earnings equal the cost of imported goods in equilibrium.

$$\sum_i PE_i E_i = \sum_i PM_i M_i \ldots\ldots\ldots\ldots \text{(19)}$$

From the above equations (i.e., 18 and 19), PE_i and PM_i represent the world prices of exported and imported commodities, respectively.

Competitive Equilibrium

For a competitive market equilibrium to exist, two conditions must be met: (i) both factor and product markets are at equilibrium (or demand equals supply); (ii) The budget constraints of economic agents such as households, producers, and government are satisfied.

Model Closures and Savings and Investment

The investment demand I function is mathematically given as

$$I = \sum_i PA_i ID_i + \sum_i PA_i IM_i \ldots\ldots \text{(20)}$$

ID_i and IM_i refer to domestic and imported investment demand for items i, respectively, in the preceding equation (20). The capital market is regarded closed when the savings-investment identity closes in the model, where i denotes the gross of indirect taxes. This suggests that the distribution of assets or resources across sectors equals domestic asset endowments, as described by:

$$\overline{K_J} = \sum_i K_{i,j} \ldots\ldots\ldots\ldots \text{(21)}$$

$\overline{K_J}$ is the endowment of the jth asset, and $K_{i,j}$ is the allocation asset in sector i in equation (21). The redistribution will continue until all industries have the same capital rental rate. For the Ethiopian economy, where capital mobility is reliant on local and international rates of return, the premise of a closed capital market is unrealistic. It is discussed in further detail by:

$$\overline{K_J} + FK_j = \sum_i K_{i,j} \ldots\ldots\ldots \text{(22)}$$

The net inflow or outflow of asset type j (i.e., FK_j) is determined using equation (22). It primarily focused on the gap between the rental rate in Ethiopia and the rest of the world.

$$r_j^{et} \geq r_j^{\omega} \Longrightarrow FK_j \geq 0; \quad r_j^{et} \leq r_j^{\omega} \Longrightarrow FK_j \leq 0 \ldots\ldots\ldots\ldots \text{(23)}$$

Model Equilibrium Condition and Closures

The market clearing or equilibrium condition for the product market is discussed in further detail by:

$$Y_i = F_i^d + \sum_{j=1}^{N} \alpha_{i,j}^d Y_j \ldots\ldots\ldots\ldots\ldots (24)$$

The disaggregation of final demand in an economy, which composed consumption by household, investment, and government expenditure) then, symbolically; $F_i^d = C_i^d + I_i^d + G_i^d + E_i^d$ and $\sum_{j=1}^{N} \alpha_{i,j}^d Y_j$ refers to aggregate demand for intermediate goods, and $\alpha_{i,j}^d$ is sector i input for sector j production.

3.8 Evaluation of Welfare Change

According to Martin (1997), there are many indicators of welfare that have been applied in the context of the CGE simulation of economic integration. The most popular measure of wellbeing is equivalent variation, which is one of numerous indicators. It is a monetary measure of wellbeing that may be used to examine interpersonal welfare comparisons in a model. It serves as a point of comparison for various policy initiatives. When estimating Equivalent and Compensation Variation, a money measure utility between old and new prices corresponding to benchmark and counterfactual scenarios are commonly used.

In a multi-country trade liberalization, the evaluated results show that countries would observe their level of welfare increased compared with the baseline, in another country, although, the level of life is falling. The global or continental welfare impact of trade liberalization may then be examined by adding various metrics of comparable variation. The values of equivalent variation and compensatory variation between benchmark and counterfactual situations can be determined as follows; according to Shoven and Whalley (1992), they are expressed mathematically as follows.

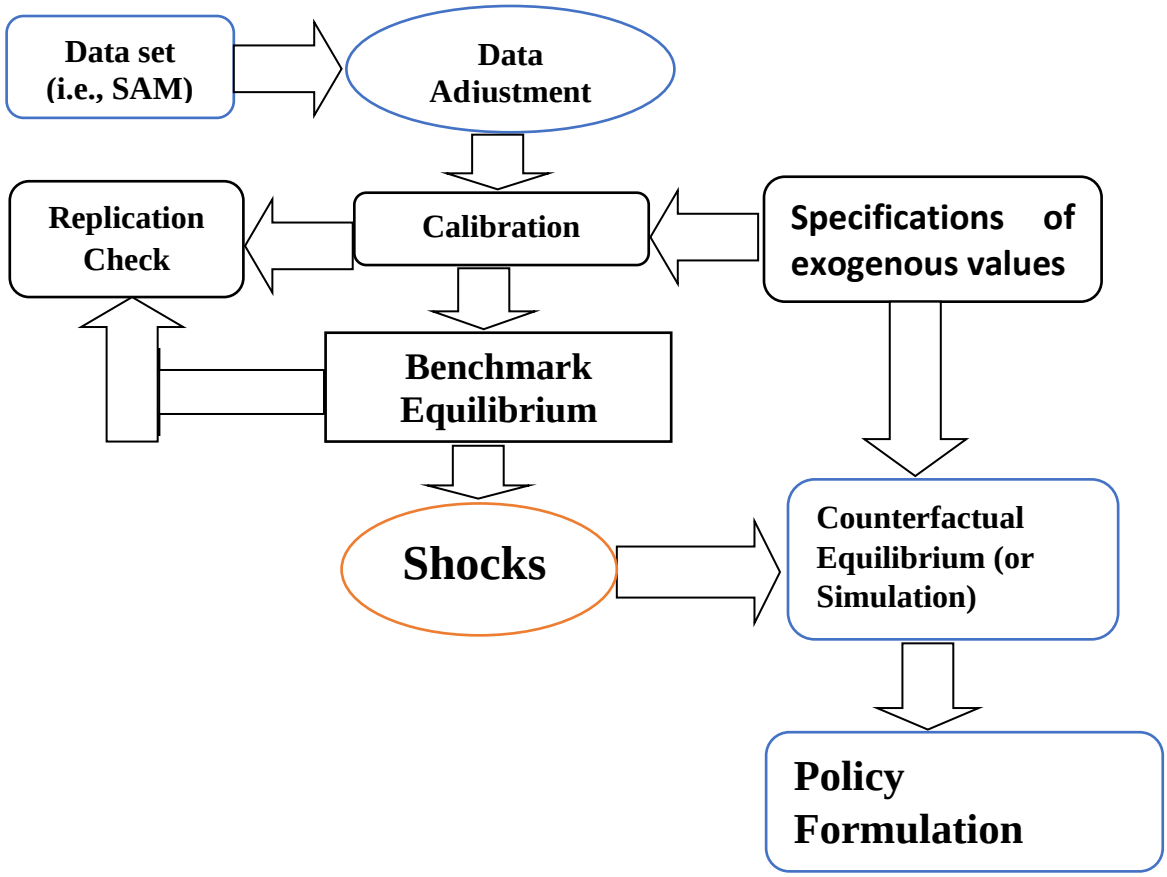
$$EV^{hh} = \left(\frac{U_{new}^{hh} - U_{old}^{hh}}{U_{old}^{hh}}\right) I_{new}^{hh} \quad \text{or} \quad CV^{hh} = \left(\frac{U_{old}^{hh} - U_{new}^{hh}}{U_{new}^{hh}}\right) I_{old}^{hh} \ldots\ldots (25)$$

The levels of equivalent variation (EV) and compensating variation are affected by substitution elasticity in production and consumption (CV). It is mandatory to examine the degree of responsiveness of the equivalent variation (EV) to the gross domestic product (GDP) ratios for the resilience of the policy reform analysis to a collection of relevant substitution elasticities (Bhattarai and Whalley 1998).

3.9 Structure of GAMS and Implementation

GAMS is the abbreviation name for a general algebraic modeling system, which is a software that helps a researcher perform the general equilibrium analysis with a large-scale dataset; it is a mathematical programing system of general equilibrium analysis (MPSGE). It was developed (or advanced) by Rutherford (1995) and Rutherford (1999). The software used a social accounting matrix as an input for the calibration and simulation of certain policy scenarios; for our case in this paper, used a 2015/16 SAM of the Ethiopia dataset and employed a GAMS code for the Ethiopia model to analyze a CGE version of Ethiopia (see Rutherford, 1995). To examine a general equilibrium model, three prerequisites must be met: i) equilibrium market (or clearing), ii) normal (or zero profit), and iii) income and expenditure balance.

Figure 3.2: The CGE Modeling Structure



Source: Shoven and Whalley (1984, p.1019)

3.10 Scenarios

In this simulation analysis, there are two scenarios that capture the potential welfare, trade, revenue, and sectoral effects of economic integration in the AfCFTA implementation on Ethiopia's economy.

Baseline scenario

This means that the business-as-usual scenario was used as a base run scenario for comparison with the policy implementation (free trade agreement) scenario.

Counterfactual scenario

In this continental free trade agreement, the trades among the member countries on the African continent aim or plan to remove trade barriers through tariffs cut (reduction). It plans to reduce tariffs by 90%. Thus, we estimate the reduction of the tariff.

3.11 Limitations of the Model

Every economic model has its own limitations; more specifically, most developing countries, such as Ethiopia, need to implement remedial measures. Therefore, according to Thurlow (2004), the CGE Model has the following fundamental limitations:

First, the model is based on Walrasian equilibrium and implies market clearance. However, various economic indicators or variables lead to rigidity and then create disequilibrium. To detect such nature of the model, this study tried to include rigidities in the model. For instance, factors of productions such as skilled labor and capital are assumed to be activity specific and considered immobile (fixed). Furthermore, unskilled labor was deemed unemployed in this study.

Second, adaptive expectation is not required in the CGE paradigm; instead, perfect foresight is needed. Despite such an assumption, the model, however, applies to many developing countries, such as Ethiopia, where economic agents lack perfect foresight.

Despite these limitations, a CGE model analyzes a certain policy effect on the whole economy, and it is the most appropriate model for the ex-ante analysis, analysis of welfare, trade, revenue and economic integration. Hence, all these issues are multi-sectoral or have economy-wide impacts.

CHAPTER FOUR

DESCRIPTIVE ANALYSIS

4.1 Introduction

In this chapter, the macroeconomic performance and development of key economic indicators are presented at a glance. That is, the structure of the Ethiopian economy and its growth trend, the trends in Ethiopia's trade, and intra-Africa trade statistics are presented. To effectively examine whether economic integration in the AfCFTA and the other variables affect the welfare of Ethiopia as well as the other objectives mentioned in the earlier chapter, this chapter shall look into the descriptive analyses.

4.2 Ethiopia's macroeconomic performance

Ethiopia's economy showed a remarkable average GDP growth rate of 8.45% for the past eight years (see table 4.1). However, the economy is characterized by a low level of domestic savings, which is insufficient to finance investment (on average, for the last eight years, the saving-investment gap is approximately -15% of GDP), a huge level of trade deficit (for the past eight years, on average, -16.5% of GDP), high inflation (Based on the NBE data, in 2020/21, the general inflation rate is 20.2), and a high budget deficit (Based on NBE data, the fiscal balance in 2020/21 is -2.8% of GDP) (see table 4.1). These problems, therefore, necessitate that the country depends on money printing, external debt, and assistance from developed countries and donor organizations.

The current government of Ethiopia introduced a new economic reform, the "Homegrown Economic Reform", in September 2019 that almost covers the last three years, and its strategy is to liberalize (or open) the economy, including privatizing state-owned businesses. It promised to be financed mainly by donor institutions (i.e., WB and IMF), which promised to finance the program with an estimated $10 billion, which is 3 times the current export value of Ethiopia, and committed to contributing through technical assistance (Geda, 2019). Despite this reform, the COVID-19 pandemic and war in the northern part of Ethiopia worsened the economy. Hence, it aggravates the macroeconomic imbalances with the severe economic crisis, resulting in current socioeconomic problems and high inflation.

Ethiopia's GDP grew by 6.1% in the fiscal year 2019/20, with the COVID-19 pandemic affecting the country primarily in the fourth quarter. Crop production increased, while service and manufacturing growth slowed to single digits, and foreign demand is still depressed as a result of COVID-19; it is beginning to improve. Merchandise exports excluding gold fell by 4.1% year over year from July to December 2020, while most goods (excluding clothes) showed signs of improvement in the second quarter of the fiscal year. Merchandise exports increased by 21%, including gold. Services exports (including air travel) decreased by 9.2%. Moreover, remittances also decreased by 10% in fiscal year 2019/20. During the first half of fiscal year 2020/21, it recovered by 19.1%, and the net foreign direct investment decreased by 1.7% during the same period. Even though healthcare spending climbed dramatically in reaction to the pandemic, total spending decreased in fiscal year 2019/20. As demand has weakened, revenue collection has declined, owing primarily to a drop in indirect tax collections (see table 4.1).

