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THE IMPACT OF ECONOMIC PARTNERSHIP AGREEMENT (EPA) AND COUNTER FISCAL POLICY MEASURES FOR ETHIOPIA: A RECURSIVE DYNAMIC COMPUTABLE GENERAL EQUILIBRIUM MODEL

By

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The Impact of Economic Partnership Agreement (EPA) and Counter Fiscal Policy Measures for Ethiopia: A Recursive Dynamic Computable General Equilibrium Model

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Abstract

The Impact of Economic Partnership Agreement (EPA) and Counter Fiscal Policy Measures for Ethiopia: A Recursive Dynamic Computable General Equilibrium Model

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As a Growth and Transformation Plan (GTP), the Ethiopian government has planned to conclude the Economic Partnership Agreement (EPA) with European Union (EU) and joining Common Market for Eastern and Southern Africa- Free Trade Area (COMESA-FTA). Thus, in the study we have shown endeavour to examine the economy-wide effects of concluding those agreements. To attain the stated objectives, a recursive dynamic computable general equilibrium (CGE) model is used as an important analytical tool. As a main data base the model is calibrated with an updated version of 2005/06 Social Accounting Matrix (SAM). There were three individual and two combined simulations.

According to the simulation results, following tariff reduction, with exception of investment and government income, almost all of the macroeconomic indicators, sectoral output and welfare indicators have shown improvement. Similarly, in the combined simulation, tariff reduction and direct tax rate adjustment, though the percentage of improvement is lower for some variables all of the variables have recorded a positive change. Unlike the above simulations, the simulation combining tariff reduction together with sales tax rate adjustment has shown a negative change in some of macroeconomic indicators, sectoral output and welfare indicators. In concluding, in those simulations which included sales tax rate adjustment has brought adverse effect on most of the economic variables. Therefore, from the welfare point of view, the implication of our study is that, comparing the two compensating measures, it is beneficial to apply direct tax rate adjustment together with tariff reduction.

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Acronyms

AA – Association Agreement

ACP – African, Caribbean and Pasfic

BEC – Broad Economic Category

BPR – Business Process Reengineering

CEMAC – Communate Economique et Monetaired' Afrique Centrale

CES – Constant Elasticity of Substitution

CET – Constant Elasticity of Transformation

CGE – Computable General Equilibrium

COMESA – Common Market for Eastern and Southern Africa

CPI – Consumer Price Index

DPI – Producer Price Index

ECOWAS – Economic Commission for West Africa

EDRI – Economic and Development Research Institution

EEC – European Economic Community

EPA – Economic Partnership Agreement

ERCA – Ethiopian Revenue and Customs Authority

ESA – Eastern and Southern Africa

EU – European Union

EV – Equivalent Variation

FCU – Foreign Currency Unit

FDRE – Federal Democratic Republic of Ethiopia

FTA – Free Trade Area

GAMS – General Algebraic Modelling System

GATT – General Agreement on Tariff and Trade

GDP – Gross Domestic Product

GTP – Growth and Transformation Plan

IMF – International Monetary Fund

IO – Input - Output

LCU – Local Currency Unit

MPS – Marginal Propensity to Save

MTS – Multilateral Trading System

NTT – New Trade Theory

OECD – Organization for Economic Cooperation and Development

RIAs – Regional Integration Arrangements

ROW – Rest of the World

SADU – Southern Africa Development Community

SAM – Social Accounting Matrix

SAP – Structural Adjustment Program

SDT – Special and Differential Treatment

S-I – Saving - Investment

TIN – Tax payers Identification Number

TOR – Terms of Reference

TOT – Turnover Tax

TRIST – Tariff Reform Impact Simulation Tool

UNSD – United Nation Statistic Division

VAT – Value Added Tax

WTO – World Trade Organization

CHAPTER ONE

INTRODUCTION

1.1. Background

During the depression of the 1930s international trade became much restricted as countries imposed tariffs and other barriers to trade in an effort to mitigate the effects of unemployment by protecting their domestic markets for domestic producers. The outcome of these protectionist measures was a sharp decline in the level of world trade, due to increasing incidence of retaliatory protective policy. This led to the formation of the General Agreement on Tariff and Trade (GATT) in 1947 with the objective of avoiding further tariff wars and the consequent diminution in world trade volumes. The key principle of GATT is non-discrimination in trade relations, and the move towards completely free trade on a global scale. GATT negotiations have made slow progress since its inception, but progress has been made over the course of the various 'rounds': the Kennedy Round of the 1960s, the Tokyo Round of the 1970s and the Uruguay Round of the 1990s (Atkinion et.al, 1996).

Currently the global trade relations and the bulk of world trade are governed by World Trade Organization (WTO) agreements forming the multilateral trading system (MTS). Unlike GATT principles, the WTO agreements cover a wider set of border as well as domestic issues in a better way. All members of the WTO are obliged to be party to all agreements.

Apart from multilateral trade agreements (like that of WTO), there are also Regional trade Arrangements (RIAs) and bilateral trade agreements which serve as a best instrument to facilitate trade between and/ or among member countries.

When we say Regional Integration Arrangements (RIAs), it is to mean the case where a group of countries formed with the objective of reducing barriers to trade between the member countries. For the first time the concept of regional integration was raised following the establishment of the European Communities in 1950. As demonstrated in the Organisation for Economic Cooperation and Development (OECD) report (2005), more than half of the total world trade occurs through RIAs. Specifically during the period 2001 to 2005, trade grew from 43% to 60% because of RIAs.

Currently there are about 14 RIAs in Africa. Among this eight of them are regional economic communities and the remaining six RIAs are Inter-Governmental organization. Nonetheless, Regional Integration Arrangements among developing countries in general and African countries in particular was not successful. Unlike the case for developing countries, Regional Integration Arrangements in developed countries has been doing well. As a good example the case of European Union can be raised (Lyakurwa, 1997). Consequently, there is a change of interest among developing countries in regards to the formation of RIAs. Because of the recorded failures nowadays developing countries are showing interest in the formation of RIAs with the developed countries. The establishment of ACP-EU Economic Partnership Agreement (EPA)[1] was the result of the change in interest of developing countries in regards to the formation of RIAs. In summing up, the purpose of being the member of either multilateral trade agreement or regional integration arrangements is so as to

[1] Economic Partnership Agreements are an arrangement to create a free trade area (FTA) between the European Union and the African, Caribbean and Pacific Group of States (ACP). They are a response to continuing criticism that the non-reciprocal and discriminating preferential trade agreements offered by the EU are incompatible with WTO rules. The EPAs are a key element of the Cotonou Agreement, the latest agreement in the history of ACP-EU Development Cooperation.

liberalize trade between the member countries by removing both tariff and non-tariff trade barriers and then, to reap the benefit of free trade.

In Ethiopia efforts of trade liberalization has started in the year 1992, with re-structuring of the economy through Structural Adjustment Program (SAP). Through SAP, Ethiopia has embarked on far reaching policy and institutional reforms including drastic devaluation of the domestic currency (the birr) and reduction of tariff and non-tariff barriers. These days, quantitative import restrictions are applied only to use of clothes, harmful drugs and armaments for security reasons. Both tariff levels and dispersion have been reduced significantly under tariff reforms and specific tariffs have been converted into ad- valorem rates. By 2002, only 2.7% of total tariff lines had specific rates. The range of tariff rates narrowed from pre-reform 0-240% to 0-80% in 1995 and then to 0-35% in 2002. In the year 2004, the maximum tariff rate has been reduced to 35% with an average rate of 17.5% (Khandelwal, 2004).

Altogether, to reap the benefit of free trade, currently the Ethiopian government has planned to integrate the country into multilateral trading system, as a part of the Growth and Transformation Plan (GTP). In order to achieve the stated goal there is a need for successfully completing the WTO accession process and also strengthening regional trade integration with the Inter-Governmental Authority on Development, Sana'a Forum, The Common Market for Eastern and Southern Africa (COMESA) and the COMESA- East African Community- Southern African Development Community Tripartite. Apart from this, government has planned to conclude the Economic Partnership Agreement with European Union (EPA-EU).

1.2. Statement of the problem

Being the member of either multilateral trade agreements or regional integration arrangements, a given country can pursue trade liberalization. Subsequently, the liberalization process will bring new opportunities for accelerating growth and development. Moreover, in most of the economic literature, it is demonstrated that, trade liberalization leads to an increase in welfare, which is derived from an improved allocation of domestic resources. Generally speaking, import restrictions of any kind will create an anti-export bias by raising the price of importable goods relative to exportable goods. Thus, the removal of this bias through trade liberalization will encourage a shift of resources from the production of import substitutes to the production of export-oriented goods. This, in turn, will generate growth in the short to medium term as the country adjusts to a new allocation of resources more in keeping with its comparative advantage (McCulloch, Winters and Cirera, 2001).

Overall, by being the channel through which surplus national production can be exchanged with the products of other countries and also through efficient allocation of resources, trade promotes economic growth and bring welfare improvement. However, though the dominant view on both theory and empiricism maintain welfare enhancing effect of trade liberalization, its impact on welfare is still a centre of argument. These could be affirmed by the increasing concern shown in different literature that trade liberalization might lead the country to incur adjustment cost which may be discouraging for the country from pursuing such reforms for the fear of potentially negative effect on the welfare of the consumer.

According to Matusz and Tarr, (1999), it is expected to create adjustment costs, encompassing a wide variety of potentially disadvantageous short-term outcomes.

These outcomes may include a reduction in employment and output, the loss of industry- and firm-specific human capital, and macroeconomic instability arising from balance-of-payments difficulties or reductions in government revenue. The size of the adjustment costs depends on the speed with which resources make the transition from one sector to another.

Nevertheless, Papageorgiou et.al (1990) showed that, of trade reform in 19 developing countries trade liberalization did not generally result in decreased employment, even in the short term. The researcher observed that compared with the pre-reform period, manufacturing employment was higher during the reform period compared with the levels registered prior to liberalization. Similarly, Matusz and Tarr (1999), in a review of more than 50 empirical studies, found that the adjustment costs to the economy are very small in relation to the benefits of trade liberalization.

Coming to the case of Ethiopia, by being the member of either multilateral trade agreement like WTO or regional trade arrangements (RIAs), Ethiopia can pursue trade liberalization. Thus, generally speaking the process of trade liberalization is expected to provide benefits for Ethiopia in terms of lower import prices of investment and consumption goods that bring about higher consumer welfare. However, trade liberalisation has also a negative impact on government revenue due to reduced import tariff duties. Hence the possible compensating measures (counter fiscal policy measures so as to compensate the forgone tax revenue) that would be taken by the government may impose ambiguous impact on different economic variables. Furthermore, low income households will probably fail to exploit the benefits of increased incentives for investment and will therefore fail to make use of the full potential of trade liberalisation. This could be asserted by the point raised by

Winters (1996), trade liberalisation generally contributes to poverty alleviation, but trade reforms might create some losers, even in the long-run.

So far, different work has been done regarding the impact of trade liberalization in terms of complete and instantaneous import tariff removal, on the welfare of the consumer. However, in almost all of the previous works, the revenue implication of pursuing trade liberalization was ignored. Besides, even in those studies which considered the revenue implication of the liberalization process, they failed to use the appropriate model which would enable to capture both the first and second order effects of the policy change. In simple language, in those works the major model was the partial equilibrium model which will not show the economy-wide effects of a policy change. Thus, to capture these interrelated effects of the liberalization process we need a general equilibrium model (Computable General Equilibrium model).

Moreover, the revenue implication of trade liberalization should be given a great concern. That is, trade policy reforms should be accompanied by effective strategies to optimize fiscal revenue and trade reforms. This view point was affirmed by Ebrill et al. (1999) who demonstrated that trade tax as percent of GDP average around 0.6% among Organisation for Economic Cooperation and Development (OECD) countries and 4.4 per cent among non- OECD countries. If these measures are not undertaken together with trade liberalization reforms, they could result in a substantial reduction of government revenue, yielding larger fiscal deficits and inducing inflation. These are very import for developing countries.

Therefore, this study fills the existing gap by addressing the issue of revenue implication of signing an EPA with EU and joining COMESA-FTA and also the

counter fiscal policy responses that government would take in order to compensate the forgone tax revenue.

Generally, this study will address the following research questions:

- ✓ What is the long-run impact of signing EPA with EU and joining COMESA-FTA on household's welfare?
- ✓ How will tariff reduction affect sectoral, macro-economic indicators and welfare of the households?
- ✓ What would be the impact of the counter fiscal policy measures on the welfare of the household?
- ✓ Which counter fiscal policy measure is appropriate with regards to the impact it imposes on the welfare of the households?

1.3. Objectives of the Study

General Objective:

The overall objective of this study is to examine the economy-wide effects of signing EPA and alternative revenue compensating measures by undertaking the liberalization policy simulations with recursive dynamic computable general equilibrium model.

Specific Objectives:

- ✓ To examine the long-run impact of signing EPA with EU and joining COMESA-FTA on the welfare of the household;
- ✓ To find out the effects of tariff reduction on sectoral and macro-economic variables;
- ✓ To assess the impact of the trade policy change on the government revenue and there by devising a new counteracting fiscal measures to offset the impact;

- ✓ To examine the combined effect of tariff reduction and operation of counter fiscal policy measures on macroeconomic indicators, sectoral output and the welfare of the households;
- ✓ Forwarding policy implications of the study.

1.4. Methodology of the Study

As it is evident that, the partial equilibrium model is not comprehensive enough to account for all the complex relationship between trade liberalization, counter fiscal policy responses and welfare issues. Thus, to examine the economy-wide effects of trade liberalization and counteracting fiscal policy measures a more comprehensive general equilibrium model (CGE model) is used since it show both the first and second round effects of the simulated changes on inter-industry and macroeconomic adjustment.

Accordingly, a computable general equilibrium (CGE) model is used to estimate economy-wide effects of trade policy change and to forecast the economic effects of a policy change. However, regardless of the great importance of the outputs of such models to policy makers, they are not free of limitations. The critiques include incorporating *ad hoc* assumptions about the price responsiveness of supply and demand, assumption of a representative agent (while individuals reflect different behaviours), the key elements that drive the results of a scenario are not always transparent, and the models and their associated databases are costly to build and maintain (Scrieciu, 2006).

In the study, the model is numerically calibrated based on the 2005/06 Social Accounting Matrices (SAM) which is updated for 2009/10 economy. This is due to the fact that the current structure of the Ethiopian economy is different from 2005/06

economy on which the existing SAM is based. The SAM represents the Ethiopia's economy by activities, factors (land, capital and different types of labor) and commodities. As demonstrated by Lofgren et.al (2002), the model followed the disaggregation of factors, activities, commodities, and institutions which is given by the SAM.

In order to achieve the stated specific objectives, a recursive dynamic CGE model is used while running the three basic scenarios with their varied combination. Scenario 1 tariff reduction, scenario 2 direct tax measure and scenario 3 indirect tax measure. The percentages of tariff reduction used in the simulation are based on the requirement of terms of reference (TOR). Accordingly, in the study, to examine the impact of the signing of EPA with EU, 80% tariff reduction is simulated. And in the COMESA-FTA counterpart, 100% tariff reduction is considered.

The study simulated the impact of 80% tariff reduction for products originating from EU member states (excluding the list of sensitive products) and 100% tariff reduction for the products originating from ESA member states in the first simulation. In the second and third simulation, the effects of the increase in direct and indirect tax (sales tax) are simulated. The exact amount of the percentage increment in direct and indirect tax (sales tax) is calculated based on the result obtained in the first simulation (based on the observed revenue loss following tariff reduction). The fourth simulation combined simulation 1 and simulation 2 whereas the fifth simulation combined simulation 1 and simulation 3. In summing up, the CGE model is solved using General Algebraic Modelling Systems (GAMS 23.7).

1.5. Scope of the study

The focus of this study is to examine the overall impact of Economic Partnership Agreement (EPA) and the alternative counter fiscal policy measures. Specifically, the study has analysed the combined effects of signing EU-EPA and joining COMESA-FTA on different economic variables. Additionally, the revenue implication of the EPA and the effects of the alternative compensating measures on the economy were assessed.