Table 4.1: Overview of Ethiopia's Macroeconomic Performance

Macro Indicator	2013/14	2014/15	2015/16	2016/17	2017/18	2018/19	2019/20	2020/21
Real GDP (% Growth)	10.3	10.4	8.0	10.1	7.7	9.0	6.1	6.3
Consumer prices (% growth)	8.1	7.7	9.7	7.4	14.6	12.6	19.9	20.2
End of period Exchange rate Br/$	19.5771	20.5659	23.8004	23.1018	27.2621	28.9109	34.9822	43.691
Gross Domestic Saving (% GDP)	17.57748	20.53588	19.74178	22.39868	22.36006	24.08531	22.12464	20.91319
Gross Domestic Investment (%of GDP)	34.08112	37.99373	40.67127	37.34877	38.44399	34.72882	35.26398	30.75215
Saving-Investment Gap (% of GDP)	-16.5036	-17.4578	-20.9295	-14.9501	-16.0839	-10.6435	-13.1393	-9.83896
Fiscal balance (% of GDP)	-2.6	-2.5	-1.87	-3.3	-3.0	-2.5	-2.5	-2.8
External debt stock (% of GNI)	26.47007	30.55355	31.78029	31.59332	32.19526	33.18835	29.76692	28.36146
Current account balance (% of GDP)	-6.36627	-10.3782	-11.7149	-10.6404	-7.2503	-5.47209	-5.23928	-2.52571
Exports of goods and services (% growth)	4.2132	20.18496	21.85153	0.047979	-7.46851	2.204038	18.4639	15.60305
Imports of goods and services (% growth)	0.275165	2.821866	-11.2187	-8.14108	7.665659	11.77793	17.70413	-0.51705
External balance on goods and services (% of GDP)	-16.5036	-17.4578	-20.9295	-19.2749	-15.8449	-14.454	-12.9353	-9.83896

Source: Own computation data from NBE, MoFEC, and WDI

In sum, recently, Ethiopia has been challenged by a huge macroeconomic imbalance; among those, there is a large gap between imports and exports, which results in a trade deficit (see table 4.1). This trade deficit is due to exporting primarily (or unprocessed) agricultural products and importing finished (or processed) capital goods. Thus, Ethiopia's participation in the African

continental free trade area likely have its own implications (or effects) on trade in particular, and the overall economy in general.

4.3 Ethiopia's Economic Structure by Major Sector

The disaggregated level of economic growth measured through major economic activities is presented in table 4.2, and those economic sectors' contributions to Ethiopia's GDP growth are vital. The details are presented below.

Table 4.2: GDP growth (by Major economic activities)

Economic Activities	2015/16	2016/17	2017/18	2018/19	2019/20	2020/21
Agriculture, Hunting, and Forestry	2.3	6.7	3.5	3.8	4.3	5.6
Crop	3.4	8.2	4.7	3.0	4.7	5.7
Animal Farming and Hunting	-1.5	4.2	0.6	6.0	3.3	5.8
Forestry	2.2	3.6	3.3	3.8	3.9	3.9
Fishing	0.1	0.5	11.3	2.3	2.8	1.7
Mining and Quarrying	-3.3	-29.8	-20.8	-21.9	91.4	115.4
Manufacturing	18.4	24.7	6.8	7.7	7.5	5.1
Large and Medium Scale Manufacturing	22.9	19.2	8.4	10.0	9.8	6.2
Small Scale and Cottage Industries	2.5	36.9	3.7	3.0	2.6	2.5
Electricity and Water	15.0	12.4	9.6	4.0	7.2	8.9
Construction	25.0	20.7	15.7	15.0	9.9	6.6
Whole Sale and Retail Trade	8.2	6.5	11.4	11.7	6.4	6.3
Hotels and Restaurants	15.6	0.1	6.1	9.0	2.2	2.6
Transport and Communications	13.7	15.1	6.4	21.0	1.1	7.0
Financial Intermediation	9.6	18.3	10.7	13.6	10.2	9.0
Real Estate, Renting, and Business Activities	3.7	4.4	6.2	7.5	9.5	8.9
Public Administration and Defense	7.4	13.2	8.9	9.0	2.3	4.9
Education	8.8	-3.2	3.6	3.5	1.8	2.0
Health and Social Work	10.8	7.0	8.3	14.3	12.9	13.4
Other Community, Social & Personal Services	3.0	4.5	5.1	6.3	2.5	2.0
Private Households with Employed Persons	4.3	3.5	3.9	2.5	2.3	2.2
GDP Growth	8.0	10.2	7.7	9.0	6.1	6.3

Source: Own computation based on NBE data

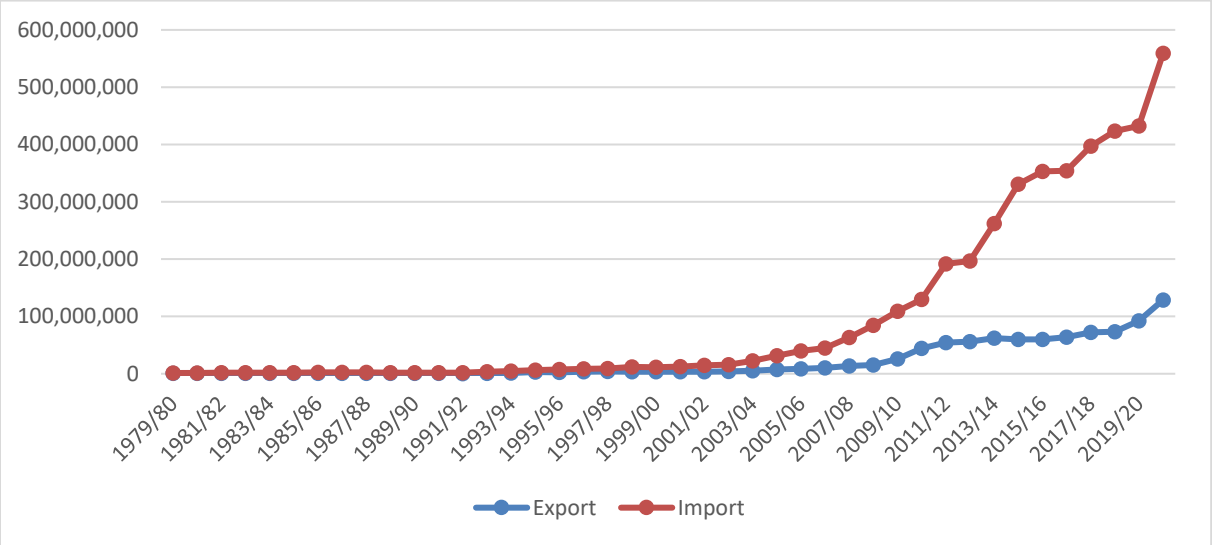
The above table 4.2 shows the growth rate of various economic activities for the last six fiscal years. In 2020/21, agriculture, hunting, and forestry grew by 5.6%, which is greater than the 4.3% growth recorded in 2019/20. Moreover, in the same fiscal year, mining and quarrying grew by

115.4%, and other major economic sectors showed positive growth in 2020/21. The Education sector in 2016/17 and mining and quarrying in the fiscal years from 2015/16 to 2018/19 showed negative growth (see table 4.2).

4.4 Ethiopia's Trade Statistics: Trade flows and Implications

There is a huge gap between imports and exports, which results in a trade deficit, and Figure 4.1 confirms that.

Figure 4.1: Import and Export Gap from 1979/80-2020/21

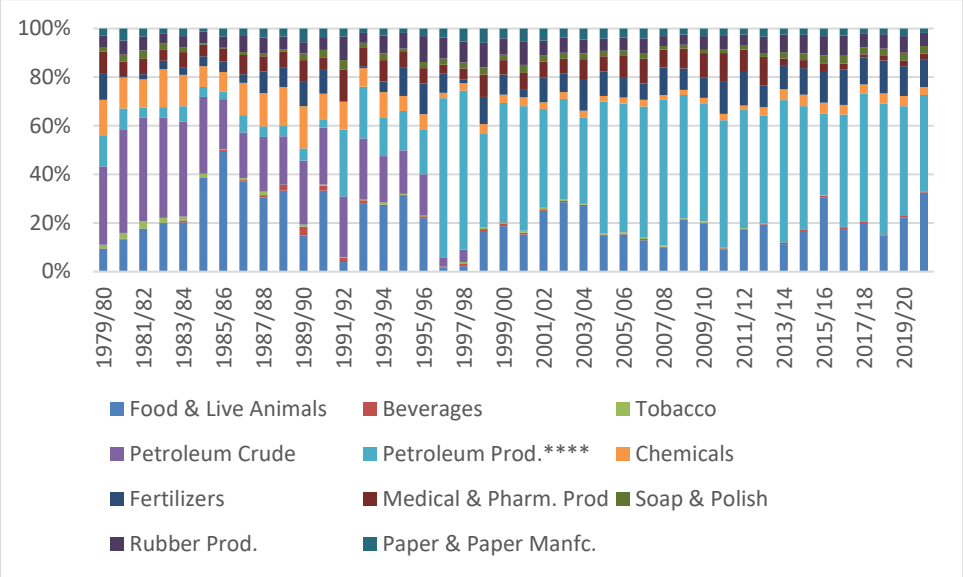


Source: Own computation data from NBE

Figure 4.1 shows the import and export gap. As demonstrated in the graph above, both exports and imports have been increasing over time. However, when compared with the export and import capacity of Ethiopia, exports have been very low until now. This is because the country has been exporting primary agricultural goods that are of low value in the international market. Thus, in terms of monetary value, trade has been unfavorable to Ethiopia. The Ethiopian exports and imports in the period from 1979/80 to 1990/91 stagnated because during this period, there was a restrictive trade policy. However, after the period from 1991/92 to 2003/04, Ethiopian export and import capacity improved, and after 2003/04, there was a rapid increase in both export and import capacity of Ethiopia, while the growth in import is higher. In general, the above graph shows that recently, there has been a huge gap between imports and exports, which results in a trade deficit.

Ethiopia's major imports from the rest of the world are presented in Figure 4.2, with a detailed explanation.

Figure 4.2: Ethiopia's Major Import commodities



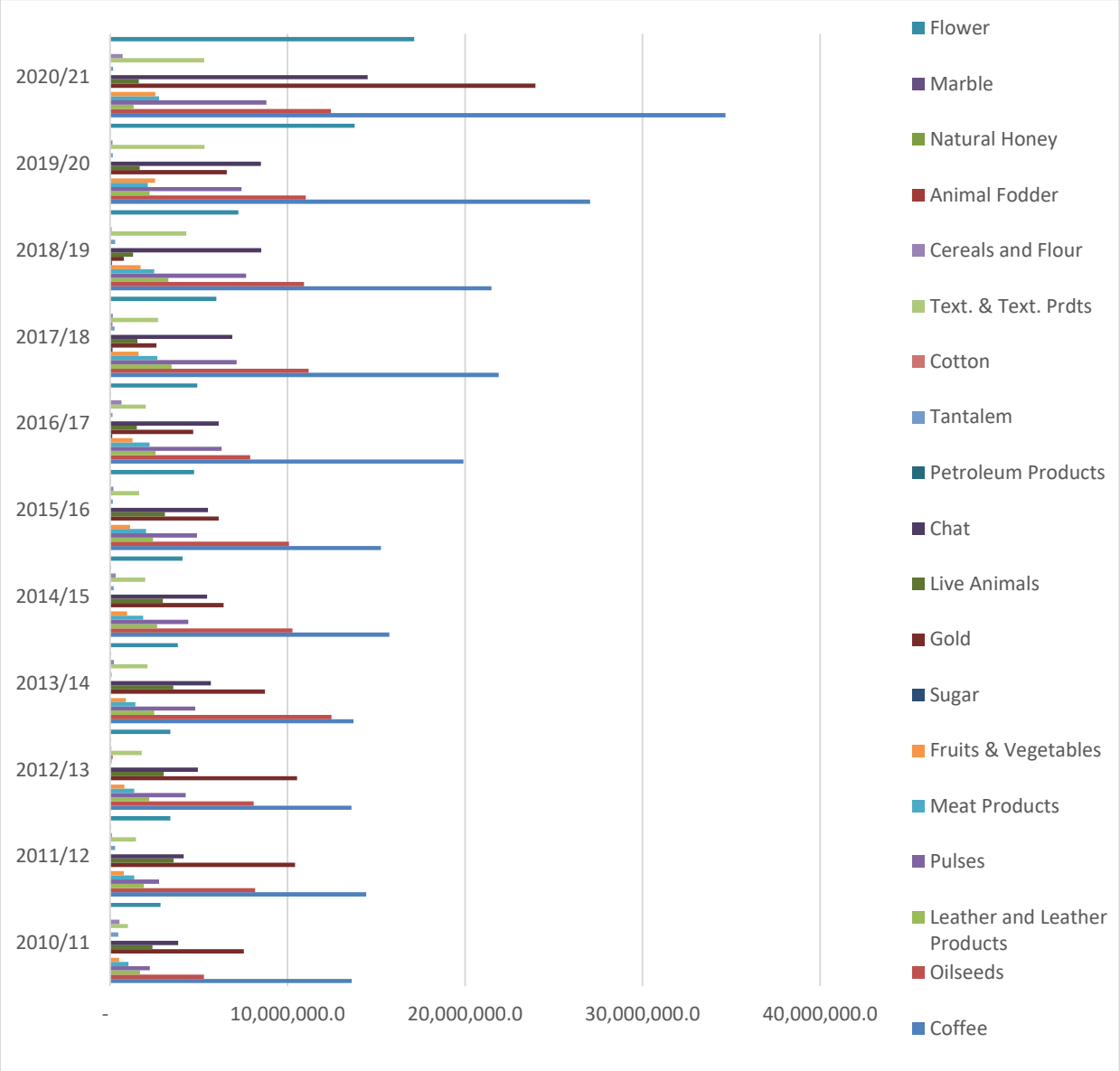
Source: Own computation based on NBE data

The above figure (4.2) shows the major import of Ethiopia from the rest of the world, which consists mostly of capital goods, nondurable consumer products, semi-finished goods, and completed items and fuel such as petroleum products, which account on average 97.4% of the total import bill over the period 2015/01−2017/18 (NBE, 2018). In fiscal year 2017/18, these items individually accounted for 34.5%, 30.9%, 16.6%, and 15.2% of total imports, respectively (see Figure 4.2 above). As one can observe from Figure 4.2, this share was maintained for the last three years., i.e., they are the most constituents of imports for the last three successive years.

Moreover, from Figure 4.2 above, we understand that total merchandize imports declined as the period increased mainly because of the decline in the import of semi-finished goods, capital goods, and consumer goods. However, in recent years, the share of petroleum or fuel has increased from 11.5% (2016/17) to 15.2% (2017/18) due to an increase in international prices and imports. This results in Ethiopia facing reserve constraints (due to low export earnings from primary agricultural or low elasticity product exports and high imports of capital goods), which creates a macroeconomic imbalance.

Ethiopia's major exports to the rest of the world are also presented in Figure 4.3 and Table 4.3, with a detailed explanation.

Figure 4.3: Ethiopia's major export commodities



Source: Own computation based on NBE data

Ethiopia's export dependence on a few primary commodities (mainly agricultural products) has worsened the vulnerability of receipt instability from merchandise exports. Commodity coffee, oilseeds, and gold alone contributed more than half of the total earnings in the last three years (see Figure 4.3 and Table 4.3).

Table 4.3: Ethiopia's performance of major export share (%)

Commodities	2016/17	2017/18	2018/19	2019/20	2020/21
Coffee	32.505627	31.703263	30.338516	30.253757	27.312324
Oilseeds	12.891716	16.202229	15.417675	12.323596	9.8080504
Leather and Leather Products	4.1805009	5.0042484	4.6381159	2.4888514	1.040951
Pulses	10.253701	10.316424	10.813018	8.2871733	6.9423134
Meat Products	3.6180779	3.8547125	3.5080116	2.3840393	2.179775
Fruits & Vegetables	2.0547195	2.321974	2.4132633	2.8261197	2.0131582
Sugar	0.1885749	0.1934366	0.1506436	0.0526967	0.0061523
Gold	7.6519968	3.7733153	1.0950667	7.3527744	18.880439
Live Animals	2.4611067	2.2286814	1.8182105	1.869438	1.2757137
Chat	9.9876228	9.9659537	12.015183	9.5073768	11.438218
Bee's Wax	0.0989447	0.1177445	0.0955128	0.0734485	0.0515101
Tantalum	0.2252172	0.3562358	0.3872187	0.1739585	0.126582
Text. & Text. Prdts	3.2742993	3.9028764	6.0650517	5.9467762	4.1740005
Cereals and Flour	1.053869	0.2270276	0.1156757	0.1548701	0.5574313
Natural Gum	0.4348448	0.3385593	0.2045881	0.1765976	0.0944172
Natural Honey	0.051205	0.0343116	0.0190133	0.0183892	0.0022595
Flower	8.0138775	8.66245	10.204109	15.416608	13.498538
Beverage	0.1478667	0.1575489	0.1619871	0.1263831	0.1422797
Spices	0.9062326	0.639007	0.5391408	0.5671466	0.4558867
Others	14.100	14.30	17.70	22.60	19.10
Total	100.00	100.00	100.00	100.00	100.00

Source: Own computation based on NBE data

Based on the NBE and ECA data, during the COVID-19 pandemic, favorable gold prices led to an increase in the value of Ethiopia's gold exports to $197 million (7.3% of total exports) in 2019/20 from $28 million (1.09% of total exports) in 2018/19 (see table 4.3). Additionally, the continuous and increasing war in northern Ethiopia poses considerable obstacles to Ethiopia's export sector. The region produces 40% of Ethiopia's sesame, and the war may be partly to blame for an 11% drop in oilseed exports and a sustained downturn in shipments to China in fiscal year 2019/2020 (NBE, 2021a; Berhe, 2019).

Furthermore, on November 2, 2021, the United States suspended Ethiopia's participation in the African Growth and Opportunity Act (AGOA) due to abuses of internationally recognized human rights, which would be lifted if the government resolved the humanitarian and political crises (Gebre and Tadesse, 2021). By January 1, 2022, the United States will have officially ended AGOA trade favors for Ethiopia (OUSTR, 2022). Nearly half of Ethiopia's exports to the United States were traded under the AGOA in 2020, with the most common items being clothes, leather footwear, leather goods, flowers, and vegetable products (Naumann, 2021).

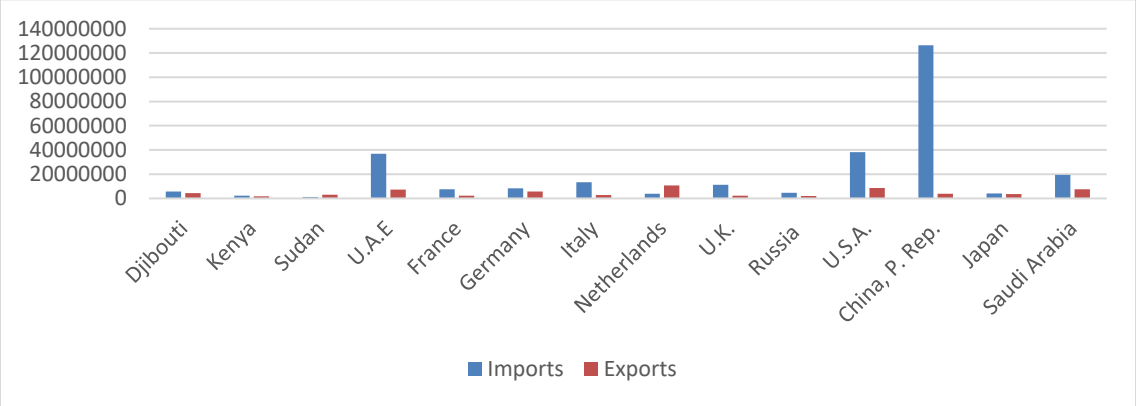
4.5 Ethiopia's Intra-African Trade Potential

Based on the World Trade Integrated solutions database, Ethiopia's trade-weighted most-favorable-nation tariffs on African imports ranged from zero percent for Botswana to 33.8% for

Cape Verde in 2018. Ethiopia offers special tariffs to COMESA member countries. Ethiopia, on the other hand, has yet to join the COMESA Free Trade Area, although reiterating its pledge to do so in November 2020 (ibid).

As part of the AfCFTA implementation, tariffs will be gradually removed (or totally liberalized). A 90% of tariff lines will be liberalized (to zero) over ten years for least developed nations (LDCs) and five years for non-LDCs (AfCFTA Secretariat, 2021). Sensitive products must account for no more than 7% of total tariff lines, while the exclusion list must account for no more than 3% of total tariff lines, with a 10% intra-Africa import value limit (ibid).

Figure 4.4: Ethiopia's trade balance with its major trading partners (2020/21)



Source: Own computation based on NBE data

Figure (4.4) provides a list of Ethiopia's top trading partners in 2020/21, which include three African countries (Djibouti, Kenya, and Sudan), accounting for a weak share of Ethiopia's total trade that year. The intraregional trade agreements, of which Ethiopia is currently a member, are a significant element of the three continental partners. However, except for trade with Sudan, the data present a trade imbalance, which results in a trade deficit. Overall, Ethiopia's trade performance with the rest of the world is a negative balance, especially trade with China, the USA, the U.A E, and Saudi Arabia shows a huge deficit. Generally, Ethiopia's intra-Africa trade balance is negative (trade deficit) (see table 4.4).

Ethiopia's 2019/20 intra-African trade accounted for 10% of total trade, as Ethiopia had a goods trade surplus with African countries in 2015/16 and 2016/17, while in recent years, the net import of goods from African countries has become high, which results in a trade deficit (see Figure 4.4 and Table 4.4). In the last five fiscal years, 80% of Ethiopia's exports to the continent went to

Somalia, Djibouti, and Sudan, while 80% of Ethiopia's imports from Africa were sourced from Kenya, Morocco, Egypt, and South Africa. Moreover, in 2019, Ethiopia's trade with African countries shows a negative trade balance (see table 4.4). In particular, trade with Kenya, Egypt, Morocco, Rwanda, Tunisia, and South Africa results in a huge trade deficit, while Ethiopia's trade with some African countries, such as Benin, Botswana, Congo, Comoros, Malawi, and Zambia, the results in a positive trade balance or surplus (see table 4.4).

Table 4.4: Ethiopia's balance of trade with top African countries trade partners, 2019

Countries	Import (US$ million)	Export (US$ million)	Trade balance (US$ million)
Burundi	8.50935	0.71042	-7.79893
Benin	0.24537	0.60786	0.36249
Burkina Faso	42.49624	1.56447	-40.93177
Botswana	0.1709	2.81855	2.64765
Cote d'Ivoire	0.73497	41.17493	40.43996
Republic of the Congo	0.05867	0.36522	0.30655
Comoros	0.00223	0.02968	0.02745
Egypt	2562.16383	280.16723	-2281.9966
Ghana	15.96789	18.59428	2.62639
Kenya	646.81585	107.13129	-539.68456
Morocco	423.85188	6.32152	-417.53036
Madagascar	42.23457	0.99663	-41.23794
Mauritius	0.51964	0.18584	-0.3338
Malawi	1.53806	10.11433	8.57627
Namibia	0.16003	0.01488	-0.14515
Nigeria	0.33535	63.71229	63.37694
Rwanda	102.3153	2.16693	-100.14837
Senegal	16.99533	1.06367	-15.93166
Eswatini	0.00362	0.06665	0.06303
Togo	12.54903	0.1035	-12.44553
Tunisia	337.24472	4.3413	-332.90342
South Africa	708.58284	69.41822	-639.16462
Zambia	0.65473	3.4803	2.82557
Zimbabwe	0.18189	0.38624	0.20435
Total	**4924.33229**	**615.53623**	**-4308.79606**

Source: Own formulation based on data from Trade Map of Ethiopia 2019

Ethiopia's major imported products from Africa between 2015/16 and 2019/20 consisted of fertilizers (24.5%), petroleum oil (10.9%), and coal (8.7%). In recent years, imports from African countries have significantly increased in 2019/20 double-digit growth in imports from Morocco and Egypt. Moreover, from 2015 to 2018, Ethiopia's major exports to African countries were

composed of coffee (15%), kidney beans (12.5%), broad and horse beans (5.9%), vegetables (7%), and live cattle (4.6%).

Ethiopia's exports to the rest of Africa accounted for 21% of total world exports in fiscal year 2019/20; Ethiopia's major African export destinations include Egypt, Kenya, Nigeria, Ghana, and South Africa. In 2020, those countries trade with Ethiopia were estimated to be approximately 529 million dollars. Vegetables, manioc roots and tubers, and coffee are the principal export items. On the other hand, Machinery and aircraft (15.9%), petroleum products (12.9%), metal and produced metals (11.2%), electrical materials (7.7%), and road motor vehicles (7.7%) were Ethiopia's primary imported goods in the last five fiscal years (6.7%). China accounted for approximately one-third of Ethiopia's imports during the same period, followed by the United States (7.7%) and the United Arab Emirates (UAE) (3.3%). Ethiopia had the highest trade imbalance with China in FY2020/2021. Ethiopian exports to China totaled $84 million, compared to $3.5 billion in purchases from the country, which results in a huge trade deficit (see figure 4.4). However, Ethiopia's trade with Africa is a very small share.