1.6. Significance of the Study

By signing the EPA with EU and joining COMESA-FTA Ethiopia is expected to pursue a trade liberalization process. This process in turn may have its own implication on the revenue of the government. Therefore, by considering the link between trade reform and the resulting fiscal impact, the finding of this study is expected to provide the appropriate counter fiscal policy reform that the policy makers need to consider while pursuing the liberalization policy. In other words, this study will provide a justification that trade policy reform should be accompanied by effective strategies to optimize fiscal revenue and tariff reforms. Moreover, such study will provide a room for further research on the link between the trade policy reform and fiscal policy reform.

1.7. Organization of the Paper

The paper is organized into six chapters. Chapter one deals with introduction and chapter two treats theoretical and empirical literature reviews. Chapter three discuss about foreign trade and tax administration in Ethiopia. Chapter four describe data and methodology of the study and chapter five present results and findings of the study and policy simulations. Finally, chapter six, provide conclusion and implications of the study.

CHAPTER TWO

LITERATURE REVIEW

2.1 Theoretical Literature

2.1.1. Introduction

It is argued that, the term trade liberalization tends to be interpreted in three broad ways. Countries may be considered more out ward oriented if their trade reforms imply a move towards neutrality, liberality or openness. A move towards neutrality involves equalizing incentives, on an average, between the exporting and import-competing sectors. A more liberal regime is the one where the level of intervention has been reduced. Lastly, an increase in openness is equated with an increase in the importance of trade in the economy (Pritchet 1996).

According to Winter (2000), trade liberalization is defined as the reduction of official barriers to trade that distorts the price of tradable and non-tradable goods and services.[2] However, its practical overall measurement is challenging. This is because identification of all distortionary policies is rare. Further, it is uncertain that how the promised policy changes have actually been implemented.

[2]Tariffs and non-tariff measures are considered to be distortion in the markets that encumber trade and cause trade and welfare losses to the economies. Thus, trade liberalization and facilitation are understood as the removal and/or the reduction of economic distortions. Generally, such measures reduce import barriers, which increase imports and lowers import prices to the domestic market. Theoretically, these cheaper imports, in turn, lead to lower cost of production for other domestic industries. Relocation of labour and capital to other, more efficient sectors concurrently takes place from the formerly protected sectors. The improved competitiveness of the export sector increases the exports of the economy. According to the standard assumption in theoretical framework, trade accounts tend to be balanced in the long-run. Consequently, the export of the economy will increase until balanced trade is eventually recovered.

Similarly, Lee (1988), loosely defined trade liberalization as a move towards freer trade through the reduction of tariff and other barriers, is largely perceived as the major driving force behind globalization. Rapidly increasing flows of goods and services across national borders have been the most visible aspect of the increasing integration of the global economy in recent decades. Nevertheless, this has also been one of the most argumentative aspects of globalization.

Further, before proceeding to inspect the empirical evidence, it is necessary to review a few issues relating to the concept of trade liberalization and its measurement. Conceptually, trade liberalization is often defined in terms of the bias in the incentive structure between exports and imports. The free trade position is one where incentives are neutral between exports and imports. Thus, trade liberalization could be achieved either by the reduction of tariffs or of any anti-export bias through other means. Another element of trade liberalization is the replacement of an instrument of trade control by another that is less distorting of the incentive structure. A common example of this is when quantitative restrictions on trade are replaced by a tariff.

With regards to the measurements, in practice there are several ways in which the extent of trade liberalization can be measured but there are problems with each of these. One measure usually adopted is that of relying on announced changes in policy such as a reduction in tariffs or the removal of quantitative restrictions. This, however, must be checked against actual performance and the possibility for instrument substitution, that is, changes in other policies that may negate the intended effects of the announced policy changes. A second measure is based on a direct estimate of the change in the bias in trade regime as reflected in changes in relative prices. This, however, often runs into problems of weighting and aggregating price changes.

A third measure is to use multiple criteria such as tariff changes and changes in relative prices but this too faces the same problems of weighting and aggregation (Lee, 1988).

2.1.2 Doctrine of Free trade

The importance of international trade to a nation's economic welfare and development has been heavily recognized in the economics literature since Adam Smith's (1776) pioneering investigation into the nature and causes of the wealth of nations. In simple language, the theory that trade is positively correlate with economic growth goes back to Adam Smith, who argued that trade allows for increased specialization. According to his explanation, specialization permits increased attainment of economics of scale, especially from countries with relatively small domestic markets.

Through trade a given country may also fully exploit its abundant means of production. Because of competition from imports, domestic businesses are forced to improve their technologies. In addition, increased economic integration with the outside world encourages technological innovation through the diffusion of new technologies from more advanced countries. Increased imports curb domestic monopolies that hold production below and prices above socially optimal levels.

To sum up, for Smith absolute advantage determine trade patterns among countries. Accordingly a given country will have absolute advantage when it is more productive than another country in producing a particular product. Thus, a country should specialize in the production of and export products for which it has absolute advantage; import other products.

From 1500 – 1800 was the period of Neo-mercantilism/ mercantilism. They promote the idea that a country should export more to ‘’strangers’’ than import a mass treasure from other countries. According to their view government should intervene to achieve a surplus in export. Generally, as opposed to free trade, which was championed by both Smith and Ricardo as a route to achieve production efficiency at a global level, the mercantilists advocate the policies of protection.

Meanwhile, David Ricardo sorted out the basic premises of a theory of free trade, which Smith had initiated. Unlike the case for Smith, it was comparative advantage and not absolute advantage, which was considered both necessary, as well as sufficient, to ensure mutually gainful trade across nations, guaranteeing complete specialization in the specific commodity with a comparative advantage in terms of labour hours used per unit of output (since Ricardo’s cost calculations were based on labour hours, which were treated as a single homogeneous input with production subject to constant costs). In this model, comparative advantage takes the form of technological differences (Sen, 2010).

Besides, the Ricardian model was developed to respond to the mercantilist’s view that exports are good and imports are bad. To prove his point, David Ricardo, considered an example in which trade between two countries (England and Portugal) is balanced. This is to mean, the value of imports equals the value of exports for each country. According to Ricardo, the deriving factor for trade to occur between England and Portugal was the existing technological difference in the production of wine and cloth in the two countries. Portugal has an absolute advantage in both goods, but England has a comparative advantage in cloth. That is, the opportunity cost of producing cloth in England is lower than in Portugal. Based on this comparative advantage, the no-trade relative price of cloth is also

lower in England than in Portugal. Because of trade, cloth merchants in England export to Portugal, where they can obtain a higher price, and wine vintners in Portugal export to England. Therefore, as we have seen in the above example its comparative advantage which determined the pattern of trade among the two countries and also both countries gain from trade (Finestra, 2002).

Later, the balancing act between forces of supply and demand was carried forward by the Austrian school with their notion of opportunity cost, defined in terms of the utility of foregone consumption. This provided the base for the Heckscher-Ohlin version of free trade doctrine that followed. It was a Herculean job for the neo-classical economists in setting the stage to arrive at the factor-endowment based theory of free trade. Thus consumer preferences (or demand) in either country had its role in determining both commodity or factor prices (including those of labor) in the pre-trade stage, reflecting the disparities in factor endowments.

The H-O Theorem is the foundation for the standard argument international trade theory regarding the distributional consequences of freer trade. By maintaining the comparative advantage principle, the theorem extended Ricardo's model to two production factors: capital and labour. According to this theorem, a country has a comparative advantage in the production of the good which intensively uses the factor of production that is relatively abundant.

Accordingly, with identical consumer preferences between the trading partners, factor endowments determine the price competitiveness of the traded goods. The common world price was settled at a level that was within the boundaries set by the pre-trade prices in the two countries. While factors of production were

assumed to be immobile (as in the Classical comparative cost theory), equalization of commodity prices was supposed to bring about the equalization of factor prices across countries. Problems in arriving at uniform prices in absolute terms with different national currencies were carefully avoided by ignoring, altogether, the possibility of different currencies across nations.

Generally, the Heckscher-Ohlin (and later Samuelson), in short HOS, version of free trade doctrine played down the otherwise overwhelming role of demand on market prices in order to bring resource endowments of nations to the centre stage as the determining factor for mutually gainful trade. With this device, free trade theory moved away from the skill- or technology-based interpretations of the Ricardian comparative cost doctrine to an endowment based explanation for nations having similar access to technology.

Following the H-O Theorem, the S-S Theorem predicted that free trade equalises factor prices among trading countries. At the heart of this explanation is the existence of proportionality between prices of goods and prices of factors. Accordingly, trade liberalization causes expansion of some sectors and contraction of others based on the existing comparative advantage. In the meantime, resource will be transferred from the shrinking import competing sector to the expanding export sector. Consequently, factor intensity will change in all productions because the release of factors of production from the import competing sector will be at different proportion than what the expanding export sector used to absorb. Subsequently, the scarce factor in trading nations (factor in the import competing sector), are to lose under free trade under factor price equalization. For instance, labour which is considered as the scarce factor of production in United States was

considered to benefit from protection and not from free trade (Stolper and Samuelson, 1941).

In the meantime, the rigid framework of trade theory being questioned from different quarters. In the late 1970s and 1980s different researchers has developed the new trade theory. They were motivated by the failure of more traditional theories to explain some of the most significant facts about post World War II trade data. As Helpman and Krugman (1985) explained, the new trade theory was designed to account for three major facts:

- The ratio of trade to GDP has increased.
- Trade has become more concentrated among industrialized countries.
- Trade among industrialized countries is largely intra-industry trade

In a major departure from old trade theories, attempts were made in the new trade theory (NTT) literature to introduce endogenous difference among countries. One focus is on economies of scale. The wider market due to trade induces a cost advantage in an industry in one of the countries. Here, a major point raised in these modifications included the impact of increasing returns to scale on the pattern as well as on the mutual benefits from international trade. Another point, to appreciate the implication of economies of scale, one need to notice the related issue of imperfect markets, which always go with the former. Products, especially under monopolistic competition, are likely to be differentiated, generating further deviation from a competitive model. Wholly, there are three deviants that differentiate the NTT from the old trade models of the HOS variant. These are consisting of economies of scale, imperfect markets and product differentiation.

Krugman (1981) and Ethier (1982) stated that as for economies of scale, which are external to the firm and internal to industry, production achieves a global span in terms of location. This, in terms of NTT, permits cost reduction on a global scale while dislocating production from areas/countries where is less cost efficient. Implicit in the argument is a case for free trade that relies on the potential gains to all trading nations by achieving increasing returns on a global scale.

Furthermore, Helpman (1984) and Ethier (1979) has made dissection between economies of scale that are of ‘’national’’ origins as distinct from the ones that are ‘’international,’’ the later arising from developments in the global industry. As with other scale economies, both are troublemaking to the predictive power, as well as the major theorems, of the traditional HOS model. Nonetheless, gains from trade arise with increased output of industries in trading countries that enjoy national-level scale economies. Correspondingly, gains from trade are also made possible to industries that enjoy economies of scale arising at an international level. Specifically, small economies that otherwise cannot access these economies are supposed to gain by opening up. Thus, trade can be beneficial/loss-making with external economies at the international level for nations with possibilities of gaining economies of scale/avoiding diseconomies of scale with integrated markets.

Conversely, aside from its innovative critique of the traditional theories, the NTT, as has been rightly pointed out, has remained ‘’…fully consistent with ‘traditional theory.’ It examined innovatively and broadly the exceptions that the ‘traditional theory.’ Would admit to its standard results…’’ (Darity and Davis, 2005). Bhattacharjea (2004) argued in its comprehensive analysis and critique of NTT,

‘’…limitations [that have] remained entrenched in the new trade theory because of its excessive dependability on the old’’.

Moreover, Darity and Davis (2005) has demonstrated that, undeniably the free trade doctrines of the traditional variety or the NTT with their purely positive approach to world trade both were unsuccessful in addressing the dynamic implications of trade opening in terms of growth and development of the trading nations; particularly for developing countries. It is interesting to note that these static theories of optimal resource allocation under free trade, in the standard comparative cost version or in the HOS theorems, both failed to reckon the awareness shared by Smith and Ricardo on uneven development of nations.[3]

Altogether, it appears that the evolution of trade theory, from old trade doctrines to the NTT, has impacted policy at two levels. The first relates to the continuing support of the free trade doctrine to determine policy for developing areas. As is expected, the push comes from the advanced nations, both at the intergovernmental level and at multilateral institutions like the IMF and the WTO. The second impact of trade theory relates to policies pursued by the advanced nations, which relies considerably on the NTT doctrines of strategic trade. The uneven power relations between the rich and poor nations of the world permits a continuation of this asymmetrical combination of policies, to which trade theory unfortunately has contributed much. Much of the preoccupation of the policymakers with the micro-theoretic formulations of trade

[3]That is, the analysis of increasing returns, innovation, and market-size in Smith, and of technical progress as in Ricardo. Particularly, Smith seems to be aware of the “marked differences” in economic development of nations as “…he refers to ‘nations of savages’ coexisting with ‘civilized nations’.” As it has been contended, both Smith and Ricardo, despite their basic differences on the respective notions of increasing as distinct from diminishing returns to scale, “…provide a framework for directly addressing the phenomenon of divergent economic development” (Darity and Davis, 2005).

theory, both old and new, are related to a total neglect of the macroeconomic issues relating to the national as well as the world economy (Sen, 2010).

2.1.3 Trade Policy and Economic Performance

As stated in the background part, the consensus in most economic literature, trade liberalization as a reform which leads to welfare improvement through efficient allocation of domestic resources. This issue is asserted by the fact demonstrated by McCulloch, Winters and Cirera (2001) which says, import restriction of any kind create anti-export bias by buoying up the price of importable goods relative to exportable goods. Hence, the removal of this bias by pursuing trade liberalization will facilitate the efficient allocation of recourses (i.e., the shift of resources from the inefficient import competing sector to the more efficient export oriented sector). Subsequently, as the country adjusts to the new resource allocation growth will generate in short to medium term. On the contrary, following trade liberalization there are some adjustment costs, including a wide variety of potentially disadvantageous short term outcomes. This was affirmed by the work of Matusz and Tarr (1999) who listed some of the unwanted consequences of the liberalization process. This may include, reduction of production, unemployment problem, loss of activity specific human capital and macroeconomic instabilities arising from balance of payment problems.

Nonetheless, trade liberalization in and of itself has not yet been explicitly and universally linked to subsequent economic growth. Though there is a vast literature looking at this link, various empirical studied have not found the evidence conclusive.

As argued the literature is largely uninformative, and that there is a significant gap between the conclusions derived from theory and the ‘’facts’’ (Rodriguez and Rodrik, 1999). According to the researchers, many factors explain this gap. In several occasions, the indicators of ‘’openness’’ used by authors are problematic, as measures of trade barriers are highly correlated with other sources of economic performance. In other cases, the empirical strategies used to ascertain the link between trade policy and growth has serious shortcomings, the removal of which results in significantly weaker findings. Furthermore, the simultaneous implementation of other far-reaching reforms makes it difficult to separate the impact of the trade liberalization process. This being said, it is also important to note that although trade openness has not been unequivocally linked to higher growth, it has certainly not been identified as a hindrance.

In conclusion, McCulloch, Winters and Cirera (2001) said that, it may be fair to say that openness, by leading to lower prices, better information and newer technologies, has a useful role to play in promoting growth. But it must be accompanied by appropriate complementary policies (most notably, education, infrastructure, financial and macroeconomic policies) to yield strong growth results. Thus, the precise mix of trade and other policies that is needed will strongly depend on the specific circumstances of each country.

2.1.4 The impact of trade liberalization

The effects of changes in trade policy on a given country can be separated into two components. First, the ‘’terms-of-trade effect’’ states about, gains or losses associated with changes in world prices as a result of the policy. In other words, most countries

are too small for their trade policy to have a perceptible effect on world prices. But global trade agreement can significantly influence world prices.