Figure 4.5: The export performance of Sub-Saharan African countries

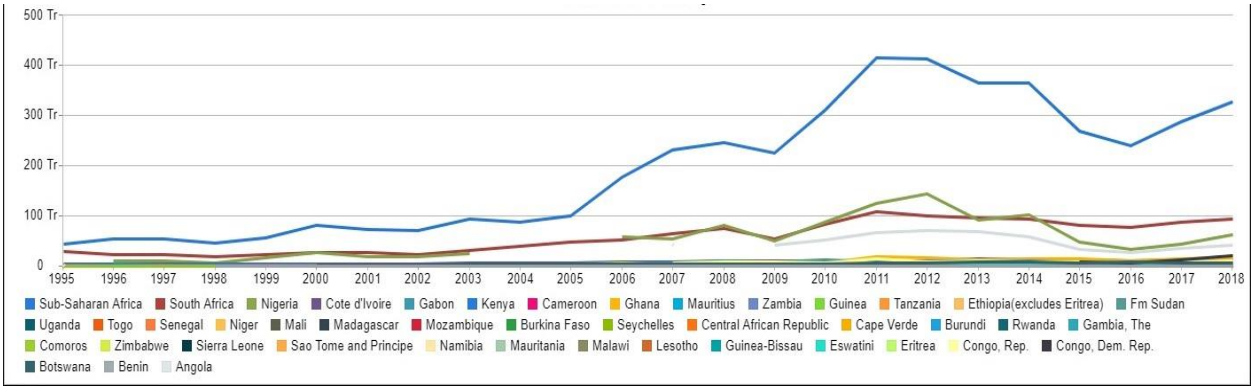
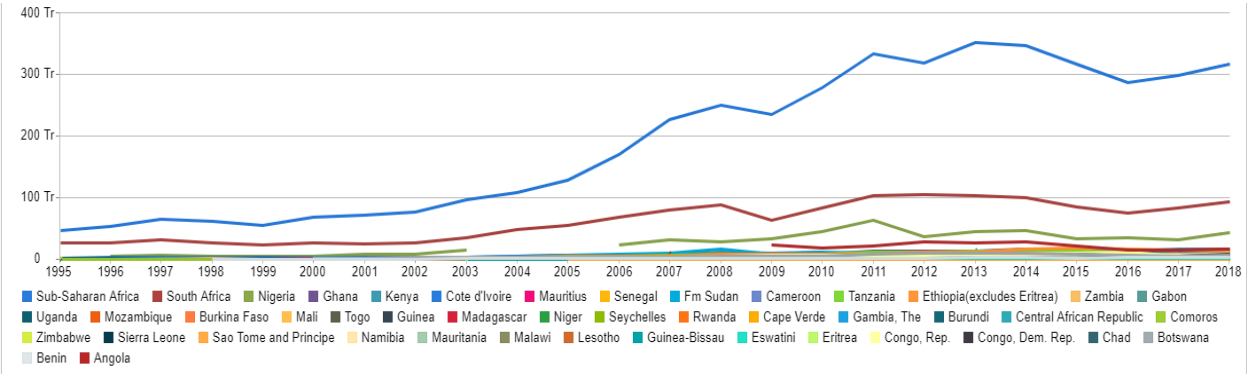


Figure 4.6: The import performance of Sub-Saharan African countries



Source: World Bank, WITS

The above figure 4.5 shows that Ethiopia's export performance is very weak compared with that of other sub-Saharan African countries. This is almost on average below the Sub-Saharan African region in general and other countries in SSA in particular. Additionally, Figure 4.6 shows that Ethiopia's import performance is also considered weak as that of many other SSA countries.

4.6 The Potential Benefits of Continental Free Trade Area

One of the key motivations behind the African continental free trade area (AfCFTA) is to boost intra-African commerce (or trade) and ensure the continent's socioeconomic advantages. It wants to do this by removing tariffs and nontariff barriers. In a study by UNCTAD, most African countries' GDP will increase by 1–3% as a result of the AfCFTA and its accompanying measures; the AfCFTA is predicted to increase intra-African commerce by 34.6 billion dollars by 2022, according to the findings. This would be a 52.3% increase over the baseline year of 2022 (if no policy change). The surge is projected to affect all key industries and economic sectors. The estimates, on the other hand, appear to be based on the notion that Africa's economic woes are largely due to foreign factors such as tariff restrictions.

Table 4.5: Ethiopia's Revenue Performance (In million ETB)

Fiscal Year ending July 7	Total Revenue and Grants	Tax revenue	Direct Taxes	Domestic indirect taxes	Import duties and taxes	Nontax revenue	External Grants
2014/15	193967.28	148552.5368	59206.46047	38848.25	50497.83	29237.47518	16177.269
2015/16	234263.84	175911.3147	70115.82577	44923.59	60871.9	29738.6612	28613.86509
2016/17	254108.48	192647.3819	78506.1589	50418.78	63722.44	46085.98417	15375.11084
2017/18	287562.14	235229.4796	97646.0235	67172.45	70411.01	34418.70931	17913.94816
2018/19	344936.5	268457.4149	115857.83	77774.01	74825.57	42860.01324	33619.06804
2019/20	394965.83	311476.4619	132214.5469	78886.49	100375.4	42836.33328	40653.0328
2020/21	478888.13	388763.4576	173965.4705	108160.1	106637.8	55819.18486	34305.48534

Source: own computation data from ERCA, and NBE

In most African countries, such as Ethiopia, tariff revenue from trade (or import duties and taxes) is a significant source of government income. According to the Economic Commission for Africa, foreign trade taxes in Sub-Saharan Africa were the highest among developing areas, accounting for 30.5 percent of total revenue, compared to 22.5 percent in other low-income nations and 18.42 percent in other lower–medium-income countries (UNECA, 2004). Thus, a free trade area (FTA) would result in (or likely have) a decrease in trade-tax revenue.

In Ethiopia, customs earnings account for over one-third of Ethiopia's total revenue (see table 4.5). As previously stated, while international trade taxes have steadily decreased in importance in many

wealthy nations, they continue to be a substantial source of government revenue in many developing countries, such as Ethiopia. As a result, Ethiopia has been hesitant to sign trade agreements that may result in a reduction in its tariff earnings. This was apparent in the flimsy attempt made to execute changes under the COMESA Free Trade Area Agreement.

According to (UNDP, 2012), Ethiopia's Economic Partnership Agreement (EPA) with the European Union (EU) and entering the COMESA Free Trade Area (FTAs) have financial consequences and possible losses from trade tariffs. It also evaluates the country's prospective income compensatory methods, as well as the equitable, social, economic, and political ramifications of these options. The study recommends fiscal adjustments to help fund alternative revenue strategies. According to the report, Ethiopia's entry into the EPA/EU and COMESA free trade zones will result in an 80% drop in import tariffs. This will result in revenue losses of US $144.5 million and US $27.4 million, totaling more than 4% of yearly national income, and finally, the finding suggests that the income loss from import tariffs can be offset by higher exports as a result of improved trade access, as well as possible increases in domestic trade taxes and VAT on imported luxury products. Ethiopia should proceed with the conclusion of the EPA with the European Union and entrance to the COMESA, according to the analysis, because the income loss may be offset.

Ethiopia will suffer a large income loss from other African nations (further reduction in tariffs revenue) who are not members of the EAC and COMESA as a direct result of adopting the AfCFTA's requirements. As a result, Ethiopia's policy of postponing tariff reductions under the AfCFTA obligations is a good one. For starters, it will postpone any potential revenue losses. Second, as previously said, the preferential treatment it wants would allow it to attract export-oriented foreign investors to help it manufacture, add value to, and increase its exports. Jobs may be created as a result of such investment, as well as a larger tax base. However, additional options for paying Ethiopia's trade taxes must be considered for the country's fiscal income levels to be unaffected by its membership in the AfCFTA.

CHAPTER FIVE

SIMULATION ANALYSIS

5.1 Introduction

In this chapter, the simulation analyses and results which were carried out on the models as well as their economic interpretation of findings obtained from the study shall be looked into. To effectively examine the welfare, trade, revenue, and sectoral effects of economic integration in the African Continental Free Trade Area (AfCFTA) in Ethiopia as well as the other objectives mentioned in the earlier chapter, this chapter examined the simulation analyses.

5.2 Scenarios

Baseline scenario

This means that the business-as-usual scenario is used as a base run scenario to compare with the policy implementation (free trade agreement) scenario.

Counterfactual scenario

In this continental free trade agreement, the trades among the member countries on the African continent aim or plan to remove trade barriers through tariff cuts (reduction). It plans to reduce tariffs by 90%. Thus, we estimate the reduction of the tariff.

Macroeconomic analysis

The implementation of the African continental free trade area's tariff reduction will almost certainly have an effect on Ethiopia's macroeconomic indicators. Hence, Ethiopia is one of the signatory members states in the AfCFTA agreement.

Table 5.1: **The effect of AfCFTA implementation on selected macro indicators (% change)**

Macro Indicators	ABSORP	PRVCON	FIXINV	GOVCON	EXPORTS	IMPORTS	GDPMP	GDPMP2	GDPFC2
INITIAL	1836645	1099103	588705	148837.2	122366	-426439	1532572	1532572	1409454
BASE	6.9	6.3	8.6	2.6	16.1	7.8	7.9	7.9	8.3
AFTA	6.9	6.3	8.6	2.6	16.1	7.8	7.9	7.9	8.3

Source: Own computation based on CGE simulation result

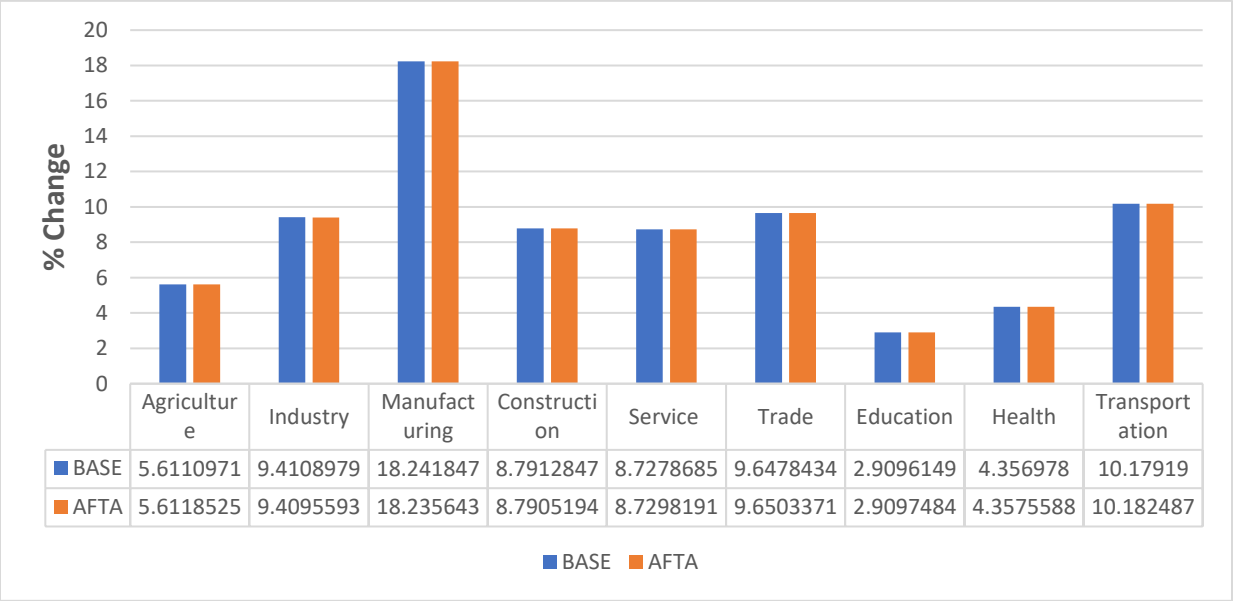
ABSORP is for absorption, PRVCON stands for private consumption, FIXINV stands for fixed investment, GOVCON stands for government consumption, exports, and imports, GDPM2 stands

for GDP at market prices, and GDPFC2 stands for GDP at factor cost, as shown in table 5.1. There is no change in GDP growth in either the BASE line scenario or the AFTA simulation. This might be due to Ethiopia's very small intra-Africa trade share.