In developing countries, unlike the developed countries most of exportable items are agricultural commodities. As demonstrated by Raul Prebisch and Hans Singer, the commodity terms of trade of developing countries deteriorated from 1870 to 1938. According to their explanation, this was because most or all of the productivity increases that took place in developed countries were passed on their workers in the form of higher wages and income while most or all of the productivity increases that took place in developing countries were reflected in lower prices. Developed countries retained the benefit of their own productivity increases in the form of higher wages and income for their workers, and at the same time they also secured most of the benefits from the productivity increases taking place in developing countries through the lower prices that they were able to pay for the agricultural exports of developing countries (Salvatore, 2005).

Generally, if growth in a nation leads to more exports but its commodity terms of trade deteriorates very much, the nation's welfare may decline. This situation was called immiserizing growth by Jagadish Bhagwati, the trade economist who first raised this issue. This is a situation where a nation's terms of trade deteriorate so much as a result of growth that the nation is worse off after growth than before, even if growth without trade tends to improve the nation's welfare.

Second, the ''efficiency effect'' states about, gains or losses associated with removing distortions in the country's own market. As demonstrated by Bouët (2008), unless there are significant externalities, a reduction in market distortions is generally expected to have efficiency effects. That is, domestic market liberalization; to the

extent that it reduces distortions in the economy will generate more benefits than costs on balance, irrespective of the action of its trade partners.

In conclusion, though most empirical result show the aggregate benefit of trade liberalization, the size and sectoral details of the results vary considerably. The rationale behind the difference in the size and sectoral details of the results are explained by Bouët (2008). These are:

- **The geographic scope of the liberalization**. This is to mean, the liberalization may be multilateral, regional, bilateral, or unilateral.
- **The sectoral scope of the liberalization**. The liberalization may be limited to the industrial or agricultural sector, or it may embrace all sectors.
- **The nature of the liberalization.** The study may simulate reduction in tariffs, cuts in export subsidies, lower domestic price supports, and so on.
- **The extent of reform.** The simulation can be partial or full liberalization depending up on the possible outcome of trade negotiations.
- **Whether or not the model includes dynamic effects**. Some models only count the one-time static impact of trade liberalization, while other models attempt to capture its dynamic effects on investment and economic growth. Models that include dynamic gains usually show the long-run effects.

- **The assumptions in the model.** All trade models are based on a large number of assumptions about the economy, including the operation of labor markets, investment, the trade balance, and the degree of factor mobility, all of which may affect the results.

Therefore, in the following section different empirical evidence will be reviewed which will present the different arguments given by different researchers about the impact of trade liberalization.

2.2 Empirical Evidence

So far, it is not unambiguous how much trade liberalization would improve welfare, and several studies have attempted to assess the size of these benefits. Therefore, this section discusses the issues raised in analysing the revenue impacts of preferential trade liberalization based on a brief review of the existing studies conducted on the implication of EPA and COMESA-FTA on Ethiopian economy. Furthermore, the impact of implementation of EPA by countries other than Ethiopia is also reviewed.

In the year 2000, Zewde and Associates examined the revenue implication for joining of COMESA-FTA and also the competitiveness of selected manufacturing industries. The study has estimated the revenue loss at less than 1% of the total tax revenue, which reflected the low level of trade within the region. With regards to the competitiveness of industries, the study found out those Ethiopian industries to be largely uncompetitive. However, it is recommended that Ethiopia enter into COMESA-FTA, taking into account the negative impact on industry as a short-term cost so as to better compete for foreign investment which might find the larger sub-regional market attractive and to benefit from the learning experience in preparing to conform to WTO provisions. Like the case for Feraboli (2008), here also the issues of various compensating measures to offset the loss of revenue were raised.

Choudhri et al. (2006) has demonstrated that, trade liberalization offers long-run efficiency benefits but it can also give rise to costly short-run macroeconomic adjustment. The estimates were derived for a small developing economy that initially has higher trade restrictions in the form of tariffs than the rest of the world. This study has explored the relative importance of the stated effects within a dynamic general equilibrium model that captures key elements of both international trade and

macroeconomic models. One of the finding of this paper was that the adjustment costs of trade liberalization were not only relatively small but also can be avoided by appropriate monetary policy.

Further, using the WITS/SMART partial equilibrium model on 2002/03 dataset, Hammouda et al. (2006) has demonstrated the welfare effects and revenue implication for Ethiopia from EU-EPA and from the combined entry into the EPA and the COMESA-FTA. Through different simulations, the researchers have find out that full liberalization under EPA would result in revenue loss of about 4% of Ethiopian government revenues in 2002/03. With regards to consumer welfare, they estimated that Ethiopia would gain about 0.22% of Ethiopian GDP in 2002/03. In the case of simultaneous entry into EPA and COMESA-FTA, government revenue loss has raised, while the percentage change in welfare improvement is greater than result recorded when Ethiopia is only signing EPA with EU. The limitation of the study is the probability of underestimation of the actual effects of the liberalization process since the major analytical tool used is the partial equilibrium model.

Likewise, Brenton et al. (2009), has assessed the impact of the signing of an EU-EPA and joining COMESA-FTA. They used a partial equilibrium which was developed at World Bank particularly to estimate the revenue impact of trade reforms, the Tariff Reform Impact Simulation Tool (TRIST). In addition, this model is structured in the way which would enable to take into account the impact of tariff reduction on other tax revenues derived from imports, like VAT and excise tax. According to their finding, running the simulation on the actual revenue collected reduces tariff revenue by almost half. This was explained by the fact that in the simulation the list of sensitive products were not excluded.

Unlike the above authors, Feraboli (2008) examined the intertemporal effects of the Association Agreement (AA) between Jordan and EU on the Jordanian economy using a multisectoral dynamic CGE model as a major analytical tool. Specifically, the author has given great emphasis on the welfare impact of the AA. According to the AA, tariffs on industrial products imported from the EU member states is eliminated progressively, whereas customs duties on agricultural products and processed agricultural products are gradually and only partially eliminated. In concluding, the operation of AA raises consumer welfare in Jordan and brought positive effects on all macroeconomic variables in the long-run, but it reduces consumption in the short-run. As a strong side, in addition to the revenue implication of the application of the AA, the author has raised issues about the need for alternative compensating fiscal measures in order to offset the loss in government revenue following the liberalization process.

Similarly, using standard neoclassical dynamic computable general equilibrium model, Feraboli and Trimborn (2008) has investigated the economic implication of introduced trade liberalization on aggregate performance as well as effects on welfare and income distribution of heterogeneous households of Jordan. The liberalization process was following the Association Agreement between Jordan and EU entered into force in 2002. The agreement provides a gradual reduction of import duties on EU products over a period of twelve years. The writers disaggregated the households into six different groups ranked by their disposable income. They find a result which supported the fact that, effects are diverse among household, since one household group even lost welfare. Finally, they concluded that, trade liberalization alone is not Pareto improving for Jordan.

Moreover, Cho and Diaz (2011) analysed the distributional welfare impact of trade liberalization reforms on heterogeneous households. The researchers developed a static applied general equilibrium model, and using a Social Accounting Matrix and Household Expenditure Survey, they calibrated it to match Slovenian data. They simulated the case of Slovenia joining the EU and quantify its welfare impact on households that differ in terms of age, income, and education. Additionally, the researchers compared this benchmark case with two alternative scenarios: (1) a free trade agreement between Slovenia and the EU and (2) a custom union arrangement where tariff revenues are rebated proportionally to the households. As a conclusion, while trade liberalization leads to falling consumer prices, increased production in the export sectors, and aggregate welfare gains, the differentiated welfare impacts across heterogeneous households vary in their degrees.

Altogether, from the reviews of different literature, one can deduce that, the revenue impact of EPA with EU and the COMESA-FTA would be quite small. As demonstrated in the work of Zewde and Associates (2000), the local industries would be uncompetitive and could even suffer severely from unrestrained competition from COMESA let alone EU firms. Furthermore, about the impacts of the application of EPA, different studies have argued that the agreement could be staged in, dispersing the impact over a number of years. Hence, facilitating adjustment of the economy and mitigating the duty of compensating for the forgone revenue.

Nonetheless, in almost all of the above literature we have reviewed, specifically, in all of the literatures about the impact of the implementation of EPA with EU and joining COMESA-FTA, the methodology that has been used for analysis purpose was partial equilibrium model. As we have discussed in the introductory chapter, the short

coming of the partial equilibrium model is the failure to show the second round effects of policy change. Thus, we need an analytical tool which will enable as to measure both the first round effects of simulated changes, and second round effects on different macroeconomic and other variables. These days a Computable general equilibrium (CGE) models are used as a useful tools to estimate economy-wide effects of trade policy changes. In our study, to address the welfare effects and revenue implication of the simultaneous entry to EU and COMESA-FTA, a recursive dynamic CGE model is used as a major analytical tool.

CHAPTER THREE

FOREIGN TRADE AND TAX ADMINISTRATION IN ETHIOPIA

3.1 Introduction

It is very difficult to get reliable documentary evidence as to when exactly taxation was introduced in Ethiopia. As a belief, the introduction of taxation in the country is associated with the formulation of government. However, as it was gauged, it was started during the reign of Emperor Zerea Yakob in the 15th century. Till the replacement of the traditional method of taxation by the modern tax system (in the mid-20th century), people used to make some sort of contributions to the governor of their state in terms of cattle and agricultural products (ERCA, 2011).[4]

Nevertheless, during the relatively modern administration of Emperor Haileselassie-I, the traditional method of taxation was continued. After the five-year Italian occupation, an income tax proclamation was issued for the first time. While during the Derg Regime (1975-1991), in order to raise more revenue to finance the civil war together with ever growing public sectors, the tax base was increased and also some changes were made with the tax rates. In nutshell, during the transitional government of Ethiopia (from 1991-1995), with the establishment of regional governments, major changes took place in the tax policy of the country. That is, tax brackets and tax rates were modified and new tax bases such as taxes on mining activities and on capital gains were introduced.[5]The country's tax policy is generally designed for two main

[4]Succeeding the formulation of central government (starting from the early 19th century to the reign of Emperor Menelik II), tax was paid in kind or in labor service progressively took the shape of modern taxation.

[5]After the adoption of the 1994 Constitution of Ethiopia, the power to levy and collect taxes from the respective sources was given to both the federal and regional government. Some of the major changes that took place in the tax system of the country during the Federal Democratic Republic of Ethiopia (FDRE) since the adoption of the 1994 constitutions were: reduction in the top rate of employment

purposes; on one hand, so as to finance the ever-growing needs of government expenditure. This policy is geared towards promoting investment; supporting industrial development; and broadening the tax base and decreasing the tax rate. On the contrary, this policy is geared toward discouraging certain production and consumption activities which had/ and will have adverse effects on health, moral, economic and social settings of the community. The duty to accomplish the above stated policy objectives are given to the Ethiopian Revenues and Customs Authority (ERCA).

Commonly, in Ethiopia tax payers are classified into three major categorizes; those individuals or companies incorporated under the laws of Ethiopia, which have an annual turnover of Birr 500,000 or more are classified under category ''A'' taxpayers; those individuals or enterprises, which have legal entity and whose annual turnover is more than Birr 100,000 and below Birr 500,000 are classified under category ''B'' taxpayers and finally, those individuals and business enterprises whose annual turnover estimated to be Birr 100,000 are classified under category ''C'' taxpayers (ERCA, 2011).

Before closing this section, let us see the classification of taxes in Ethiopia. Mainly, in Ethiopia taxes are grouped into direct taxes[6]and indirect taxes. For our purpose we will focus on the indirect taxes, particularly tax on foreign trade. Indirect taxes are levied on both locally produced and imported goods and services rendered.

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income tax from 40% to 35%, equalization of tax rates at 35% for both small-scale and large-scale mining activities, cancellation of export duty on coffee exports, assignment of agricultural income tax collection to regional governments, introduction of Tax Payers Identification Number (TIN), replacement of sales tax with value-added or turnover tax, and so on (ERCA, 2011).

[6]In Ethiopia direct taxes encompass the following income type: income from employment, income from rental of building, income from business profit, income from royalties, income paid for services rendered outside of Ethiopia, income from games of chances, income from casual rental of property, interest income, gains from transfer of certain investment property and income from agricultural activities (ERCA, 2011).

Since about 75% of the Federal Government revenue is collected from indirect taxes, in Ethiopia, the government has given a due attention to indirect taxes. Such dependence on indirect taxation is common in low income countries. Nonetheless, as the economy develops there will be a move towards a more progressive tax structure that demands a persistent shift towards a domestic and/ or direct taxation. Indirect tax includes; valued added tax (VAT), turnover tax (TOT), excise tax, stamp duty, customs duty, taxes on exported goods, and withholding tax. Among the specified tax types, import (custom) duty, excise tax on excisable commodities, and value-added tax will be imposed on imported commodities. Apart from the above tax type, the duties and taxes on imported commodities is comprised of surtax and withholding tax.

Currently, there are six bands which are applicable for custom duty rates. These are: 0%, 5%, 10%, 20%, 30% and 35%. For the case of excise tax, the rate varies between 10% and a maximum of 100%. Finally, with the exception of those commodities which are exempted from VAT on imports, a value-added tax of 15% rate is applied for all imported commodities.

3.2 Trends in Federal Revenue Collection

In order to finance its expenditure, government generate revenue from different sources. And the amount of revenue collected will in turn determine the level of government expenditure on various public services, development programmes and projects (comprising the state budget too). In this section we will discuss about the structure of revenue collected from the period 2005/06 to 2009/2010. According to the Ethiopian Revenues and customs Authority (ERCA) reports (2011), the average annual share of indirect tax accounted for 48.19% while direct, non-tax and revenue from lottery sales on average accounted for 20.74%, 0.93% and 0.14% respectively.

From the above figure one can infer that the contribution of the indirect taxes out weight all the other incomes sources of the government. The table below will demonstrate the structure of revenue in the stated period.

Table – 3.1 Revenue Collections by Major Tax Type (2005/2006-2009/10)

Million Birr

Revenue sources	Fiscal Year					Annual Average Revenue	Annual Average % share
	2005/2006	**2006/2007**	**2007/2008**	**2008/2009**	**2009/2010**		
Total Tax Revenue	**11, 173.71**	**14,012.85**	**19,205.55**	**23,224.31**	**35,229.95**	**20,569.27**	**98.94**
Direct Taxes	2, 053.26	2,646.08	3,781.41	5,396.26	8,693.44	**4, 514.13**	20.74
Indirect Taxes	9,120.25	11,366.77	15,424.14	17,828.05	26,536.52	**16,055.15**	48.19
Non-Tax Revenue	68.3	168.53	46.44	329.80	427.69	**208.15**	0.93
Revenue From Lottery Sales	19.23	18.8	23.36	29.15	50.82	**28.37**	0.14
Grand Total	11, 261.24	14,200.18	19,275.85	23,583.26	35,708.46	**20,805.80**	
Annual grow rates		**26.0978**	**35.7437**	**22.34615**	**51.4144**	**33.90**	

Source: ERCA

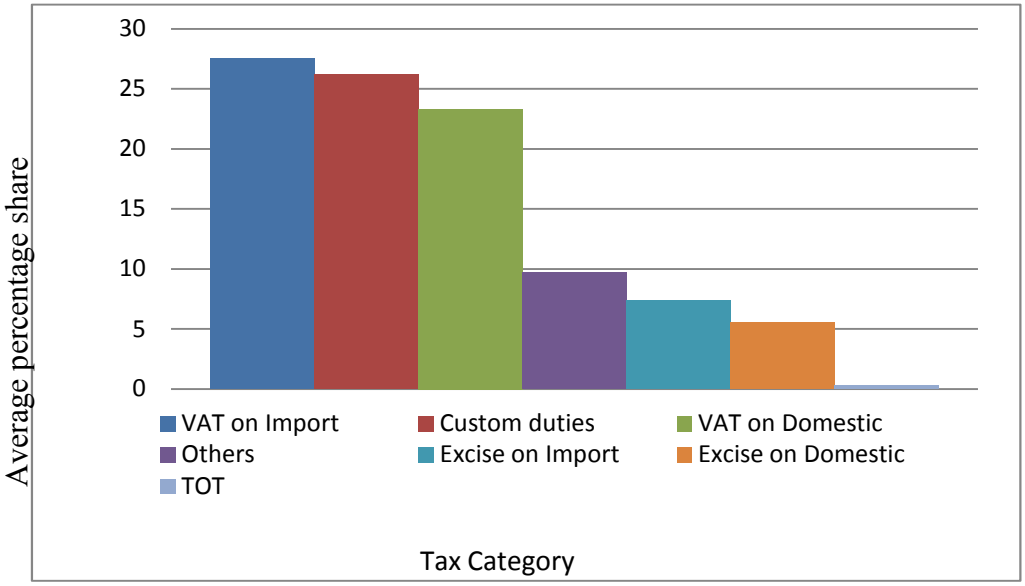
The total revenue collected during the period 2009/10 (Birr 35.71 billion from tax and non-tax sources) was greater than the planned amount (Birr 34.67 billion). During the same period the actual collection of revenue showed a growth of 2.99% as compared with its plan (102.99% of the planned amount). Even compared with the previous year performance the growth revenue collection was 51.41%.[7]

[7]This was mainly attributed to the efforts made by Ethiopian Revenues and Customs Authority (ERCA). The effort was made through the newly introduced Business Process Reengineering (BPR), the tax and customs and enforcement measures implemented so far.