5. 2.1 Sectoral effect

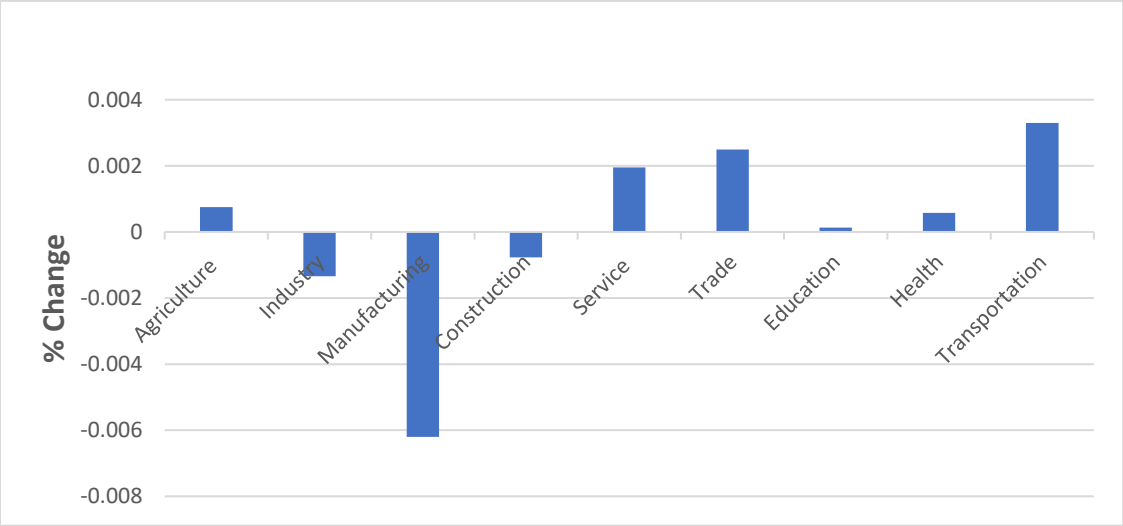
The effect of tariff cuts (or reduction) in the AfCFTA policy implementation is used to quantify the sectoral effects.

Figure 5.1: The sectoral production effect of AfCFTA



	Agriculture	Industry	Manufacturing	Construction	Service	Trade	Education	Health	Transportation
BASE	5.6110971	9.4108979	18.241847	8.7912847	8.7278685	9.6478434	2.9096149	4.356978	10.17919
AFTA	5.6118525	9.4095593	18.235643	8.7905194	8.7298191	9.6503371	2.9097484	4.3575588	10.182487

Figure 5.2: The sectoral production effect of AfCFTA: (% deviation from baseline)



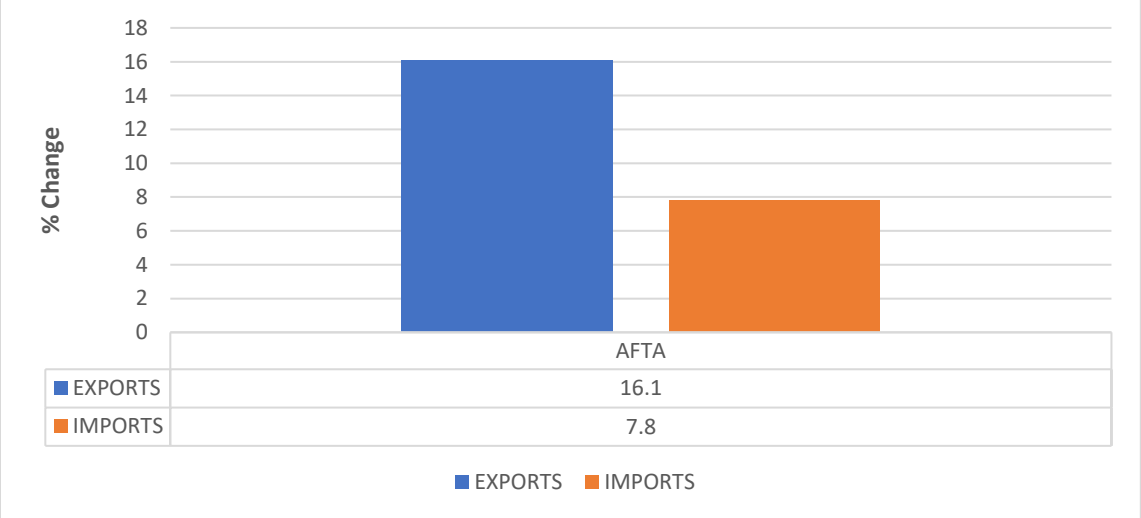
Source: Own computation based on CGE simulation result

Figures 5.1 and 5.2 show the sectoral effect of the AfCFTA implementation in Ethiopia. The simulation outcome reveals that AfCFTA implementation likely both positive and negative effects on sectoral productivity. Hence, the deviation of the simulation result (i.e., AFTA) from the baseline scenario (i.e., BASE) is a positive change in the agriculture, service, trade, education, health, and transportation sectors. While, it is also a negative change in the industry, manufacturing, and construction sectors. This is due to Ethiopia's intra-Africa small trade share and the fact that trade is mainly focused on unprocessed primarily agricultural products (or because there is no production support trade). In sum, the AfCFTA implementation (i.e., 90% tariffs reduction) in Ethiopia will likely have a strong positive effect on the agriculture, service, trade, education, health, and transportation sectors. While it also negatively affects the industry, manufacturing, and construction sectors.

5.2.2 Trade effect

The implementation of the African continental free trade area in Ethiopia likely affects trade (either trade creation or the trade diversion effect). If exports exceed imports, trade creation results, and the reverse is trade diversion.

Figure 5.3: The trade effect of AfCFTA



Source: Own computation based on CGE simulation result

Figure 5.3 shows that AfCFTA implementation in Ethiopia likely has a positive (or trade creation) effect. Hence, exports increased by 16.1%, while imports increased by 7.8%; the rise in exports is more than double that of imports. Therefore, Ethiopia's participation in the AfCFTA will likely have a positive trade creation effect.

Moreover, the figures (i.e., Figures 5.4 and 5.5) below show that disaggregated Ethiopia's intra-Africa exports and imports are affected by the execution of the African continental free trade area agreement; in Figure 5.4, the result reveals that the AfCFTA implementation will likely have very small positive changes in Ethiopia's intra-Africa exports. Additionally, Figure 5.5 shows that the implementation of the AfCFTA likely has a positive effect on Ethiopia's intra-Africa imports in many commodities, while it also has a negative effect in some commodities.

Figure 5.4: The effect of AfCFTA on Ethiopia's Intra-Africa export

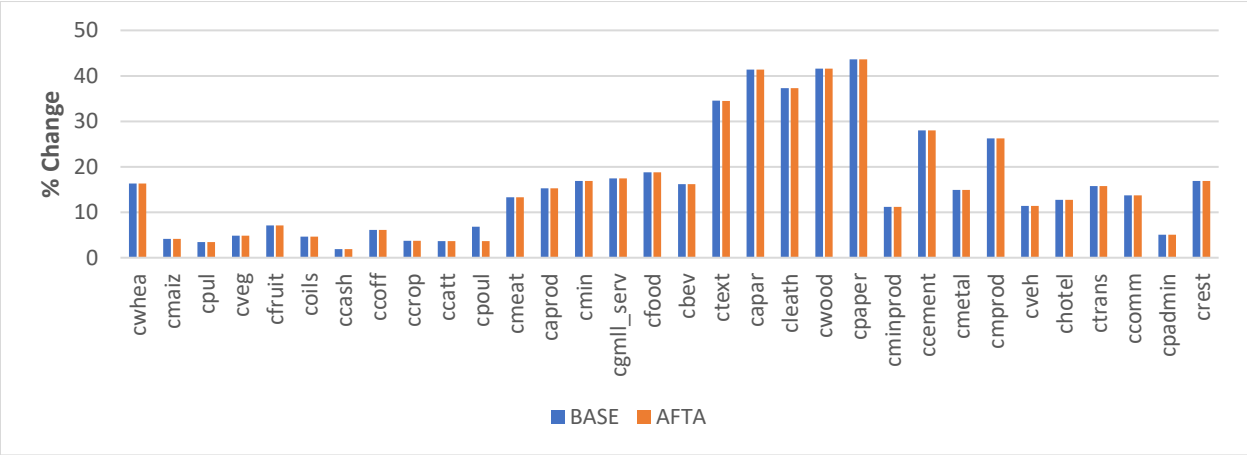
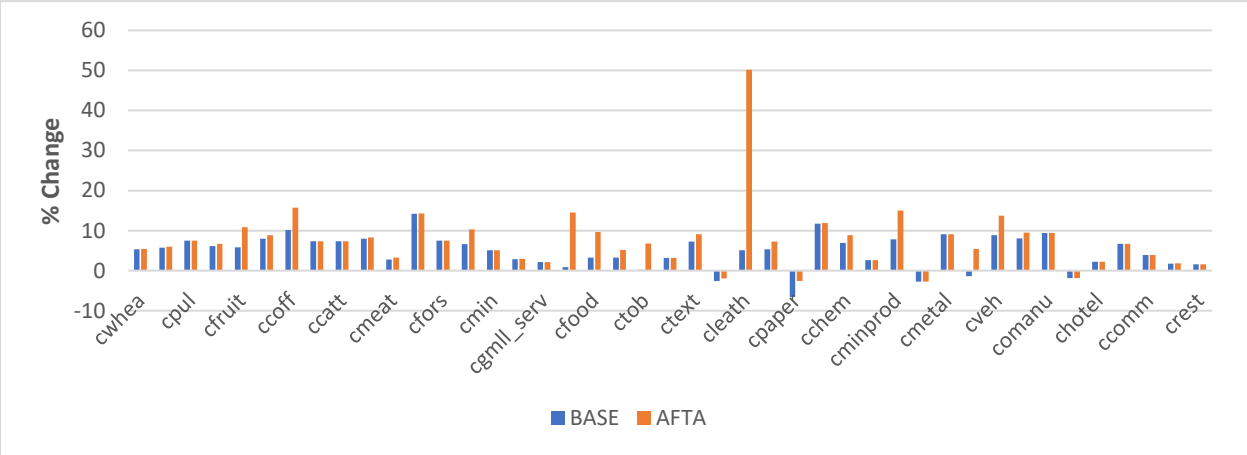


Figure 5.5: The effect of AfCFTA on Ethiopia's Intra-Africa imports



Source: Own computation based on CGE simulation result

5.2.3 Revenue implication (Fiscal Response)

The revenue implication of such tariff reduction in the free trade area agreements has the most important policy implication. Hence, tariffs are one source of government income in most

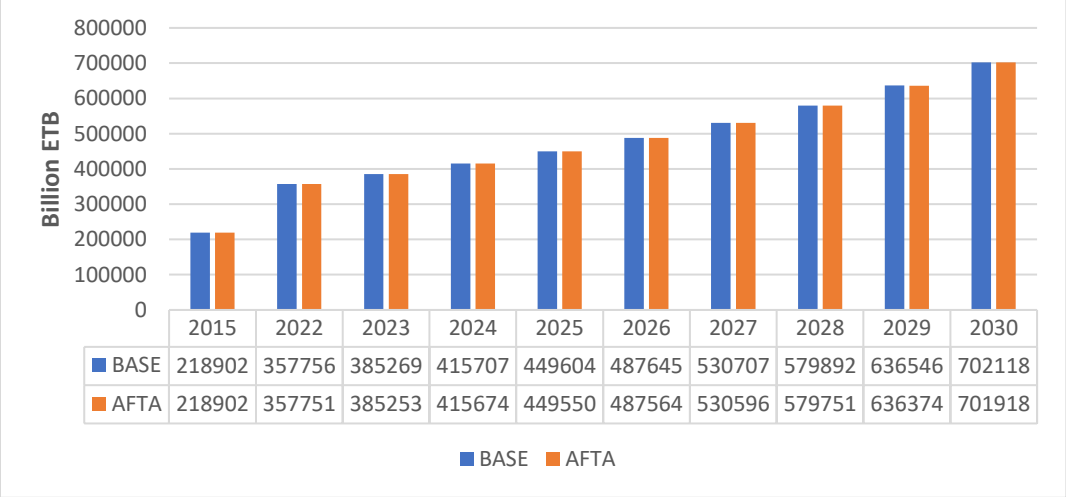
developing countries, such as Ethiopia. Therefore, the implementation of the AfCFTA in Ethiopia will likely have its own effect on revenue (either gain or loss).

Table 5.2: The revenue implication of AfCFTA implementation in Ethiopia

Simulations	2015	2022	2023	2024	2025	2026	2027	2028	2029	2030
BASE	218901.8	357756.3	385269.3	415706.7	449604.5	487644.6	530706.8	579892.1	636545.5	702118.2
AFTA	218901.8	357750.6	385252.8	415673.8	449550.1	487564	530596.5	579750.8	636373.9	701918.3
Revenue implication	0	-5.6191	-16.5522	-32.814	-54.3619	-80.614	-110.263	-141.366	-171.654	-199.904

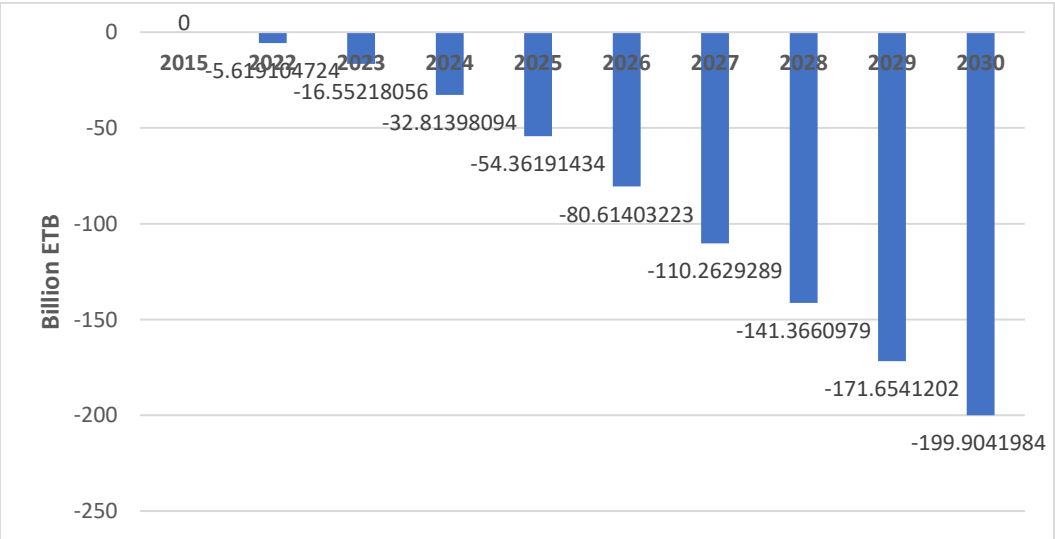
Source: Own computation based on CGE simulation result

Figure 5.6: Revenue implication of AfCFTA



Source: Own computation based on CGE simulation result

Figure 5.7: Revenue implication of AfCFTA: (Deviation from baseline)



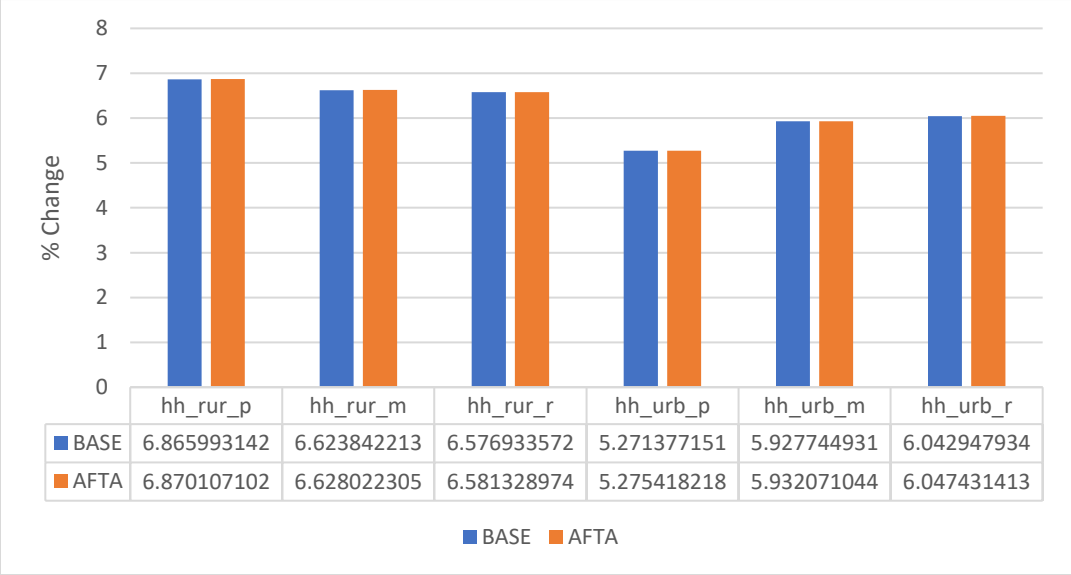
Source: Own computation based on CGE simulation result

The above table 5.2, figure 5.6, and figure 5.7 provide an answer for the revenue implication of the AfCFTA implementation in Ethiopia. Thus, the tariff reduction in the AfCFTA will likely have a revenue loss effect in Ethiopia. Hence, the deviation of AFTA from the BASE scenario is negative. This is due to tariff reduction because tariff duties and taxes on imports are significant sources of Ethiopian government revenue.

5.2.4 Welfare effect

The AfCFTA implementation will likely have an impact on both microeconomic and macroeconomic indicators, in which welfare is addressed (i.e., welfare of both consumers and producers). Hence, free trade area agreements have an economy-wide impact in which they affect all economic agents, i.e., households, producers, and the public sector. Therefore, Ethiopian joining the African continental free trade area (AfCFTA) is a likely effect on the welfare of households and might be welfare improving or loss. Equivalent variation (EV) is a key instrument for measuring the welfare effect since it quantifies the amount of income that a consumer must spend before a shock to be better off at an equivalent level of utility loss after the shock.

Figure 5.8: The effect of AfCFTA on Household consumption



	hh_rur_p	hh_rur_m	hh_rur_r	hh_urb_p	hh_urb_m	hh_urb_r
BASE	6.865993142	6.623842213	6.576933572	5.271377151	5.927744931	6.042947934
AFTA	6.870107102	6.628022305	6.581328974	5.275418218	5.932071044	6.047431413

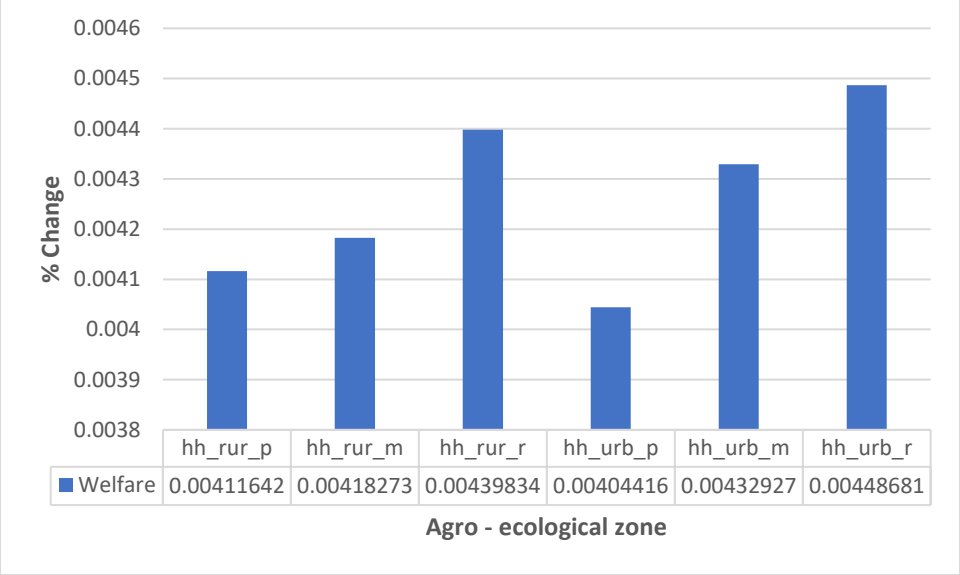
Source: Own computation based on CGE simulation result

The simulation result in Figure 5.8 shows that all households are better off by tariff reduction (cut). Hence, with a 90% tariff reduction, both producers and consumers gain a surplus from the rise of

imports. Because the deviation of the AFTA simulation from the BASE line scenario is positive in disaggregated household consumption, the classification of households is based on the agro-ecological zone. Thus, hh_rur_p refers to poor households living in rural areas; hh_rur_m stands for middle class households living in rural areas; hh_rur_r is rich households living in rural areas; hh_urb_p is poor households living in urban areas; hh_urb_m is middle class households living in urban areas and hh_urb_r also refers to rich households living in urban areas. Thus, the simulation result revealed that all those households are positively affected by the AfCFTA implementation in Ethiopia.

Therefore, Ethiopia's joining the African continental free trade area (or liberalizing trade to the rest of African countries) will likely have a significant positive effect on all households' welfare. Hence, the hecksian equivalent variation is positive for all households (i.e., rural poor, rural middle income, rural rich, urban poor, urban middle income, urban rich). However, the welfare gain by urban rich and rural rich households is greater than that of middle-class and poor-class households, and the welfare gain of middle-class households is also greater than that of poor-class households [i.e., hh_r (both urban and rural) > hh_m (both urban and rural) > hh_p (both urban and rural)] (see Figure 5.9).

Figure 5.9: The Welfare effect of AfCFTA based on the Equivalent variation % change



Source: Own computation based on CGE simulation result

Figures 5.8 and 5.9 show that the welfare of households is improving when the continental free trade agreement (CFTA) is implemented. Hence, it aims or plans to remove trade barriers through tariffs cut (reduction) by 90%. Thus, the simulation result in Figure 5.9 revealed that a reduction of the tariff by 90% results in a welfare improvement (all households are better off). Therefore, Ethiopia's participation in the African continental free trade area implementation results in welfare improvement (or gain).

5.3 Robustness of the model (or analysis)

We examine the robustness of the welfare, trade, revenue, and sectoral effects results outlined above (or the model robustness in general) through the walras test. Hence, walras' law shows that the aggregate of the values of excess demands across all markets must equal zero, whether or not the economy is in a general equilibrium. Thus, in our model, the warlas is zero, which means that the results outlined above satisfy the basic assumption of the general equilibrium model and that the model is robust (i.e., correctly explained the economy-wide analysis).

5.4 General analysis of Ethiopia's intra-African trade

Ethiopia is one of the signatory African countries of the African continental free trade area (AfCFTA), and it start its implementation by 2022. The main aim of such continental economic (or trade) integration is the removal of trade and nontrade barriers; specifically, the African continental free trade area plans to reduce tariffs by 90%, and gradually, it will be totally liberalized. Thus, Ethiopia's participation (or joining) the AfCFTA likely have an economy-wide effect, mainly on welfare, trade, revenue, and sectoral productivity (or growth).

In sum, the potential economy-wide effects of Ethiopia's joining the African Continental Free Trade Area (AfCFTA) will likely have a positive effect on the Ethiopian economy, such that sectoral productivity (in agriculture, service, education, health, and transportation sectors), as well as trade, and welfare are likely improve (all are affected positively). However, government revenue decreased due to such tariff reduction (cut); hence, it is one of the most important sources of government income, and such tariff reduction results in no more government income from import tariffs. Thus, Ethiopia is likely to benefit from joining the African continental free trade area (AfCFTA).

CHAPTER SIX

CONCLUSION AND IMPLICATIONS

This study set out to determine the potential economy-wide effects of economic integration in the African Continental Free Trade Area (AfCFTA), evidence from Ethiopia with an ex-ante economy-wide analysis, in which the study employed a 2015/16 Social Accounting Matrix (SAM) of Ethiopia. It mainly sought to examine the potential sectoral, trade, revenue and welfare effects of Ethiopia's participation in the AfCFTA. After a review of relevant literature and the necessary empirical analyses conducted through descriptive and simulation methods of analysis.

6.1 Conclusion

Ethiopia's economy is characterized by a very small market share in intra-African trade as well as in global trade and weak economic integration with other African countries. These problems, therefore, result in the country facing a huge level of trade deficit, which shows there are high imports (mainly capital goods) and fewer exports (mainly primary agricultural products). However, there has been a great debate on the effect of this economic integration on sectors, trade, revenue, and contributions to economic welfare and how this impact is transmitted. Therefore, this study's main concern has been to examine the economy-wide effect of economic integration in the African Continental Free Trade Area (AfCFTA) evidence from Ethiopia; more specifically, it assesses the effect of Ethiopia's joining the AfCFTA on sectors, trade, revenue, and welfare. To analyze this, both descriptive and simulation analyses are employed.

According to descriptive analysis, Ethiopia's trade statistics show a huge trade deficit, especially in recent years, where the gap between exports and imports has increased significantly. Despite the huge inflow of imports into the country, there is no visible export to the rest of the world; rather, these huge imports from the rest of the world undermine our domestic production or investment and outflow of more foreign currency. Ethiopia's intra-Africa trade flows are also very little or weak compared to Ethiopia's trade with the non-African rest of the world.

The simulation analysis explores the potential welfare, trade, revenue, and sectoral effects of economic integration in the African continental free trade areas (AfCFTA) evidence from Ethiopia. The study employed a social accounting matrix (SAM) dataset of 2015/16. To identify the

economy-wide impact of such economic integration on various sectors in the economy, such as trade, sectoral, revenue, and welfare, this study has investigated the effects of the AfCFTA on those economic indicators. The following are the conclusions of this paper: In Ethiopia, the sectoral, trade, revenue, and welfare effects of joining the African Continental Free Trade Area (AfCFTA) are a positive effect on the Ethiopian economy, such that most economic sectors, trade, and welfare are likely improved (or affected positively). However, government revenue likely decreased due to such tariff reduction (cut); hence, it is one of most important sources of government income, and such tariff reduction results in no more government income from import tariffs.