In general, during 2005/06-2009/10 total Federal tax revenues increased at an average growth rate of 33.9%. From the total of Birr 11,173.71million in 2005/06, the total Federal tax revenue collected had increased to Birr 35,229.95 million after five years (2009/2010). This represents a marked shift in Federal tax revenue structure of the country. Out of the total tax revenue, the annual average share of indirect taxes was around 79.03%. Accordingly, indirect taxes have grown extensively from Birr 9,120.25 million in 2005/06 to Birr 26,536.52 million in 2009/10. However, considering the composition of tax revenue, there was a steady decline in the share of indirect taxes from 81.62% in 2005/06 to about 75.32% in 2009/10.

Since the focus of this study is mainly related to indirect taxes (specifically tax on imported commodities), in the following paragraph we will discuss about indirect taxes in more detail. According to the report of ERCA (2011), the average revenue collected from indirect tax (i.e., the authority may collect indirect taxes from custom duties, excise tax on domestic, excise tax on import, VAT on domestic, VAT on import, TOT and so on.) was Birr 16,055.14 million per year. Of this amount, the annual average percentage share of indirect tax components is given as: 27.52% from VAT on import, 26.20% from custom duties, 23.33% from VAT on domestic, 7.39% from excise tax on import, 5.56% from excise tax on domestic, 0.30% from TOT, and 9.96% from other indirect tax revenue sources (ERCA, 2011).

Figure – 3.1 Annual Average Percentage Share of Indirect Tax Components



Source: Own Computation based on 2011 ERCA's Report

As shown in the above graph, on average more than 50% of indirect taxes revenue was collected from foreign trade (VAT on imports, custom duties, excise tax on imports and others).

3.3 Foreign Trade Performance

Lately Ethiopia has broadened its trade relations with the rest of the world. But with some immediate neighbour countries, Ethiopia has maintained long commercial relations. Namely the countries are, West Europe, Asian, African and Middle East Asian countries.

During 2008/09-2009/10 Europe and Asia were the two major continents of destination of Ethiopia commodities. In this period the share of Europe and Asia out of the total export was 40.07% and 37.46% respectively. Country wise, China was the leading country among the Ethiopia's export trading partners countries. In the same period, in terms of the volume of commodities that the Ethiopia has imported, though

the rank is reversed, still Europe and Asia are the two major continent of the origin of the Ethiopia's import (Asia is the leading continent as origin for the country's import). As a peculiar feature of Ethiopia's foreign trade structure, both for the case of export and import, the majority of trade took place with a limited numbers of countries [8](ERCA, 2011).

For the duration of 2005/6-2009/10, the overall trade performance of Ethiopia (both export and import) has increased considerably. For instance, in those five years the value of export has increased from Birr 8.83 billion to Birr 26.22 billion. Furthermore, import of different commodities into the country has increased from Birr 37.24 billion in 2005/06 to Birr 109.60 billion in 2009/10. Thus, from the above figures one can easily see that, in 2009/10 fiscal year, the growth in expenditure in import is much greater than export earnings. Consequently, in the same period Ethiopia has running a trade deficit.

3.3.1 Export

It is known that the backbone of the country's economy is agriculture. Subsequently, being an agrarian economy, the composition of the country's export is more of dominated by agricultural raw materials. Out of the total export, the share of value-added goods (processed and semi processed) is very insignificant. To mention few of the dominant export commodities: coffee (though its share has declined from 36.28% in 2005/06 to 26.55% in 2009/10, coffee is the leading export commodity), oilseeds and gold, are ranked as the second and the third most important export items of the country. Apart from these items, chat (in terms of value, it is ranked fourth) has

[8]For instance, in 2009/10 fiscal year, the top 15 export trading partners of the country made up 84.32% of the total annual export of the country. Similarly, in the same fiscal year, the top15 partners of the country accounted for 81.32% of the total imports of the country (ERCA, 2011).

shown remarkable contribution in the export earnings of the country. From this specific export item, the country's export earning has increased from Birr 774.29 million in 2005/06 to Birr 2,743.62 million in 2009/10.

Table 3.2. Value of Export by Major Product Category (2005/06 – 2009/10)

	Value of export (in Million birr)				
Product Category	2005/06	2006/07	2007/08	2008/09	2009/10
Coffee	3,204.72	3,779.77	4,943.73	3,973.40	7,005.37
Oil Seeds	1,838.83	1,671.62	2,056.44	3,863.50	4,728.14
Gold	566.86	872.69	742.75	1,060.69	3,689.92
Chat	774.29	824.31	1,010.68	1,464.37	2,743.62
Flower	192.64	567.03	1,048	1,389.67	2,231.74
Pulses	324.3	625.84	1,338.59	957.37	1,695.21
Live Animals	238.9	326.19	380.19	546.15	1,191.26
Skin	510.41	594.88	654.28	571.87	525.03
Meat & Meat products	160.34	136.88	195.77	276.49	446.44
Fruits & Vegetables	110.97	143.57	127.28	123.23	421.62
Textile & Garment	97.3	110.65	142.53	145.44	302.45
Spice	86.44	98.44	115.84	118.36	245.73
Natural Gum	46.97	50.19	64.56	101.14	166.10
Tantalite Ore	38.1	55.07	57.15	73.28	155.71
Cotton	59.69	128.1	179.89	63.76	139.15
Leather Products	17.52	58.76	69.99	77.25	82.58
Cereals	121.03	14.34	8.18	0.30	65.87
Bees Wax	13.29	16.26	17.27	16.61	21.67
Hides	63.59	87.26	89.60	32.60	11.45
Tea	7.34	8.17	11.31	9.87	11.42
Goods Not Elsewhere Classified	360.64	393.38	509.54	534.41	500.53
Total	8,834.15	10,563.46	13,763.16	15,399.76	26,380.99

Source: ERCA

As demonstrated in the above table, in those five years the country's export has shown an increase in the value. Moreover, in the same period the country's export has also shown an increase in terms of volume. The annual average growth rate of export during the specified period was 33.3% per year with an average value of Birr 14.98 billion per year. However, the recorded growth was not distributed evenly across different categories. Despite the increment shown in value and volume of export in

most of the commodity categories, there was a modest fluctuation of value of commodities.[9]

3.3.2 Import

Due to the sensitivity of the import sector to external shocks, in terms of flexibility and dynamism, the composition of this sector is more flexible and dynamic than the export sector. For instance, change in government policies may easily affect the composition of import of a given country.

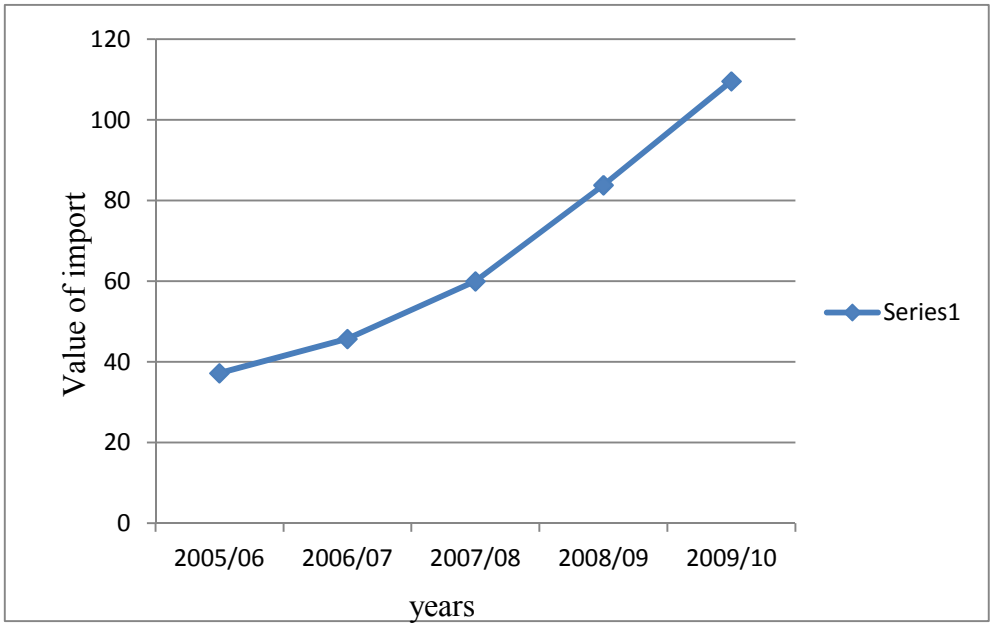
According to the categorization given by United Nation Statistics Division (UNSD) Broad Economic Category (BEC), the country's import commodities are mainly grouped into seven categories. These are: food and beverage, industrial supplies not elsewhere classified, fuels and lubricants, capital goods (exclusive of transport equipment and parts and accessories thereof), transport equipment and parts and accessories, consumer goods not elsewhere specified, and goods not elsewhere specified. As reported by ERCA, during the fiscal year 2005/06 – 2009/10, based on their annual average percentage shares, the imported commodities are ranked (in descending order) as, industrial supplies not elsewhere classified (28.80%), capital goods (21.62), fuels and lubricants (18.44), consumer goods not elsewhere specified (10.50%), transport equipment parts and accessories thereof (10.39%), food and beverage (9.85), and goods not elsewhere specified (0.40%) (ERCA, 2011).

As pointed out in the beginning of section 3.3, continental wise Asia is the leading continent as an import trading partner of the country. To be precise, during the fiscal years 2008/09 – 2009/10, the top three important trading partners of the countries

[9]For instance, the values of coffee, oil seeds, gold, pulses, skins, fruits and vegetables, cotton, cereals, hides, tea, and goods not elsewhere classified were not stable during those fiscal years. On the contrary, the values of commodities like chat, flower, live animals, meat and meat products, textiles and garments, spices, natural gum, tantalite ore, leather products and bee wax remained stable (has shown increment) throughout the year 2005/06 – 2009/2010.

were, China at the top, Saudi Arabia and India in the second and the third place. In the fiscal year 2009/10, out of the total import (109.6 billion), the estimated amount of import from each of the top three import trading partners of the country was Birr 27.05 billion, Birr 13.85 billion and Birr 8.65 billion, respectively. To sum up, same as the case of export, during 2005/06 – 2009/10, the value of import has shown an increment. Graphically, this can be shown as follows:

Figure 3.2 Total value of Import (in billion birr) (2005/06 – 2009/10)



Source: Own Computation based on 2011 ERCA's Report

3.4 Ethiopia's Trade Relation with EU and COMESA

As we have discussed in the background part, for the recorded failures in the regional integration among developing countries, there is a shift of interest in the formation of RIAs among developing countries to the formation RIAs with developed countries. Nowadays this is reflected by the concern shown by developing countries to form RIAs with developed countries (for instance the ACP – EU).

The Lome convention is a multilateral trade and aid agreement which was signed between the European Economic Community (EEC) and 46 African, Caribbean and Pacific (ACP) countries in the year 1975. This agreement was signed under the condition where there is no quantitative restriction (quota – free) and also tariff- free access to the EU markets. However, these unilateral discriminatory preferences to ACP countries in the EEC markets bring the EU into conflict with the WTO rule (reciprocal preferences).[10]As a result of its non-compatibility with the principle of reciprocality of preferences, the Lome trade agreement came to an end in the year 2000 (Lecomte, 2001).

Following the termination of the Lome convention, a new trade agreement called Cotonu Agreement was replaced. This trade agreement paved the way for new trading regime based on the reciprocal preferences. On the basis of this, in 2001 WTO agreed to give a waiver to the EU to continue providing unilateral preferences until January 2008. Under this agreement EPAs will be established between the EU and the ACP countries. Because of the termination of this agreement in January 2008, some of the ACP countries including Ethiopia did not sign the EPA. Now the ACP countries are required to provide preferential access to the EU products in their market if they are to

[10]The principle of non-discrimination which is stated in Article I of GATT. According to this principle, all preferences granted to one member must automatically be extended to all members (Abregoa, Riezmanb and Whalley, 2006).

continue enjoy preferential access to the EU markets. Consequently, negotiations are still ongoing for those countries who did not sign the EPA.

In order to assist the negotiation process, initially the ACP countries were grouped into six groups.[11] Among this four of them are from Africa: Common Market for Eastern and Southern Africa (COMESA)[12], Southern Africa Development Community (SADU), Economic Commission for Western Africa (ECOWAS) and Communante Economique et Monetaire d' Afrique Centrale (CEMAC). But nowadays countries like Burundi, Kenya, Rwanda and Uganda, are pulled out of COMESA and began negotiation under the umbrella of the regional integration they have formed called Eastern Africa Community (EAC). Afterwards, COMESA has been adjusted to Eastern and Southern Africa (ESA) (Hinkle et al., 2006). Currently, the ESA group include: Comoros, Djibouti, Eritrea, Ethiopia, Madagascar, Malawi, Mauritius, Seychelles, Sudan, Zambia and Zimbabwe. Hence, the number of groups within the ACP countries is now increased by one more group (EAC).

After the termination of the provision of unilateral preferences to the ACP countries in January 2008, the European Commission has suggested the term "substantially all trade''- SAT. They have interpreted it as, 90% of mutual trade. As we have seen in the previous discussion, the EU's offer is 100% tariff reduction for the products originating from partner states while the counterparties are requested to liberalize

[11]The groups were; Common Market for Eastern and Southern Africa (COMESA), Southern Africa Development Community (SADU), Economic Commission for West Africa (ECOWAS), Communante Economique et Monetaire d'Afrique Centrale (CEMAC), Caribbean and Pacific.

[12]COMESA is a free trade area which is signified as one of the pillars of African Economic Communities. This was formed in December 1994, replacing a preferential Trade Area which had existed since 1981.Currently the member countries are: Burundi, Comoros, Democratic Republic of Congo, Djibouti, Egypt, Eritrea, Ethiopia, Kenya, Libya, Madagascar, Malawi, Mauritius, Rwanda, Seychelles, South Sudan, Sudan, Swaziland, Uganda, Zambia and Zimbabwe. In 2000 nine of the member states (Djibouti, Egypt, Kenya, Madagascar, Malawi, Mauritius, Sudan, Zambia, and Zimbabwe) formed free trade area (FTA) with Rwanda and Burundi joined the FTA in 2004 and Comoros and Libya in 2006.

80% of their imports from the EU for mutual trade to fulfil the 90% average. The same is true for Ethiopia, the EPA negotiations necessitate the 80% tariff reduction to fulfil the ‘’substantially all trade’’ on imports from the EU into Ethiopia.