In sum, Ethiopia is likely to benefit from joining the African Continental Free Trade Area (AfCFTA). Hence, it will have a positive effect in the Ethiopian economy by improving sectoral productivity, trade flows and welfare. Ethiopia might face a revenue loss.

6.2 Implications

The findings of this study have significant policy implications that suggest the following policies.

a) When Ethiopia structuring its tariff offer and negotiating with its African partners, it is necessary to retain a considerable number of tariff lines for sensitive and excluded commodities throughout a prolonged period of liberalization.

b) Subsidization programs or targeted tax incentives are required to help the transformation of those sectors that stand to lose as a result of trade liberalization.

c) Ethiopia's trade figures revealed a negative trade balance due to heavy imports from other countries and selling fewer or unprocessed basic commodities to other countries, which results in a huge trade gap (deficit). To avoid such problems, Ethiopia should work on product diversification with value addition and mainly target replacing imported products from outside the continent. Hence, it narrows the trade gap and increases the gain from continental and international trade, resulting in welfare improvement.

d) The government of Ethiopia should design or adapt an appropriate economic policy, and conducive economic constitutions must formulate well-detailed development plans,

appropriate allocation systems, participatory approaches, and efficient government administration.

e) In addition, the government of Ethiopia and the African continent also have the task of building the potential to produce (substitute) products that are largely imported from outside the African continent and remove production side (infrastructural) constraints, which should also be a long-term policy or strategy for Ethiopia and other member countries of the AfCFTA.

f) To improve Ethiopia's intra-African trade share, multidimensional policy measures are vital, which is beyond the reduction (or removal) of tariff barriers; building infrastructure, creating technological linkages in the production process with stable macroeconomic environments, also attracts foreign direct investments into the country and continent.

g) Ethiopia and other AfCFTA member states should establish an institution within the continent that designs a policy to promote trade creation. This provides an appropriate protocol for continental free trade with an appropriate time schedule. Moreover, member countries' political integration should be strengthened to remove trade and nontrade constraints to improve intra-Africa trade activities in the continent of Africa.

h) Finally, policymakers should ensure that policy on the encouragement of more productive sectors through protection for the domestic infant industries, export promotion, import-substitution, and expanding (or widening) the domestic tax base of the economy enables the country to finance its expenditure and narrow the fiscal gap (or compensate for a revenue loss) by its own resources rather than dependency on external debt and aid.

6.3 Suggestions for further study

The interesting part of this study is the newness of the issue. Hence, the AfCFTA is a new policy issue in Africa. This would be giving more concern by the African governments, including the Ethiopian government. Thus, focusing on the same topic with multi-country and multi-sectoral Africa case using a CGE model should be an important avenue for future research. A combination of WITS-SMART and CGE simulation approaches also provides the fullest answer in assessing the potential welfare, trade, revenue, and sectoral effects of trade liberalization in Africa.

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APPENDIX

Appendix 1

SAM_livestockaggregated	is the relatively aggregated version that is distributed to users. It is copied from Ethiopia_SAM 2015_16_PSI_basic_version_2, sheet ("SAM_livestockaggregated") A detailed version is available from the authors up on request
Macro_SAM	is the macrosam generated using the values in the SAM
household_and_labor	These are provided to map the relatively aggregated hosuehold and labor accounts from the detailed SAM
activity_and_commodity	provides the definition of the activities and commodities included in the SAM

Macro SAM

Country	Ethiopia
Fiscal year	2015/16
Currency	Ethiopian Birr (ETB)
scaling	Billion

	Activities	Commodities	Factors	Enterprises	Households	Government	Taxes	Investment	Rest of the World	Total
Activities		1,907.5			216.3					2,123.8
Commodities	714.4				882.8	148.8		588.7	122.4	2,457.1
Factors	1,409.5								3.5	1,413.0
Enterprises			519.2			7.7			0.4	527.3
Households			891.3	352.6		11.0			119.9	1,374.9
Government				21.9	8.7		191.8		30.7	253.1
Taxes		123.1		41.2	27.5					191.8
Saving				110.5	232.3	81.9			164.0	588.7
Rest of the World		426.4	2.5	1.1	7.3	3.6				441.0
Total	2,123.8	2,457.1	1,413.0	527.3	1,374.9	253.1	191.8	588.7	441.0	

GDP at current basic prices	1409.454
Gross capital formation	588.705
Government final consumpotion expenditure	148.8372
Private Final consumption expenditure	1099.103
Export of goods and services	122.366
Import of goods and services	426.4393
GDP at market prices	1532.572

Ethiopia's Regional trade data

row (Rest of non-African world) and roa (rest of African nations)

Fiscal Year 2015/16; Own computation based on ERCA data

Currency ETB: In Billion ETB

Regional import values			**Regional import tariff earnings**		**Regional export value**	
	row	roa	row	Roa	row	roa
ctef				0		
cbar	0.106367	0	0.007477	0	1.55695E-05	0
cwhea	10.13903	0.249963	0.267691	0.000645018	1.11809E-05	2.21E-05
cmaiz	0.02411	0.047479	0.005786	0.002869471	0.001034268	0.000105
csorg				0		
cpul	1.513294	0.02965	0.761055	0	4.515719625	0.000587
cveg	0.141209	0.04141	0.061298	0.002869471	0.624353899	0.073218
cfruit	0.007423	0.011262	0.013521	0.012402605	0.08588615	0.005186
coils	0.006226	0.001361	8.65E-05	0.196518262	10.20449821	0.003822
ccash	0.001239	0	0.000645	0.030905654	5.725000278	0.110693
ccoff	0.014798	0.000132	0.011359	6.92335E-05	15.33896529	0.201443
censet				0		
ccrop	4.841911	0.041055	0.350188	7.44137E-06	0.53602277	0.002464
cafeed				0		
cflower			1.3E-06	6.47159E-06	4.733257075	0.000726
clive	0.005035	0.001931	0.000733	6.43029E-05	3.215605636	0.000949
cmeat	0.016082	0.001484	0.011686	3.44499E-05	2.138061342	0.032704
cmanure				0		
cmilk				1.21298E-05		
cfors	0.153645	2.21E-06	0.113842	0	0.162565155	0
cfish	0.007495	1.93E-05	0.004599	1.19081E-05	0.014282131	0
cmin	0.306671	0.039511	0.098082	6.26271E-05	0.214180351	0.005935
cdairy	0.179371	6.04E-05	0.0737	4.8394E-07		
cgmillandgmillserv	0.578235	0.005602		6.98888E-05	0.050860364	0.004403
csug	3.701311	0.006783	0.077022	0.031018081	0.02065086	0
cvprod	0.012585	0.04141	0.037741	8.30523E-06		
cfood	13.92101	0.00777	3.344621	0.007354744	0.695010601	0.002613
cbev	1.415015	0.000735	0.76386	0.000260188	0.07973165	0.000621

ctob	0.066743	0.033064	0.093453	0.024157436		
cmtob	0.13031	0.001175	0.026727	0	0.00145669	0
clcott				0.000240586		
ctext	5.382831	0.006154	3.669705	0.000515881	0.274665102	0.007748
capar	5.777115	0.002524	5.286958	9.01158E-05	0.977935554	0.000479
cleath	1.554437	0.000166	0.244516	0.009946355	1.660402413	0.074859
cwood	2.214494	0.007653	0.74084	0.000871956	0.02193853	0.006088
cpaper	3.39894	0.04228	1.404001	0.01254349	0.003333698	0.000492
coilptrl	42.9095	1.937625	2.2125	0.032552398		
cfert	8.439943	0.00054	0.000511	0		
cchem	27.22089	0.199497	8.454779	0.025852771	0.47296305	0
cpharm	10.46409	0.999012	0.41783	2.0554E-07	0.023133725	0
cminprod	2.110666	0.039511	1.827438	0.026272951	2.284635224	0.002613
ccement	0.051952	0.007664		0.003163778	0.21299954	0.110871
cmetal	94.29893	0.00227	10.92094	3.0218E-07	0.106375332	7.75E-06
cmprod	4.907528	0.02296	0.924612	0.009128903	0.018113954	2.53E-05
cveh	29.96732	0.001848	14.91253	0.015543688	0.02687287	2.21E-06
celecq	40.67083	4.25E-06	4.672769	3.01862E-06	0.624584171	0
cmach	15.85315	0.002722	2.55514	0.003312589		
comanu	6.422536	0.214828	1.797717	8.99362E-05	0.015997711	0
celect				0.01800016	0.59998068	0.002539
cwater				0.028293304		
ccons	8.945543	0.002143		1.44578E-05	0.582155665	0
ctrad				2.80047E-06		
chotel	0.215617	8.6E-05		0	5.684195742	1
ctrans	56.65417	5.282324		0.001815652	47.54539057	4
ccomm	3.914067	0.5554		0	1.444561454	0.0005
cfserv	0.161683	0		0	0.100370426	0
cpadmin	0.0217	1.42E-05		0	2.768801475	0.5
ceduc				0		
cheal				0		
crest	7.270521	0.43261		0	2.10269628	0.3
coserv				0	0.005014681	0

Appendix 2

Ethiopia's Trade share with the non-African rest of the world; and rest of African nations

Ethiopia's Regional trade Share
Trade share with row (rest of non-African world), and roa (rast of African nations)
Fiscal year 2015/16
Source: Own computation based on Ethiopian Revenues and Customs Authority (ERCA) data

	Regional import Share		Regional import tariff Share		Regional export Share	
	row	**roa**	**row**	**roa**	**row**	**roa**
cbar	100	0	100	0	100	0
cwhea	97.59396	2.406036	99.75962	0.240377	33.57969	66.42031
cmaiz	33.67816	66.32184	66.84824	33.15176	90.81889	9.181113
cpul	98.07835	1.921652	100	0	99.98701	0.012987
cveg	77.32416	22.67584	95.52817	4.471831	89.50383	10.49617
cfruit	39.72765	60.27235	52.15684	47.84316	94.30555	5.694454
coils	82.06599	17.93401	0.043972	99.95603	99.96256	0.037436
ccash	100	0	2.045717	97.95428	98.10317	1.896826
ccoff	99.11784	0.88216	99.39419	0.605811	98.70375	1.296254
ccrop	99.15922	0.840782	99.99788	0.002125	99.5425	0.457497
ccatt	72.27624	27.72376	91.93896	8.061043	99.98466	0.01534
cpoul	72.27624	27.72376	91.93896	8.061043	99.97051	0.029489
cmeat	91.55284	8.447161	99.70607	0.293927	99.97051	0.029489
caprod	91.55284	8.447161	99.70607	0.293927	98.49344	1.506563
cfors	99.99856	0.001437	100	0	98.49344	1.506563
cfish	99.74314	0.256862	99.74174	0.258256	100	0
cmin	88.58662	11.41338	99.93619	0.063811	100	0
cdairy	99.96634	0.033656	99.99934	0.000657	97.30389	2.696115
cgmll_serv	99.04041	0.959585	0	0	92.03326	7.966735
csug	99.81708	0.182916	71.29032	28.70968	100	0
cfood	99.94421	0.055787	99.78058	0.219415	99.62547	0.374532
cbev	99.9481	0.051903	99.96595	0.034051	99.22694	0.773059
ctob	66.87215	33.12785	79.45978	20.54022	100	0
cmtob	99.10622	0.893783	100	0	97.25646	2.743539
ctext	99.8858	0.114197	99.98594	0.014056	99.95101	0.048988
capar	99.95633	0.043667	99.9983	0.001704	95.68603	4.31397
cleath	99.9893	0.010704	96.09123	3.908767	78.27692	21.72308
cwood	99.65559	0.344405	99.88244	0.11756	87.13842	12.86158
cpaper	98.77136	1.228645	99.1145	0.885499	100	0
coilptrl	95.67949	4.320511	98.55004	1.449962	100	0
cfert			100	0	99.88577	0.114234
cchem	99.27245	0.727551	99.69516	0.304845	65.76686	34.23314
cpharm	91.28498	8.715022	99.99995	4.92E-05	99.99271	0.007287

cminprod	98.16243	1.837571	98.58268	1.417316	99.86051	0.139488
ccement	87.14471	12.85529	0	0	99.99178	0.008218
cmetal	99.99759	0.002407	100	2.77E-06	100	0
cmprod	99.53432	0.465677	99.02233	0.97767	99.57866	0.421342
cveh	99.99383	0.006168	99.89588	0.104124	100	0
celecq	99.99999	1.05E-05	99.99994	6.46E-05	85.03934	14.96066
comanu	96.76336	3.23664	99.995	0.005003	92.23985	7.760151
ccons	99.97604	0.023956	0	0	99.9654	0.034601
chotel	99.96014	0.039856	0	0	100	0
ctrans	91.47139	8.528613	0	0	84.70387	15.29613
ccomm	87.57346	12.42654	0	0	87.51403	12.48597
cfserv	100	0	0	0	100	0