In the contrary, the ESA’s arrangement is to observe the issue on the case by case approach. This to mean, ESA required undertaking a comprehensible analysis on different issues, including potential revenue losses, sectoral sensitivities, infant industries and capacity constraints. Thus, ESA has been insisting on provision of support to enable the ESA states to undertake trade reforms on the parameter to be agreed. By considering the stated issues, ESA proposed to offer 70% tariff reduction for products originating from the EU states. To sum up, in our study, in the simulations the EU’s offer (80% trade liberalization for imports from the EU member countries) for EU-EPA and 100% tariff reduction for the case of COMESA-FTA were considered.

CHAPTER FOUR

DATA AND METHODLOGY

As we have seen in the introduction part, the focus of this study is examining the overall dynamic effects of liberalizing trade and also the subsequent counter change in fiscal policy. By using an important analytical tool (CGE model), the impact of tariff reduction and also alternative fiscal policy measures are estimated.[13] In our study the specific analytical tool used is the dynamic computable general equilibrium (DCGE) model. Mostly dynamic CGE models are grouped into two categories: intertemporal and sequential (recursive). Truly (intertemporal) dynamic model is based on optimal growth theory where the behaviour of economic agents is characterized by perfect foresight. In Lofgren and Robinson (2004) words, "everybody knows," in the intertemporal models, "everything about the future, and they use that information in making decisions."

On the other hand, in the recursive models agents make their decisions on the basis of past and current information with no role for forward looking expectations, i.e. agents have myopic behaviour (Lofgren and Robinson, 2004). A recursive dynamic model combines a within period module and a between-period module. The within-period model is essentially the static model while the between-period model links the within periods modules by updating selected parameters (e.g., population) on the basis of exogenous trends and past endogenous variables (e.g., investment) (Lofgren and

[13]As demonstrated by De Melo (1988) the use of this analytical tool (CGE models) for policy analysis has become well-known for a wide range of applications for both developed and developing economies. In this model equilibrium is regarded as a set of prices and output levels in each industry such that, for all commodities, market demand and supply are equal. Demand functions are homogenous of degree zero and profits are linearly homogenous in prices. Consequently, the absolute price level has no impact on the equilibrium outcome and only relative prices of any implication in the model (Shoven and Whalley, 1984).

Robinson, 2004).[14]In this study a recursive dynamic CGE model for Ethiopia is used for analysis purpose.[15]

As pointed out in the problem statement, in addition to the exogenous shock (tariff reduction), there is a need for taking appropriate fiscal measures to counterbalance the adverse effects (on government revenue) brought about by trade liberalization. Consequently, the impact of the exogenous shock (tariff reduction), is assessed together with endogenous shocks (fiscal policy responses). In order to examine the impact of Ethiopia's trade liberalization and also the resulting fiscal policy response, on the Ethiopian economy, a recursive dynamic computable general equilibrium (DCGE) model is specified and calibrated to the Ethiopian economy (represented by 2005/2006 SAM, which is updated to 2009/10 economy).

This model used social accounting matrices (SAM) to capture national income, production and input-output information and in simulating and evaluating economic policies. Defourny and Thorbecke (1984), stated that, Social Accounting Matrix (SAM) is a general equilibrium data system (usually representing one-year data) which link the production activities, factor and commodity markets, institutions (enterprises, households and government), and other accounts (foreign trade, market for loanable funds), capturing the circular interdependence of any nation-wide economic system. The SAM numerically illustrates "all the basic accounting identities which must hold for the economy to be in equilibrium". [16]

[14]The recursive CGE models are solved sequentially for each period. The time span is commonly 15 to 20 years (Hedi et. al, 2002).

[15]Cockburn and Decluwé (2006) showed that it is generally impractical to assume perfect foresight, particularly for developing countries. Consequently, in most of empirical studies myopic sequential dynamic model is adopted. Thus, for Ethiopia it is appropriate to adopt a recursive dynamic model rather than an intertemporal dynamic model.

[16]More precisely, a SAM is a square matrix in which each account is represented by a row and a column. Every single cell indicates the payment from the account of its column to the account of its

In this study the main data used for the model calibration is the updated 2005/06 SAM, which represents the Ethiopia's economy by activities, commodities, factors, and institutions. The model followed the disaggregation of factors, activities, commodities, and institutions which is given by the SAM (Lofgren et.al 2002). Therefore, in the next section the detail presentation of the Ethiopian 2005/2006 Social Accounting matrix (SAM) will follow.

4.1 The Social Accounting Matrix

Input-Output (IO) table and Social Accounting Matrices give a detailed record of the complex activities taking place within the economy and the interaction between different economic agents. However, since the Social Accounting Matrix is an extension of the IO table[17], apart from the income and expenditure flow of industries, and their output, a SAM is also comprises of detailed information on different institutions. Generally speaking, a SAM is a comprehensive economy-wide data framework which has a detailed valuation of the flows of income and expenditure in an economy of a nation for a given year, commonly for a single year. As we have mentioned in the previous section, a SAM is a square matrix (since it the outgrowth of the input-output table) in which each account is represented by a row and a column. In a SAM each cell denotes the payment from the account of its column to the account of its row. Thus, the incomes of an account appear along its row and its expenditure along its column. A SAM is based on the fundamental principle of double-entry

row. Hence, the incomes of an account appear along its row and its expenditures along its column (Lofgren et al., 2002).

[17]The IO table contain information about the interdependence among various producing and demanding sectors of the economy as they interact as each other's customers. Generally, by outlining the flows of goods and services from one sector of the economy to all other sectors (inter-sectoral flows) and to itself (intra-sectoral flows), the IO table convey systematic description of each sector's interdependence (EDRI, 2009).

accounting which requires that total income (row total) must equal total expenditure (column total) (Lofgren et al., 2002).

Moreover, a SAM is assumed to represents a complete equilibrium dataset of an economy for a single year. Based on this assumption functional parameters, such as share and shift parameters, are calibrated. These functional parameters are estimated (calibrated) in such a way that the model solution reproduces the initial dataset, called the benchmark equilibrium.

Mostly the standard SAM has four key accounts. To mention them, the activities (production sector) account, the commodities account, factor account, and institutions account. The rationale behind the division between the activities and commodities account is to take into consideration the case where a given activity produces several commodities or a given commodity is produced by more than one activity. In addition to those accounts, a SAM could be comprised of other accounts, for instance, saving-investment (S-I) account, taxes account, total margins, and so on (EDRI, 2009).

The activities account reviews production in the domestic economy. In this account, the row represents the values of goods produced by each production activity, while the column denotes the cost (expenditure) incurred so as to purchase intermediate inputs and to make payment to the primary factors. On other hand, the commodities account, in its row, it represents demand for commodities and in the column side; it denotes supply of the commodities.[18]

[18]Generally, when we say demand, this may include consumption demand by the household and the government, intermediate inputs demand, investment demand and exports, while the supply side may signifies the domestic production supply, marketing margins, indirect taxes and imports (EDRI, 2009).

In the case of the factor account, the row side signifies the payment to factors from different sources (it could be from production sectors of the domestic economy and the rest of the world) whereas the column side signifies the distribution of factor incomes to various institutions. In the SAM, all incomes and expenditures of institutions is shown in the institutions account. As a sub-account to this account we have, the government, household and the ROW account. In the case of the government and household sub-accounts, the row describes the incomes to the government from different sources (it could be from direct or indirect taxes and transfers from ROW, which is fixed in foreign currency) and incomes to the households from factors and transfers (this could be from other households, the government and the ROW). As expenditure for both the government and households, they spends on consumption, make transfer to households and also for saving. Apart from the above expenditure households make payment for direct taxes. When we come to the ROW sub-account, the source of incomes could be the sale of imports and factors (this represents the outflow of foreign exchange).The inflow of foreign exchange could be expressed by the payment made for exports, factors, transfers (to households and government), and foreign savings.

As we have seen in the previous discussion, in addition to the above four key accounts a SAM is comprises of other accounts. We have the S-I account, which summarizes the savings of different institutions (it could be from the government, households and foreign) in the row section, and expenditure for investment on capital goods in the column section.[19]Furthermore, there are accounts for taxes (direct taxes on households and indirect taxes on commodities) and marketing margins, which signifies the

[19]As a remark in a SAM only the sectors which fulfil the investment demand for commodities (sector of origin) are represented. However, a SAM does not provide us with information in which sectors these commodities are used (sector of destination) (Lofgren et al., 2002).

transaction cost incurred in relation to the flows of trade and transportation (this could be services in relation to domestic, import and export marketing). In the taxes account, payment is made from the row section to the government in the column section. The rationale behind the dissection of this account from the government account is in order to avoid ambiguity whenever economic interpretation of some payments is made. The marketing margins on the other hand, summarize the sum of trade and transport margins.

In the following paragraphs, there will be a detail discussion about the benchmark data. The 2005/2006 Ethiopia SAM which is produced by Ethiopian Development Research Institute (EDRI), is the first comprehensive economy-wide dataset. This SAM is produced in different level of aggregations. The regionalized (micro) SAM is a fully disaggregated SAM with 255 separate accounts (255 rows and 255 columns). This SAM integrates regionally disaggregated agricultural production and income generation for the four major agro-ecological zones of Ethiopia. The SAM is comprise of 98 activities, 93 commodities, 26 factors, 17 institutions, 9 direct and 8 indirect taxes, trade and transport margins, stock changes (inventory investment by the sector of origin) , saving-investment accounts and lastly we have an account for 'Total' values. Among the 17 institutions, fourteen of them are households and the remainder institutions are government, enterprises and ROW.

Moreover, there is 47×47 aggregated SAM, which incorporates 14 activities,[20]15 commodities, 4 factors of production (labor, land, livestock and capital), 7 institutions (an enterprises, government, 4 households,[21]and the ROW), 3 tax accounts (direct tax,

[20]Since Ethiopia is non-oil producing nation, the corresponding activities account for the commodity account of fuel (cfuel) is missing. Hence, the 14 activities produce 14 commodities, although the domestic production activities for commodity fuel are unavailable.
[21]The households are categorized as: rural poor, rural non-poor, urban poor and urban non-poor.

sales tax and import tax),[22]transaction costs, stock changes and S-I account. In this SAM, productions and incomes of the various agro-ecological zones were aggregated into one account before further aggregations were made. In the SAM the activities are mainly aggregations and disaggregation from the agriculture, industry and service sectors. In the agricultural sector there are five production activities, namely, teff, maize and wheat, non-traded agriculture, exportable cash crops, and livestock. Similarly, in the industrial sector there are five production activities, such as, chemicals, machinery, food processing, construction and other manufacturing. Unlike the agricultural and industrial sectors, in the service sector there are only four production activities. These are utilities, domestic trading, private services and government services.

Additionally, in the SAM there are three activities which produced more than one commodity. Among the three activities, two of them (cash crop production activity and livestock activity) are in the agricultural sector whereas the remainder activity is from the service sector (activities for utility). The cash crop activity produce outputs for export and non-traded agricultural commodities, while the livestock activity produce outputs for food products and raw materials for further production. And activity for utility produce outputs for utilities and machinery.

In summing up, as the current structure of the Ethiopian economy is different from 2005/06 on which the existing SAM is based, it was updated in 2009. The updated SAM is produced in different level of aggregations. It is disaggregated into 113 activities (with 77 agricultural activities by agro ecological zones, AEZs), 64 commodities, 16 factors (by AEZs except capital), and 13 institutions including 12

[22]The sales tax account is comprises of local VAT, domestic excise tax and service taxes while the import tax account integrates import duty, sur tax, import excise tax, import VAT, and withholding tax.

households. The SAM also has different taxes, saving-investment, inventory, and rest of the world accounts to show the interaction of different economic agents. It integrates regionally disaggregated agricultural production and income generation for the four main agro-ecological zones of Ethiopia (Humid, high land cereals, drought prone and pastoralist zones). Hence, this study has used this SAM as a major data set.

4.2 Model Specification

The dynamic model is constructed as a static CGE model that is linked to between periods by exogenous and endogenous variables updating procedures. Since the recursive dynamic model is the extension of the static model, it integrates the static model part, the within model, and the engine of dynamism, the between model. In the between model the variables could be updated endogenously or exogenously. For instance, capital stock could be updated endogenously with capital accumulation equation and population could be updated exogenously between periods.

According to the model assumption firms use intermediate inputs and value-added outputs to produce final output with a Leontief production technology. Value-added output is in turn a constant elasticity of substitution (CES) composite of primary inputs, capital and labor. Production factors are assumed to be mobile across sectors (in this study only labor and land are assumed to be mobile across sectors, while capital is activity specific). International trade flows are characterized by imperfect substitution between domestic and foreign goods. Final sectoral output is allocated across domestic sales and exports through a constant elasticity of transformation (CET) function.[23]

[23] As a note, the source for the model specification part is Lofgren et al., (2002).

Total sectoral absorption is an Armington (1969) composite of domestic good and imported good. It is differentiated among four uses: private consumption, government consumption, intermediate input and investment. The domestic country is assumed to be a price-taker in the international markets, that is world prices of imports and exports are exogenously determined. The model will be implemented by means of the mathematical software (GAMS).

The ''Within Model''

The ''within model'' integrates the static part of the recursive dynamic CGE model. Mathematically, the CGE model is represented as a system of simultaneous, nonlinear equations. In the model the number of equation must equal the number of variables (i.e., the model must be square). For the sake of simplicity, the set of simultaneous equations can be categorized into four blocks: prices, production and trade, institutions, and system constraints.

Price Block

This block comprises of different equations in which endogenous model prices are linked to other prices (endogenous or exogenous) and to non-price model variables. Since there is the assumption of quality differences among commodities of different origins and destinations, the price system of the model is opulent. Thus, in the following paragraphs different types of prices will be presented:

Import Price

The import price of a commodity in local currency units (LCU) is just the price paid by domestic users for imported commodities (without sales taxes). In simple language, it is stated as the summation of the transformed world price of imports (by taking into consideration both exchange rate and import tariffs) and transaction costs

(the cost of trade inputs needed to move the commodity from the border to the demander) per unit of the import.

Mathematically this can be shown as:

$$PM_c = pwm_c.(1+tm_c).EXR + \sum_{c' \in CT} PQ_{c'}.icm_{c'c} \qquad c \in CM \qquad (4.1)$$

Where, C is a set of commodities, CM is a set of imported commodities, CT a set of domestic trade inputs (distribution commodities), PM_c is import price in LCU including transaction costs, Pwm_c is Cost, Insurance and Freight (c.i.f) import price in FCU (foreign-currency units), tm_c is import tariff rate, PQ_c is composite commodity price (inclusive of sales tax and transaction costs), and $icm_{c'c}$ is quantity of commodity c' as trade input per imported unit of c. In this model both exchange rate and the domestic import price are flexible, whereas the tariff rate and the world price are kept fixed.[24]

Export price

This represents the price received by domestic producers when they sell their output in export markets. Mathematically,

$$PE_c = pwe_c.EXR - \sum_{c' \in CT} PQ_{c'}.ice_{c'c} \qquad c \in CE \qquad (4.2)$$

Where, CE a set of exported commodities, PE_c is export price (LCU), Pwe_c is free on board (f.o.b) export price (FCU), and $ice_{c'c}$ is quantity of commodity c' as trade input per exported unit of c.[25]

[24]The rationale behind the fixedness of the world import price is the assumption of ''small-country''. This is to mean, for the modelled country, the assumed share of world trade is so small for all of its import. Consequently, the country faces an infinitely elastic supply curve at the prevailing world price (Lofgren et al., 2002).

[25]In Ethiopia there is no imposition of tax on export. Thus, te_c (export tax rate) is removed from export price equation (i.e., te_c is zero for the case of Ethiopia).

Demand Price of Domestic Non-traded Goods

Whenever there are transaction costs, it is important to make distinction between price paid by demanders and those by suppliers. Consequently, the demand price for domestically produced non-traded goods (i.e., this includes commodities that are neither imported nor exported) can be represented as follows:

$$PDD_c = PDS_c + \sum_{c' \in CT} PQ_{c'}.icd_{c'c} \qquad c \in CD \qquad (4.3)$$

Where, CD is a set of commodities with domestic sales of domestic output, PDD_c is demand price for commodity produces and sold domestically, PDS_c is supply price for commodity produced and sold domestically, and $icd_{c'c}$ is quantity of commodity c' as trade input per unit of c produced and sold domestically.

Absorption

This refers to the total domestic spending on a commodity at domestic demanders prices (i.e., expressed as the summation of spending on domestic output and imports at demand prices, PDD and PM). Its mathematical representation is specified as follows:

$$PQ_c.(1-tq_c).QQ_c = PDD_c.QD_c + PM_c.QM_c \qquad c \in (CD \cup CM) \qquad (4.4)$$

Where, QQ_c is quantity of goods supplied to domestic market (i.e., composite supply), QD_c is quantity sold domestically of domestic output, QM_c is quantity of imports of commodity, and tq_c is sales tax rate.

Consumer Price Index

$$\overline{CPI} = \sum_{c \in C} PQ_c.cwts_c \qquad (4.5)$$

Where, $cwts_c$ is weight of commodity c in consumer price index and $\overline{CPI}$ is consumer price index (it is exogenous variable).

Producer Price Index for Non-traded Market Output

$$DPI = \sum_{c \in C} PDS_c . dwts_c \qquad (4.6)$$

Where, $dwts_c$ represent the weight of commodity c in the producer price index and DPI is producer price index for domestically marketed output.[26]

As a remark, in this block in addition to the above different price equation, we do have specification for marketed output value (for each domestically produced commodities the marketed output value at producer prices is stated as the value of domestic sales and exports), activity price (represented as multiplication of yields per activity unit by activity-specific commodity prices, summed over all commodities), aggregate intermediate input price (it demonstrates the cost of disaggregated intermediate inputs per unit of aggregate intermediate input) and activity revenue and costs (This states that for each activity, total revenue net of taxes is fully exhausted by payments for value-added and intermediate inputs).

Production and Trade Block

Each activity which undertakes the production process is assumed to maximize their profit subject to their technology, taking prices (i.e., price of outputs, intermediate inputs and factors) as given. Generally, there are two acceptable alternative specifications at the top level of the technology nest: the activity level is either a CES

[26]In the basic model version the CPI is fixed (exogenous variable) and functions as the numeraire, otherwise DPI may be fixed. A numeraire is vital since the model is homogenous of degree zero in prices. Subsequently, a doubling of the value of the numeraire would double all prices but leave all real quantities unchanged. As a remark, all simulated price and income changes should be interpreted as changes in relation to the numeraire price index (Lofgren et al., 2002).

or a Leontief function of the quantities of value-added and aggregate intermediate input use.

In this study, the technology at the top level of the technology nest is a Leontief technology which is the function of the quantities of value-added and aggregate intermediate inputs, which will yield commodity outputs in the production process. A CES function of primary factors will be used to represent the quantities of value-added. According to Thurlow (2004), the CES specification for value-added enable producer so as to respond to dynamics in factors returns by substituting among available factors. Using a Leontief technology aggregate intermediate input will be represented as composite commodities partially domestic and partially imported (Lofgren et al., 2002). Mathematically a Leontief technology can be formulated as follows:

$$QVA_a = iva_a.QA_a \qquad a \in ALEO \qquad (4.7)$$

$$QINTA_a = \text{int}\, a_a.QA_a \qquad a \in ALEO \qquad (4.8)$$

Where, a represent a set of activities in the Leontief activity function, iva_a represents quantity of value-added per activity unit, and $\text{int}\, a_a$ represents quantity of aggregate intermediate input per activity unit. As we can see from the above equations, both demand for value-added (QVA_a) and aggregate intermediate inputs ($QINTA$) are expressed as a fixed share of the level of activity (QA_a). And the implication of the use of fixed shares is that, it is technology (rather than the decision making power of the producers) which determine the necessary combination of value-added and intermediate inputs per unit of output. Hence, the Leontief technology denotes fixed proportion of inputs to outputs (Thurlow, 2004).

Domestic production may be sold in market (it can be either for domestic market or for the rest of the world) or consumed at home. For marketed output, a CES function is used as the aggregation function, in order to aggregate domestic output generated from different activities of a given commodity. Since there is difference in timing, quality, and distance between the locations of activities, the outputs are imperfect substitute to each other. Thus, the constant elasticity of substitution (CES) function is used to aggregate commodities from different disaggregated market. As a note, it is the activity-specific commodity price which clears the implicit market for each disaggregated commodity (Lofgren et al., 2002).

Assuming each suppliers maximize sales revenue for a given aggregate level subject to imperfect transformability between exports and domestic sales (which is represented by a constant elasticity of transformation, (CET)), the aggregate domestic output is allocated between exports and domestic sales. Thus, the CET function determines the relationship between the quantity of goods produced for domestic and foreign export market. Then, its mathematical formulation is given as:

$$QX_c = \alpha^t{}_c.(\delta^t{}_c.QE_c^{\rho^t{}_c} + (1-\delta^t{}_c).QD_c^{\rho^t{}_c})^{\frac{1}{\rho^t{}_c}} \qquad c \in (CE \cap CD) \qquad (4.9)$$

Where, $\alpha^t{}_c$ represents a shift parameter, $\delta^t{}_c$ represents a share parameter, and $\rho^t{}_c$ represent an elasticity exponent in the CET function. The shift parameter measures the supply shift in the destination of domestic products based on the profitability of the destination. On the other hand, the share parameter denotes the proportion of exports or domestic sale from domestically produced output, while the exponent shows the elasticity of transformation between the two destinations (Lofgren et al., 2002).

Based on the assumption of imperfect transformability between the two destinations, the export-domestic supply ratio is formulated as:

$$\frac{QE_c}{QD_c} = \left(\frac{PE_c}{PDS_c} . \frac{1-\delta^t_c}{\delta^t_c} \right)^{\frac{1}{\rho^t_c - 1}} \qquad c \in (CE \cap CD) \qquad (4.10)$$

This ratio expresses the optimal mix between exports and domestic sales. Accordingly, an increase in the export-domestic price ratio brings about an increase in the export-domestic supply ratio (i.e., a move toward the destination that offers the higher return).

As we have discussed in the above paragraphs, given observed two-way trade between countries for similar goods, the assumption of imperfect substitutability between domestic outputs and outputs supplied from the rest of the world (imported commodities) were made. Thus, the composite supply (Armington) function is specified to capture the imperfect substitutability between imports and domestic output sold domestically as a CES function in which the composite commodity for domestic supply is a contribution from both (i.e., both from domestic and imported commodities which are entering the CES function as "inputs'').[27]

Its mathematical formulation:

$$QQ_c = \alpha^q_c . (\delta^q_c . QM_c^{-\rho_c^q} + (1-\delta^q_c) . QD_c^{-\rho_c^q})^{-\frac{1}{\rho_c^q}} \qquad c \in (CM \cap CD) \qquad (4.11)$$

Where, QQ_c denotes composite supply (i.e., the quantity of goods supplied to domestic market), QM_c denotes the quantity of imports of commodity c, α^q_c denotes a shift parameter, δ^q_c denotes a share parameter, and ρ_c^q denotes an Armington function exponent. The shift parameter measures the shift in demand based on the

[27]When the domain of the CES function is restricted to commodities that are both imported and produced domestically, then, this function is often known as'' Armington" function, which is named after Paul Armington in honour of his work in 1969 (Lofgren et al., 2002).

expensiveness of the quantity supplied to the domestic economy. The share parameter signifies the domestic market share of imports or domestically produced output. The Armington exponent shows the elasticity of substitution between the two types of commodities. For the Armington function, import-domestic demand ratio (expressed as a function of domestic-import price ratio) is formulated as:

$$\frac{QM_c}{QD_c} = \left(\frac{PDD_c}{PM_c} \cdot \frac{\delta^q{}_c}{1-\delta^q{}_c} \right)^{\frac{1}{1+\rho_c{}^q}} \qquad c \in (CM \cap CD) \qquad (4.12)$$

This ratio states the optimal mix between imports and domestic output. Consequently, an increase in the price ratio leads to an increase in the demand ratio implying a shift away from the source that becomes more expensive (Lofgren et al., 2002).

Institutional Block

In this block the income and expenditure of four major institutions are modelled. In the model institutions are represented by households, enterprises, government, and the rest of the world (ROW). The major sources of income for the households are the endowment of factors of production and also transfer from other institutions (it could be from enterprise or the government). Then, the households use their income for consumption spending, saving, payment of direct taxes and also to make transfer to other institutions. With the exception of consumption spending, enterprises picture related features like that of households in income and expenditure aspects. As an income sources government collects taxes and receives transfers from other institutions. Then, uses this income for consumption (which is fixed in real terms), saving, and transfers to non-government domestic institutions (are CPI-index). To sum up about the four major institutions, we should note one point, that is, transfer payments between the rest of the world and domestic institutions and factors are all fixed in foreign currency.

Factor income, which defines the total income of each factor, is framed as:

$$YF_f = \sum_{a \in A} WF_f . \overline{WFDIST}_{fa} . QF_{fa} \qquad f \in F \qquad (4.13)$$

Where, YF_f denotes factor incomes, WF_f denotes the average factor price, $\overline{WFDIST}_{fa}$ denotes the wage distortion factor, and QF_{fa} denotes the quantity demanded of factor f from activity a. As we can see from the above equation factor income is expressed as the sum over all activities of the product of the average factor price, the wage distortion factor and the quantity demanded of factor f from activity a. The purpose of the wage distortion term is the measurement of the deviation from the average wage. In the model, for each factor the deviation from the average wage is the same, consequently the wage distortion term is fixed.

On the other hand, we have institutional factor income which splits income among domestic institutions in fixed shares after payments are made for direct taxes and transfers to the ROW.

$$YIF_{if} = shif_{if} . \left[YF_f - trnsfr_{rowf} . EXR \right] \qquad i \in INSD \qquad (4.14)$$

Where, i which stands for institutions is an element of INSD (it represents a set of domestic institutions), YIF_{if} represents institutional factor income, $shif_{if}$ represents the share of domestic institution i in income of factor f, and $trnsfr_{rowf}$ represents transfer from factor f to the rest of the world.[28]

[28]Ethiopia does not impose direct tax rate for factor (tf_f). Thus, in the above equation, the direct tax rate for factor f is taken as zero.

Additionally, in order to show the different sources of income of domestic non-government institutions (i.e., households and enterprises) the following formulation can be used:

$$YI_i = \sum_{f \in F} YIF_{if} + \sum_{i' \in INSDNG'} TRII_{ii'} + trnsfr_{gov}.\overline{CPI} + trnsfr_{irow}.EXR \quad i \in INSDNG \qquad (4.15)$$

Where, $INSDNG$ stands for domestic non-government institutions, YI_i denotes income of institution i, and $TRII_{ii'}$ denotes transfers from institution i' to i. According to the above formulation, the total income of any domestic non-government institution is the sum of factor incomes, transfers from other non-government institutions, transfers from the government and transfers from the rest of the world.

When we come to the household consumption expenditure, it is important to make division on commodities consumed by households as marketed commodities and home commodities. Consequently, two functions are needed to represent the household consumption expenditure function. But for our case the formulation for household consumption expenditure is given as:

$$EH_h = \left(1 - \sum_{i \in INSDNG} shii_{ih}\right).(1 - MPS_h).(1 - TINS_h).YI_h \qquad h \in H \qquad (4.16)$$

Where, h is an element of a set of households H, $shii_{ih}$ represents the share of net income of household h to institution i, MPS_h represents the marginal propensity to save for household h, $TINS_h$ represents direct tax rate for household h, and YI_h represents the income of household h. Accordingly, household consumption expenditure is expressed as a remnant after payments are made for direct taxes, savings and also transfers.

With regards to investment demand, it is expressed as the base-year quantity multiplied by an adjustment factor (this factor is exogenous in the basic model version). Since the adjustment factor is exogenous, the investment quantity is also exogenous in process. Then, it is framed as:

$$QINV_c = \overline{IADJ}.\overline{qinv_c} \qquad c \in C \qquad (4.17)$$

Where, $QINV_c$ denotes quantity of fixed investment demand for commodity, $\overline{IADJ}$ denotes investment adjustment factor, and $\overline{qinv_c}$ denotes the base-year quantity of fixed investment demand.

Correspondingly, government consumption demand is as well defined as, the base-year quantity multiplied by an adjustment factor (this factor is exogenous; hence the quantity of government consumption is fixed). Its formulation is given as:

$$QG_c = \overline{GADJ}.\overline{qg_c} \qquad c \in C \qquad (4.18)$$

Where, QG_c represents government consumption demand for commodity, $\overline{GADJ}$ represents government consumption adjustment factor, and $\overline{qg_c}$ represents the base-year quantity of government demand.

Additionally, there are equations representing government revenue and expenditure. Government is treated as a separate agent with income and expenditure. As its income sources government collects taxes and receives transfers from other institutions. Mathematically this can be shown as follows:

$$YG = \sum_{i \in INSDNG} TINS_i.YI_i + \sum_{c \in CM} tm_c.pwm_c.QM_c.EXR + \sum_{c \in C} tq_c.PQ_c.QQ_c + \sum_{f \in F} YIF_{govf} + trnsfr_{govrow}.EXR \qquad (4.19)$$

Where, YG is government revenue, $TINS_i$ is direct tax rate for institution i, YI_i is income of institution i, tm_c is import tariffs, pwm_c is world price of import, QM_c

quantity of import, tq_c is indirect sales tax, PQ_c is composite commodity price, QQ_c is composite supply, YIF_{govf} is transfer from institution to the government, $trnsfr_{govrow}$ is transfer from the rest of the world to the government, and EXR is exchange rate(local currency per foreign currency).[29]

Government uses its income to purchase commodities for its consumption (its consumption is fixed in real (quantity) terms) and to make transfer to other institutions (households and enterprises). Unlike that of government consumption, transfers to domestic institutions are CPI indexed. Mathematically;

$$EG = \sum_{c \in C} PQ_c . QG_c + \sum_{i \in INSDNG} trnsfr_{i\ gov} . \overline{CPI} \qquad (4.20)$$

Where, EG stands for government expenditure, PQ_c stands for composite price, QG_c stands for government consumption demand for commodity, $trnsfr_{igov}$ stands for transfers from the government to institution i, and CPI stands for consumer price index. In this block apart from the above equations, there is also equation specifying intra-institutional transfer (i.e., transfer between domestic non-government institutions, where the payment is made as a fixed shares of total institutional incomes net of direct taxes and savings).

[29]As shown in the work of Dorosh et al., (2009) in Ethiopia direct tax from factors, ‘’value-added taxes’’ on activities, activity taxes and export taxes are excluded from the equation specifying the government revenue sources. This is because those taxes are fictional in Ethiopia.

System Constraint Block

In this block different closure rule (this infers the equality of equations and endogenous variables which in fact require the fixation of some variables for the model to have a solution) will be specified. Particularly, these are factor market closure rule and macroeconomic closure rules. The choice made on different closures has no effect on the solution to the base simulation nonetheless it will normally have impact on the results of other simulations (Lofgren et al., 2002).

In the model, the first closure is the closure for factor markets, which enforce equality between quantity demanded and quantity supplied for each factor f . Mathematically this can be shown as follows:

$$\sum_{a \in A} QF_{fa} = \overline{QFS_f} \qquad f \in F \qquad (4.21)$$

Where, $\overline{QFS_f}$ denotes quantity supplied of factor f . Conditional on the type of the closure rule, QFS_f can be fixed (exogenous variable) or flexible. But in the above equation, all demand variables are flexible, while supply is kept fixed. Consequently, the average prices for each factor (the economy-wide wage); WF play the role of marketing clearing in setting with perfect factor mobility across activities. In addition to the above closure, there are two other alternative factor market closures which are encoded in the GAMS version. The first one is the case with unemployment at a given wage for a factor, where the supply variable for the factor is flexible while the economy-wide wage is fixed (WF). The second alterative is the case of a fully segmented factor market with fixed factor demands (Lofgren et al., 2002).