Appendix 3

Activity	**Description**
atef	Growing of Teff
abar	Growing of Barley
awhea	Growing of Wheat
amaiz	Growing of Maize
asorg	Growing of Sorghum
apul	Growing of Pulses
aveg	Growing of Vegetables
afruit	Growing of Fruit
aoils	Growing of oil seeds
acash	Growing of cash crops: sugar cane, chat, and cotton seeds
acoff	Growing of coffee
aenset	Growing of enset
acrop	Growing of crops nec.
aflower	Growing of flowers
	Cattle farming, dairy farming from cattle and production of cattle products
	Sheep farming, and production of sheep products
	Goat farming, and production of goat products
alive	Camel farming, dairy farming from camel and production of camel products
	Poultry farming and production of Poultry products
	Livestock farming, dairy farming, production of animal products
afor	Forestry
afish	Fishing
amining	Mining and quarrying
adairy	Manufacture of dairy products
	Manufacture of grain mill products
agmillandagmillserv	Manufacture of starches and starch products
	Activity of giving grain milling service
asug	Manufacture of sugar;

aofood	Manufacture of cocoa, chocolate and sugar confectionery
	Production, processing and preserving of meat and meat products
	Processing and preserving of fish and fish products
	Processing and preserving of fruit and vegetables
	Manufacture of prepared animal feeds
	Manufacture of bakery products
	Manufacture of macaroni, noodles, couscous and similar farinaceous products
	Manufacture of other food products n.e.c.
abev	Distilling, rectifying and blending of spirits; ethyl alc production from fermented materials
	Manufacture of wines
	Manufacture of malt liquors and malt
	Manufacture of soft drinks; production of mineral waters
atob	Manufacture of tobacco products
atext	Finishing of textiles
	Manufacture of made-up textile articles, except apparel
	Manufacture of carpets and rugs
	Manufacture of cordage, rope, twine and netting
	Manufacture of other textiles n.e.c.
aspin	Manufacture of knitted and crocheted fabrics and articles
	Preparation and spinning of textile fibres; weaving of textiles
aapar	Manufacture of wearing apparel except fur apparel
aleath	Tanning and dressing of leather
	Manufacture of luggage handbags and the like, saddlery and harness
	Manufacture of footwear
awood	Manufacture of wooden containers
	Manufacture of veneer sheets; Manufacture of plywood, laminboard, particle board and other panels and boards
	Manufacture of builders' carpentry and joinery
	Manufacture of other products of wood; manufacture of articles of cork, straw and plaiting materials
apaperp	Manufacture of pulp, paper and paperboard
	Manufacture of corrugated paper and paperboard and of containers of paper and paperboard
	Publishing of books, brochures, musical books and other publications
	Publishing of books, brochures, musical books and other publications
	Publishing of books, brochures, musical books and other publications
	Other publishing
	Printing
	Service activities related to printing
achem	Manufacture of refined petroleum products
	Manufacture of basic chemicals, except fertilizers and nitrogen compounds
	Manufacture of fertilizers and nitrogen compounds

	Manufacture of pesticides and other agro-chemical products
	Manufacture of paints, varnishes and similar coatings, printing ink and mastics
	Manufacture of soap and detergents, cleaning and polishing preparations, perfumes and toilet preparations
	Manufacture of other chemical products n.e.c.
	Manufacture of rubber tyres and tubes; retreading and rebuilding of rubber tyres
	Manufacture of rubber tyres and tubes; retreading and rebuilding of rubber tyres
	Manufacture of other rubber products
	Manufacture of plastic products
apharm	Manufacture of pharmaceuticals, medicinal chemicals, and botanical products
	Manufacture of glass and glass products
	Manufacture of non-structural non-refractory ceramic ware
aminprod	Manufacture of structural non-refractory clay and ceramic products
	Manufacture of articles of concrete
	Cutting, shaping and finishing of stone
	Manufacture of other non-metallic mineral products n.e.c.
acement	Manufacture of cement, lime and plaster
ametal	Manufacture of basic iron and steel
	Manufacture of basic precious and non-ferrous metals
	Manufacture of metal products
	Manufacture of structural metal products
	Manufacture of tanks, reservoirs and containers of metal
amprod	Treatment and coating of metals: general mechanical engineering on a fee or contract basis
	Manufacture of cutlery, hand tools and general hardware
	Manufacture of other fabricated metal products n.e.c.
	Manufacture of ovens, furnaces and furnace burners
	Manufacture of bearings, gears, gearing and driving elements
	Manufacture of machinery for food, beverage and tobacco processing
	Manufacture of agricultural and forestry machinery
amach	Manufacture of machine-tools
	Manufacture of machinery for mining , quarrying and construction
	Manufacture of machinery for food, beverage and tobacco processing
	Manufacture of domestic appliances n.e.c.
	Manufacture of other general purpose machinery
	Manufacture of electric motors, generators and transformers
	Manufacture of insulated wire and cable
aelecq	Manufacture of accumulators, primary cells and primary batteries
	Manufacture of electric lamps and lighting equipment
	Manufacture of electronic valves and tubes and other electronic components

	Manufacture of television and radio transmitters and apparatus for line telephony and line telegraphy
aveh	Manufacture of bodies (coachwork) for motor vehicles; manufacture of trailers and semi-trailers
	Manufacture of parts and accessories for motor vehicles and their engines
	Manufacture of motorcycles
amedq	Manufacture of medical and surgical equipment and orthopaedic appliances
	Manufacture of furniture
	Manufacture of jewellery and related articles
aomanu	Other manufacturing n.e.c.
	Recycling of metal waste and scrap
	manufacture of furniture; manufacturing n.e.c.
aelect	Electricity, gas, steam and air conditioning supply
	Water collection, treatment and supply
awater	Sewerage
	Waste collection, treatment and disposal activities; materials recovery
	Construction of buildings
acons	Civil engineering
	Specialized construction activities
	Wholesale and retail trade and repair of motor vehicles and motorcycles
atrad	Wholesale trade, except of motor vehicles and motorcycles
	Retail trade, except of motor vehicles and motorcycles
ahotel	Accommodation
	Food and beverage service activities
	Land transport and transport via pipelines
atrans	Water transport
	Air transport
	Warehousing
acomm	Telecommunications
	Postal and courier activities
	Financial service activities, except insurance and pension funding
afserv	Insurance, reinsurance and pension funding, except compulsory social security
	Activities auxiliary to financial service and insurance activities
apadmin	Public administration and defense; compulsory social security
aeduc	Education
	Human health activities
aheal	Residential care activities
	Social work activities without accommodation
	Real estate, renting, and other business services
	Legal and accounting activities
arest	Activities of head offices; management consultancy activities
	Architectural and engineering activities; technical testing and analysis
	Scientific research and development

aoserv	Advertising and market research Other professional, scientific and technical activities Veterinary activities Rental and leasing activities Employment activities Travel agency, tour operator, reservation service and related activities Security and investigation activities Services to buildings and landscape activities Office administrative, office support and other business support activities Creative, arts and entertainment activities Libraries, archives, museums and other cultural activities Gambling and betting activities Sports activities and amusement and recreation activities Activities of membership organizations Repair of computers and personal and household goods Other personal service activities Activities of households as employers of domestic personnel Undifferentiated goods/service activities of private households for own use Activities of extraterritorial organizations and bodies Wholesale and retail trade; repairs

Commodities	**Description**
ctef	Teff
cbar	Barley
cwhea	Wheat
cmaiz	Maize
csorg	Sorghum
cpul	Pulses
cveg	Vegetables nec
coils	Oil seeds
ccash	Sugar cane; chat; raw cotton
cfruit	Fruit Crops
ccoff	Coffee
censet	Enset
ccrop	Other cereal grains, tea, and other crops nec
cafeed	Animal feed
cflower	Flower
clive	Cattle: Live animal, meat Sheep: Live animal, meat Goat: Live animal, meat Camel: Live animal, meat Poultry; Other small livestock Animal products nec

cmeat	Meat products (processed)
cmanure	Manure
cmilk	Raw Milk
cfors	Forestry
cfish	Fish
cmin	Minerals nec.
cvprod	Vegetable products; animal oils and fats
cdairy	Dairy products
csug	Sugar and sugar confectionary
cgmillandgmillserv	Grain mill products & Grain milling service
cfood	Food products (including processed tea)nec;
cbev	Beverages
ctob	Tobacco Products
cmtob	Manufactured tobacco
clcott	Linted cotton
ctext	Textiles
capar	Wearing apparel
cleath	Leather products
cwood	Wood products
cpaper	Paper products publishing
coilptrl	Petroleum coal products
cfert	Fertilisers
cchem	Chemicals, rubber and plastic products
cpharm	Pharmaceutical Products
cminprod	Mineral products nec
ccement	Cement
cmetal	Metals nec
cmprod	Metal products
cveh	Motor vehicles and parts; other transport equipment
celecq	Electronic equipment
cmach	Machinery and equipment nec
comanu	Manufactures nec
celect	Electricity
cwater	Water
ccons	Construction
ctrad	Trade and repair services
chotel	Hotels and restaurants
ctrans	Transport services
ccomm	Communication
cfserv	Financial services

cpadmin	Public administration and defense
ceduc	Education
cheal	Health
coserv	Recreation and other services
crest	Real estate , renting services, and other business services

The most detailed version of the SAM contains the following classifications of households and labor

Households	**Description**
hh_rur1	The poorest quintile households who live in rural areas
hh_rur2	The second quintile of households who live in rural areas
hh_rur3	The third quintile of households who live in rural areas
hh_rur4	The fourth quintile of households who live in rural areas
hh_rur5	The top quintile (5th) of households who live in rural areas
hh_smac1	The poorest quintile households who live in small towns
hh_smac2	The second quintile of households who live in small towns
hh_smac3	The third quintile of households who live in small towns
hh_smac4	The fourth quintile of households who live in small towns
hh_smac5	The top quintile (5th) of households who live in small towns
hh_othc1	The poorest quintile households who live in other towns
hh_othc2	The second quintile of households who live in other towns
hh_othc3	The third quintile of households who live in other towns
hh_othc4	The fourth quintile of households who live in other towns
hh_othc5	The top quintile (5th) of households who live in other towns
hh_bigc1	The poorest quintile households who live in big cities
hh_bigc2	The second quintile of households who live in big cities
hh_bigc3	The third quintile of households who live in big cities
hh_bigc4	The fourth quintile of households who live in big cities
hh_bigc5	The top quintile (5th) of households who live in big cities

Mapping household categories			**Description**
hh_rur_p	hh_rur1	hh_smac1	Poor households living in rural areas
hh_rur_m	hh_rur2 hh_rur3 hh_rur4	hh_smac2 hh_smac3 hh_smac4	middle class households living in rural areas

hh_rur_r	hh_rur5	hh_smac5	Rich households living in rural areas
hh_urb_p	hh_bigc1	hh_othc1	Poor households living in urban areas
hh_urb_m	hh_bigc2 hh_bigc3 hh_bigc4	hh_othc2 hh_othc3 hh_othc4	middle class households living in urban areas
hh_urb_r	hh_bigc5	hh_othc5	Rich households living in urban areas

Other Mapping household categories		Description
hh-p	hh_rur1 hh_bigc1 hh_othc1 hh_smac1	poor households
hh-m	hh_rur2 hh_rur3 hh_rur4 hh_bigc2 hh_bigc3 hh_bigc4 hh_othc2 hh_othc3 hh_othc4 hh_smac2 hh_smac3 hh_smac4	Middle Class households
hh-r	hh_rur5 hh_bigc5 hh_othc5 hh_smac5	Rich households

Labor	Descriptions
lab-r-n	Labor – with no formal education and reside in rural areas
lab-r-p	Labor – with some formal education but have not completed high school and reside in rural areas

lab-r-s	Labor – completed high school but not college and reside in rural areas
lab-r-t	Labor – those that completed college education and reside in rural areas
lab-u-n	Labor – with no formal education and reside in urban areas
lab-u-p	Labor – with some formal education but have not completed high school and reside in urban areas
lab-u-s	Labor – completed high school but not college and reside in urban areas
lab-u-t	Labor – those that completed college education and reside in urban areas

Mapping of labor categories	**Descriptions**
lab:n	Labor – with no formal education
lab:p	Labor – with some formal education but have not completed high school
lab:s	Labor – completed high school but not college
lab:t	Labor – those that completed college education

Other mapping of labor categories

unskilled labor	lab-un	lab-n
semi-skilled labor	lab-ss	lab-p
		lab-s
skilled labor	lab-sk	lab-t
have secondary eduction bu have not finished college	lab-ss	lab-r_se
		lab-u_se
Skilled	lab-sk	lab-r_ter
		lab-u_ter