Particular for this study, factor market closure where labor is unemployed and mobile across sectors; land is fully employed and mobile across sectors and capital is fully

employed and activity specific is used. The implication of full employment of both land and capital is the fixation of their quantity. But for the case of labor since there is a room for unemployment, its employment is flexible. And the mobility of labor and land across sectors implies that they can be employed in different activities, whereas capital is immobile across sectors since it is activity specific. In the model there is disaggregation of labor into skilled, semi-skilled and unskilled. Subsequently, in Ethiopia, a cumulative of these divisions is made to follow the labor market characteristics of the large portion of the labor force, unskilled labor.[30]

In the model macroeconomic balance is determined exogenously by a series of ‘’closure rules’’. Mainly this include, the government balance, the external (current account) balance, and the saving-investment (S-I) balance. For the government balance, the default closure is flexible government saving, $GSAV$ and fixed direct tax rates. Since government saving is flexible, it plays the role of balancing the government account. Alternative there are two other closures, under these alternative government closures, the direct tax rates of domestic institutions are adjusted endogenously to generate a fixed level of government savings (in the adjustment of direct tax rates the alternative can be the imposition uniform tax rates or scaled direct tax rates for selected institutions). Generally, mathematical formulation of government balance can be represented as:

$$YG = EG + GSAV \tag{4.22}$$

Thus, from the above equation we can clearly see that, this closure enforce the equality of government revenue and the sum of government expenditure and savings. In our study we have used the first closure where the direct tax rates are held fixed

[30] In the study, the case where skilled labor is fully employed and activity specific, semi-skilled labor is unemployed and mobile, and unskilled labor is unemployed and mobile are simulated.

and government saving is flexible (thus, the change of this variable will balance the government account).

The external (ROW) balance enforces the equality between the country's spending and its earning of foreign exchange. For this balance the default closure is fixed foreign savings (trade balance) and flexible exchange rate which plays the role of equilibrating variable to the current account balance. As alternative closure, exchange rate may be fixed and foreign savings flexible. The mathematical formulation of the current account balance (which is expressed in foreign currency) is given as:

$$\sum_{c \in CM} pwm_c.QM_c + \sum_{f \in F} trnsfr_{rowf} = \sum_{c \in CE} pwe_c.QE_c + \sum_{i \in INSD} trnsfr_{irow} + \overline{FSAV} \qquad (4.23)$$

Where, $\overline{FSAV}$ denotes foreign saving (in foreign currency unit). According to the above equation, import spending plus factor transfers to the ROW must equal the sum of export earning, institutional transfers from the ROW and foreign savings. Specifically, in this study the first closure where foreign saving is held fixed is employed. Therefore, real exchange rate plays the role of equilibrating the current account balance.

Finally, we have the saving-investment balance (S-I), which impose the equality of total savings and total investment. In the S-I balance, we have about five closure. As a default closure, propensities to save for all non-government domestic institutions is held fixed, while capital formation is made flexible (saving-driven closure). Among the remaining four closures the first alternative is investment- driven closure, where saving do the adjustment (uniform saving rates (MPS) adjust for selected institutions to finance the cost of investment). The other alternative is similar with the above

closure (investment-driven) except for the saving rate which is not uniform (the saving rates are scaled). The remaining closures are the variants of investment-driven closure, but the adjustment of government consumption is required. Therefore, in the last two alternative closures, fixed investment and government consumption absorption shares for both with the disparities being uniform MPS for the former and scaled MPS for the later (Lofgren et al., 2002).

$$\sum_{i \in INSDNG} MPS_i.(1-TINS_i).YI_i + GSAV + EXR.\overline{FSAV} = \sum_{c \in C} PQ_c.QINV_c + \sum_{c \in C} PQ_c.qdst_c \quad (4.24)$$

Where, $qdst_c$ represents the quantity of stock changes. Accordingly, the sum of savings from the government, domestic non-government institutions and the ROW are equated with the sum of fixed investment and stock change. To cater for imbalance, the S-I balance also has an optional addendum in 'WALRAS' which is valued at zero if the model is in equilibrium (balanced).[31]

[31]According to Varian (1992) the foundations for the Walrasian general equilibrium are the accounting rules (the conservation of value) which reflects the accounting principle of budgetary balance that for each activity in the economy the value of expenditures must be balanced by the value of incomes, and that each unit of expenditure has to purchase some amount of some type of commodity. The author normally stated the Walrasian equilibrium as the price and commodity vectors such that there is no good for which there is positive excess demand. Further, the Walrasian general equilibrium prevails when the price of commodities equal to their marginal cost of production with firms earning zero profits, there is no excess demand for commodities and factors, and consumers' income equals their expenditure.

The ‘’Between model’’

As we have pointed out in the previous discussion, this model is the engine of the dynamic process. In this model variables could be updated endogenously or exogenously. Accordingly, capital stock could be updated endogenously with capital accumulation equation and population could be updated exogenously between periods. The full specification each of the dynamic equation is given in the appendix B.

CHAPTER FIVE

SIMULATIONS AND RESULTS

5.1 Description of Simulations

In this section, a detail presentation of each of the scenario is given. Apart from the base line simulation, we have five simulations. Among the five simulations three of them (tariff reduction, the increase in direct tax and sales tax) are the major simulations while the remainders are the combination of varied simulations. For each of the simulation, their impact on major macroeconomic variables, sectoral and the welfare of the consumer is assessed.

Simulation Scheme for Trade Liberalization

The intend of our study is to examine the economy-wide effects of signing EPA with EU and joining COMESA-FTA. Further, the impact of the implementation of counteracting fiscal measures is assessed. Hence, to achieve the stated objectives, the following simulations are considered.

Base Line Simulation

The base case scenario is established to serve as a reference in an absence of any policy shock and serves as a benchmark for policy evaluation. Thus, in this scenario, welfare, which is measured as equivalent variation in the representative agent's real income, and other macroeconomic variables show their value without any policy shock to the economy. Therefore, the result of the base line simulation is used as the benchmark value so as to compare the values of different variables after the policy shocks.

Simulation 1: 80% tariff reduction for EU member states and 100% for COMESA-FTA

As we have discussed in chapter one, the percentage used in the simulation are based on the requirement of the terms of reference (TOR). Accordingly, in the EPA negotiation, in addition to other issues, the ESA's offer to the EU is to liberalize import from EU member states by 70% whereas the EU's offer is to liberalize import from ESA states by 100% and on its part EU requested the ESA states to reduce tariff by 80% for products originating from the EU member states.

In our study for analysis purpose we have only considered the EU's offer (80% liberalization for import from EU member states). That is, we simulated the impact of 80% tariff reduction for products originating from EU member states (excluding the list of sensitive products) and 100% tariff reduction for the products originating from ESA member states.

Simulation 2: Increasing direct tax rate by 2.42%

The target of our study is not examining the impact of increasing direct tax rate, rather analysing the combined effect of tariff reduction and counteracting fiscal policy measures that would be taken by the government to compensate the revenue loss following trade liberalization. Further, it is advisable first to consider the individual simulation before undertaking the combined simulation. Thus, in this simulation we have analyzed the individual impact of the increase in direct tax rate by exact amount (direct tax rate is adjusted to grow by 2.42 % annually) which would offset the revenue loss.

Simulation 3: Increasing sales tax rate by 0.84%

Similarly, before examining the combined effect of tariff reduction and increasing sales tax rate, in this simulation we examined the impact of the increase in sales tax rate only. The percentage of increment is based on the amount which would exactly offset the revenue loss. Accordingly, the sales tax rate is adjusted to grow by 0.84% annually.

Simulation 4: Sim 1 + Sim 2

After signing the EPA with EU and joining COMESA-FTA, Ethiopia is expected to liberalize its import from those member states. Consequently, there will be a significant revenue loss which needs to be compensated by implementing appropriate counteracting fiscal policy measures. Among the different measures, government can compensate the revenue loss by raising direct tax rate by the equivalent amount which will offset the budget gap (revenue loss). Consequently, together with the tariff reduction, direct tax rate is adjusted to grow by 2.42% annually.

Simulation 5: Sim 1 + Sim 3

For the same reason, in this simulation another fiscal policy measure that government would take to compensate the revenue loss following trade liberalization is considered. Government can give back the revenue loss by raising the sales tax rate. Thus, in this simulation, tariff reduction and the increase in sales tax rate is simulated jointly. Sales tax rate is adjusted to grow by 0.84% annually.

5.2 Discussion of Results

In this section, the detail interpretation of the simulation result is given. To achieve the stated objectives, the analysis centred only on major issues; their impact on macroeconomic variables, sectoral and finally, the welfare effect.

5.2.1 Effect on Macroeconomic Variables

In table 5.1 the summary of simulation results of major macroeconomic variables is given. These variables are real GDP at factor cost (GDPFC2), absorption, fixed investment, private consumption, real export, real import, government income, and government recurrent expenditure.

Table 5.1: Impact on Selected Macroeconomic Variables (% change of real values)

Macroeconomic Indicators	Base value (in billion birr)	sim 1	sim 2	sim 3	sim 4	sim 5
Real GDP	355	0.58	0.16	-0.37	0.35	-0.18
Absorption	457.8	0.46	0.14	-0.28	0.29	-0.13
private consumption	338.7	0.97	-0.35	-0.87	0.27	-0.24
Fixed investment	85.5	-1.4	2.14	1.9	0.44	0.2
Real Export	52.2	2.85	0.61	-1.67	2.92	0.64
Rear Import	-126.5	1.17	0.25	-0.69	1.2	0.26
Government Income	67.765	-2.411	2.682	2.691	0	0
Government Exp.	32.3	0.863306	-0.5601	-0.7845	0.352039	0.1305

Source: Own computation from the simulation results

In simulation 1, following the 80% tariff reduction for products originating from EU member states and 100% tariff reduction for COMESA-FTA, most of the macroeconomic variables has recorded a positive change. Real GDP at factor cost has increased by 0.58%. Mainly due to the increase in private consumption (0.97%) and recurrent government expenditure (0.86%), absorption has grown by 0.46%. The increase in private consumption could be explained by the increase in household consumption expenditure. Moreover, the component of real GDP, real export and import has increased by 2.85% (due to exchange rate depreciation) and 1.17% (due to tariff reduction) respectively. Unlike those variables, government income has fall down by 2.41% due to the reduction of tariff. Consequently, investment has recorded a negative change (decreased by 1.4%).

Among the stated macroeconomic variables the focus of our study is centred on government income. Hence, in the following paragraph we will discuss about the impact of trade liberalization on government income in more detail.

Table 5.2: Total current government income (%change)

INITIAL	BASE	Sim 1	Sim2	Sim 3	Sim4	Sim 5
67.765	63.768	61.357	66.45	66.459	63.768	63.768

Source: Simulation result from the CGE model

Within four years (2012 – 2015), the percentage change in current government income is 61.357% which is lower than the base year percentage change, 63.768%. This is to mean, following the signing of EPA with EU and joining of COMESA-FTA, government has to reduce tariff, which in turn has brought adverse effect on the government income. Thus, 80% tariff reduction on imports from EU member states

and 100% tariff reduction on imports from ESA member states has reduced the overall current government income approximately by 2.4%.

Consequently, government need to take counter fiscal policy measures so as to compensate the revenue loss. In our study, we have considered two alternative compensating fiscal policy measures; direct and indirect tax (sales tax). The percentage of increment of these taxes is by the exact amount which will offset the existing revenue gap. Accordingly, direct tax is adjusted to grow annually approximately by 2.42% whereas sales tax is adjusted to increase by 0.84% annually. But before running the combined simulation it is better to run the individual simulation. Therefore, in simulation 2 and 3 we will analyse the individual impact of each of the counter fiscal policy measure, then in the fourth and fifth simulation the combined effect of tariff reduction and implementation of alternative compensating measures will be analysed.

Similarly, in simulation 2, most of the macroeconomic variables have shown improvement. Real GDP at factor cost has increased by 0.16%. Absorption has grown by 0.14% mainly due to a positive change recorded by investment (increased by 2.14%), which in turn has offsetting effect on a negative change shown by private consumption (decreased by 0.35%). The fall of private consumption could be affirmed by the reduction of disposable income following the adjustment of the direct tax rate. Due to the rise of direct tax rate, government income has grown by 2.68%. This improvement could explain the positive change recorded by investment. Since the huge part of government income is allocated for investment purpose, government recurrent expenditure has fell down by 0.56%. Apart from this, real export and import has increased by 0.61% and 0.25% in that order.

In simulation 3, unlike the case for the first and second simulation, most of the macroeconomic variables have shown a negative change. Real GDP at factor cost has decreased by 0.37%. Due to the fall of private consumption (0.87%) and recurrent government expenditure (0.78%), absorption has decreased by 0.28%. The fall of private consumption could be attributing to the increase in price of commodities following increment of sales tax rate. Since the rate of sales tax has raised the government income has shown growth by 2.69%. As a result, investment has increased by 1.9%. The increment of sales tax rate has also brought adverse effect on real export (decreased by1.67%) and import (0.69%).

In simulation 4, unlike the above simulations, in this simulation, tariff reduction together with the alternative compensating measure is simulated. Specifically, tariff reduction and the increase in direct tax rate (2.42%) are considered. The simulation results are a complete opposite of the above simulations. That is, in this simulation all of the macroeconomic variables have shown an improvement. Real GDP at factor cost has increased by 0.35%. Owing to the improvement shown by private consumption (0.27%), investment (0.44%) and government recurrent expenditure (0.35%), absorption has increased by 0.29%. For the same reason given in simulation 1, real export and import has grown by 2.92% and 1.2% respectively.

Table 5.3: Current Government income (annual % change)

	2010	2011	2012	2013	2014	2015
BASE	67.8	73.4	80.4	90.1	103.2	111
Sim 1	67.8	73.4	79.1	88.8	101.7	109.3
Sim 4	67.8	67.8	79.3	89.3	102.8	111

Source: Simulation result from the CGE model

As demonstrated in the above table, after the policy change (tariff reduction), compared with the base year, the current government income has been decreasing in each year. However, after the implementation of the counter fiscal policy measures (the adjustment of direct tax rate to grow by approximately by 2.42%), the trend has been changing a little bit. That is, in each year the percentage change has been adjusting itself till the base year amount is replaced.

In the last simulation also tariff reduction is simulated together with sales tax adjustment. Sales tax rate is adjusted to grow by 0.84% annually. As the case for simulation 3, in this simulation, real GDP at factor cost has fall down by 0.18%. Absorption has recorded a negative change (decreased by 0.13%) mainly due to a fall in private consumption by 0.24%. The increase in investment (0.2%) is very small to offset the negative change shown by private consumption. The small increase in investment could be affirmed by the fact that government now has shifted most of its income for the purpose of recurrent expenditure (increased by 0.13%). For the same reason given in simulation 1 and 4, real export and import has increased by 0.64% and 0.26% in that order.

Table 5.4: Current Government income (annual % change)

	2010	2011	2012	2013	2014	2015
BASE	67.8	73.4	80.4	90.1	103.2	111
Sim 1	67.8	73.4	79.1	88.8	101.7	109.3
Sim 5	67.8	73.5	73.5	89.3	102.8	111

Source: Simulation result from the CGE model

As we can see from the above table, following tariff reduction (starting from 2012), in each year the percentage change of current government income has been falling down (see the result of Sim 1). However, after the implementation of the compensating measure (increase in sales tax rate) together with the liberalization process, in each year the percentage change of current government income has been adjusting to replace the base year value (see the result of Sim 5).

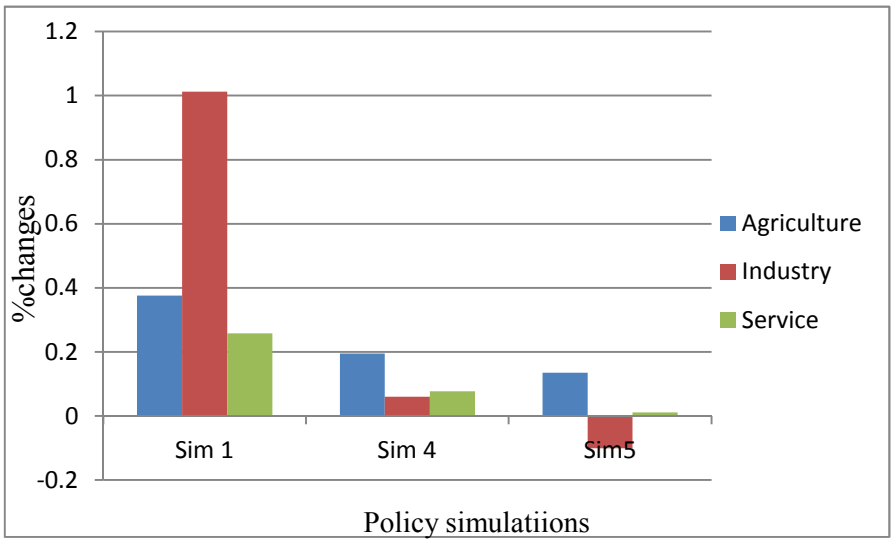
In summing up, the impact on each macroeconomic indicator can be summarized as follows. Except for the third and fifth simulation, real GDP at factor cost has shown improvement. The largest percentage change (0.58%) has been recorded in the first simulation (tariff reduction). Similarly, absorption and private consumption has shown a negative value in third and fifth simulation. Moreover, private consumption has decreased in second simulation due to the reduction of disposable income following the increment of direct tax rate. Investment has shown improvement in all simulation except for the first simulation (due to loss of government revenue after tariff reduction). Specifically, in the second simulation, the largest percentage change (2.14%) has been shown. With the exception of the third simulation, both real export and import has shown a positive change in all the simulations. Huge percentage change for real export and import has been recorded in the fourth and first simulation respectively. After tariff reduction (Sim 1), government income has decreased, while in the fourth and fifth simulation the loss is compensated by implementing alternative counter fiscal policy measures. Lastly, government recurrent expenditure recorded a negative value in the second and third simulation due to shift of the government income for investment purpose.

Generally speaking, except for investment and government income, all of the macroeconomic indicators have shown the largest percentage change in the first simulation. However, the focus of our study is analysing not only the impact of trade liberalization rather the combined effect of trade liberalization and the counteracting fiscal policy measures that would be taken by the government to compensate the revenue loss. Hence, comparing the results shown in the fourth and fifth simulation, almost all of the macroeconomic indicators have shown a positive change in the fourth simulation. In other language, rather than implementing the sales tax adjustment as a counteracting fiscal policy measure, policy makers have to make the direct tax adjustment as way of compensating the revenue loss.

5.2.2 Sectoral Effects

For analysis purpose we have considered the effects of only the three main simulations (the first, fourth and fifth simulation).The following diagram is used to demonstrate the impact of each of the simulations on the sectoral output.

Figure 5.1 Sectoral output (% change in 2012)



Source: Own computation based on the CGE model

In the first simulation, where the liberalization process is considered without application of any compensating measures for the revenue loss, the percentage change of each sector's output has grown. After tariff reduction, though the recorded percentage change is different for each sector, the output of each sector has increased. Among the sectors, the largest expansion has shown by the industrial sector (1.01%). This is attributing to the reduction of tariff on those products which are mainly used by the industrial sector for production purpose. Then, in terms of percentage change of sectoral output, agricultural and service sector are ranked in the second and third place with percentage change of 0.38% and 0.26% respectively.

In the fourth simulation the combined effect of trade liberalization and operation of counter fiscal policy measure (the adjustment of direct tax rate) is analysed. Similarly, in this simulation, the output of each sector has improved. However, compared with the first simulation, here the percentage of increment of sectoral output is lower. This is mainly due to the reduction of disposable income after the adjustment of direct tax rate. Moreover, unlike the case for the first simulation, in this simulation, the agricultural sector has recorded the largest percentage change (0.19%) whereas the industrial sector has shown the lowest percentage change (0.06%). This originates from the fact that the industrial sector is the most advantageous sector from reduction of tariff. Hence, the increment of direct tax rate has limited purchasing power by reducing the available disposable income, which in turn has imposed adverse effect on sector.

In the last simulation, the recorded value for the industrial sector is a complete opposite of the result shown in the first simulation. That is, the running of the combined simulation (tariff reduction and sales tax adjustment) has brought adverse

effect on this sector (decreased by 0.1%). This could be explained by the resulting price effect after the adjustment of sales tax rate. For the agricultural and service sector, the percentage change of output is lower when it is compared with the fourth simulation. The same explanation could be given for the lower percentage recorded in both the agricultural (0.14%) and service sector (0.01%). That is, the increment of sales tax rate has brought associated price effect in different sectors.

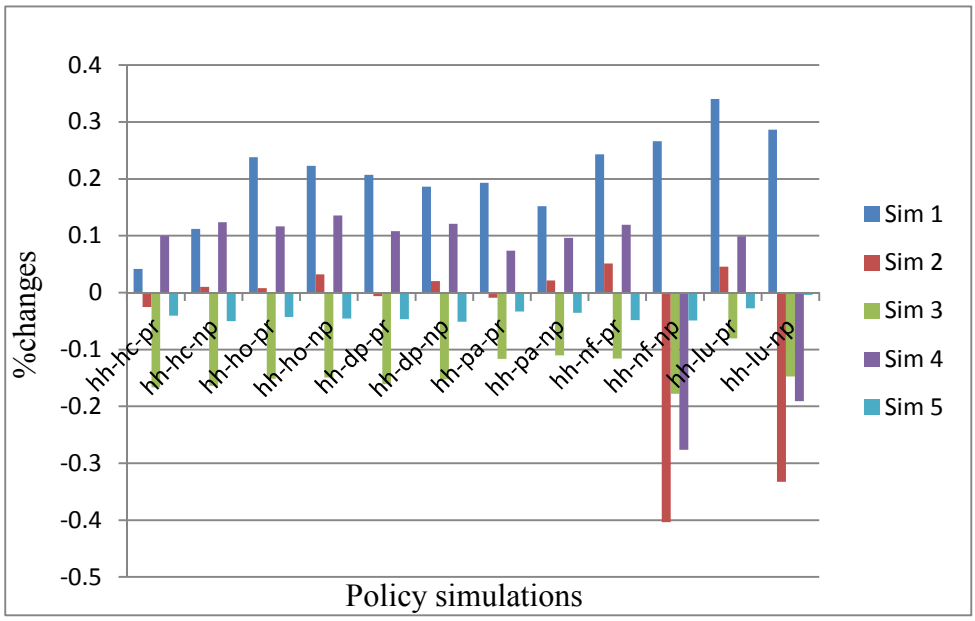
In concluding, as demonstrated in figure 5.1, while pursuing the liberalization process, government has to follow the direct tax rate adjustment rather than implementing sales tax rate adjustment. The adjustment of sales tax rate has brought unwanted result through its price related effect. Therefore, matching the results of the fourth and fifth simulation, the overall sectoral output has increased in the fourth simulation.

5.2.3 Welfare Effects

To examine the impact of the different simulation on the household's welfare we can use variables like household consumption expenditure and household real consumption. However, in most literature, to measure the welfare impact, equivalent variation (EV) is used as an important tool. Generally, after policy change there is a need for price adjustment to take place. Consequently, EV is used an important tool to measure the level of income that the consumer need to pay before a shock to leave him/her as well off at equivalent level of utility loss after the price change (increase). Accordingly, EV indicates that the increase in price from p_0 to p_1 leads to welfare loss by the amount equal to the loss of income (which equal to EV) if the price remained at p_0. But for our analysis we will use the EV together with those variables to measure the welfare change.

The effects of each of the simulations on the household's welfare are demonstrated using the following diagram.

Figure 5.2 Effects of simulations on welfare (EV) of household groups (% change)



Source: Own computation based on the CGE result

As we can see from the above diagram, after trade liberalization (Simulation 1), the welfare of all households in different agro-ecological zones has shown improvement. This is due to the fact that, the reduction of the import duty rates on imports from the EU and ESA member states will immediately decrease the prices of imported goods. This will cause, ceteris paribus, a fall of final internal prices, which are a composite of prices of imports and domestically produced commodities. Hence, lower price will in turn increase the purchasing of the households. In nut shell, though the percentage of improvement is different among the households in different agro-ecological zones, the households are better off following tariff reduction.

In simulation 2, some of the poor households are adversely affected by the increment of the direct tax rate while in simulation 3; almost all of the households in the different agro-ecological zones are negatively following the rise of the sales tax rate.

In the fourth and fifth simulation the combined effect of trade liberalization and counteracting fiscal policy measures are simulated. Accordingly, in the fourth simulation the welfare of almost all households group is improved following the reduction of tariff together with the operation of counter fiscal policy measure (direct tax rate is adjusted to grow by 2.42% annually). However, in the fifth simulation, the welfare of all the households in different agro-ecological zones is deteriorated. In concluding, as the percentage change of welfare (EV) for different households group show global wise all household is better off if we consider the impact of trade liberalization alone (without implementing alternative compensating measures) while for some of the household groups the largest percentage of welfare change is recorded whenever the combined simulation is considered (see the fourth simulation result). Nevertheless, the analysis of our study is centred on the combined effect of trade liberalization and implementing counteracting fiscal policy measures. Thus, comparing the welfare change recorded in the fourth and fifth simulation, the households group is better off when the liberalization process is taken together with the adjustment of direct tax rate (fourth simulation).

The above result could be affirmed by using household consumption expenditure and household real consumption. For the different simulations, the percentage change of household consumption expenditure is given in the table below.

Table 5.5: Household consumption expenditure (% change)

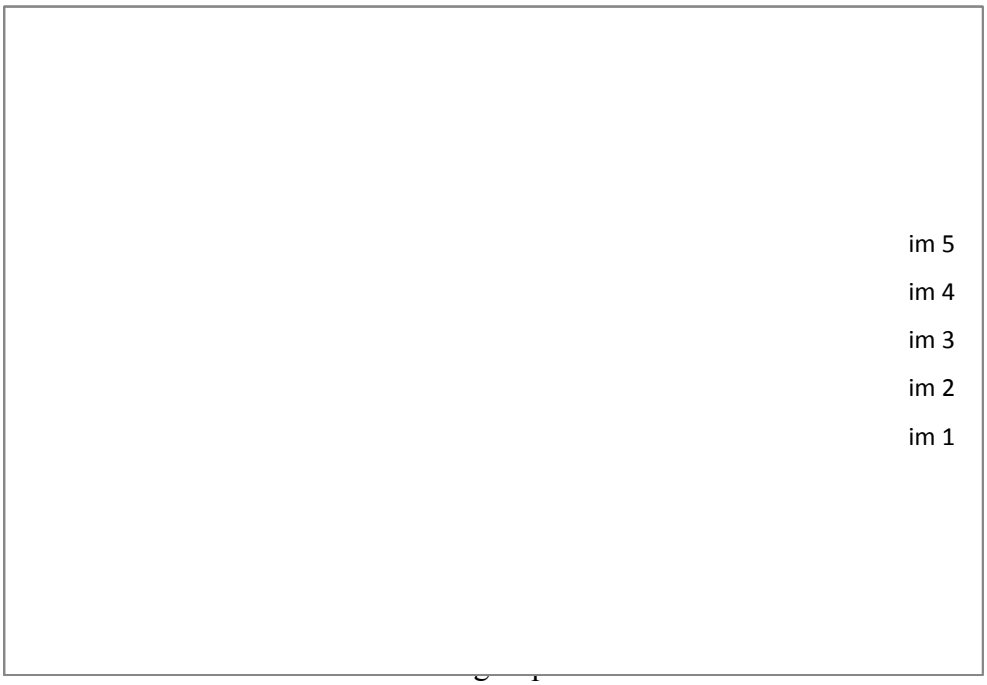
	BASE	Sim 1	Sim 2	Sim3	Sim 4	Sim 5
hh-hc-pr	66.3	0.6	-0.2	-1.1	0.6	-0.3
hh-hc-np	63.7	0.8	0.1	-0.9	0.7	-0.3
hh-ho-pr	64.9	1.6	0.1	-1	0.8	-0.3
hh-ho-np	63.9	1.4	0.2	-0.9	0.8	-0.3
hh-dp-pr	61.9	1.4	0	-0.9	0.7	-0.2
hh-dp-np	55.4	1.2	0.1	-0.8	0.7	-0.3
hh-pa-pr	65.8	1.8	-0.1	-1.2	0.7	-0.3
hh-pa-np	64.7	1.5	0.1	-1	0.8	-0.3
hh-nf-pr	56.7	1.1	0.2	-0.8	0.8	-0.2
hh-nf-np	62.7	1.2	-1.9	-0.8	-1.3	-0.2
hh-lu-pr	32.2	0.9	0.2	-0.6	0.6	-0.1
hh-lu-np	35.5	0.9	-1.6	-0.6	-1.1	-0.1

Source: Own computation based on the simulation results

Similarly, in the first simulation the household consumption expenditure has increased for all household groups in different agro-ecological zones. In the third and fifth simulation, all of the household groups are worse off (their consumption expenditure has fall down). The increase in consumption expenditure for some household groups in the second simulation is may be due to the increase in transfer from the government to the households (since government income has grown after the raise of direct tax rate). Lastly, except for two household groups, in the fourth simulation the household consumption expenditure for all household groups has recorded a positive value. Therefore, using household consumption expenditure also we have inferred that the implementation of direct tax as a compensating measure has brought welfare improvement for most of the household groups.

Lastly, using real household consumption we can also analyse the impact of the different simulations on the household's welfare. The impact of the different simulations on the household's welfare is demonstrated using the figure below.

Figure 5.3 Disaggregated real household consumption (% change)



Source: Own computation based on the CGE results

As shown in the above diagram, the amount of real consumption by all the households groups has increased following tariff reduction (see simulation 1). In the second simulation both positive and negative values have been recorded whereas in the third and fifth simulation the real consumption of all household groups has dwindled. However, in the fourth simulation, the real consumption of most household groups has improved.

In concluding, as the percentage change of EV, household consumption expenditure and disaggregated real household consumption signify, compared with the sales tax adjustment, the application of direct tax adjustment together with trade liberalization is the best compensating measure with regards to the impact it imposes on the household's welfare.

CHAPTER SIX

CONCLUSTIONS AND IMPLICATIONS

6.1 Conclusions

In our study we have shown endeavour to examine the economy-wide effects of trade liberalization on one hand, and pursuing trade liberalization together with the operation of counteracting fiscal policy measures on the other hand. That is, we examined the impact of tariff reduction alone, tariff reduction and application of direct tax rate adjustment, and finally, implementation of sales tax rate adjustment together with the tariff reduction.

As a Growth and Transformation Plan (GTP), the Ethiopian government has planned to conclude the Economic Partnership Agreement (EPA) with European Union (EPA-EU) and also joining COMESA-FTA. Hence, our study has investigated the impact of concluding those agreements on the household's welfare. Apart from this, the study provided the quantification of the resulting revenue loss. To attain the stated objectives, a recursive dynamic CGE model is used as a major analytical tool. This model has used the updated version of 2005/06 SAM as its main data base.

As we have discussed in chapter three, the percentage of tariff reduction used in the simulations is in conformity with the requirement of the terms of reference (TOR). That is, in the EPA negotiation, beside other issues, the ESA's offer to EU is 70% import liberalization for products originating from the EU member states, while the EU's offer is 100% import liberalization for products originating from the ESA member states and on its part, EU requested the ESA to liberalize import from the EU member states by 80%. However, in our study, we have only reflected the impact of 80% tariff reduction for products originating from the EU member states.

And for the case of COMESA-FTA, we investigated the effects of 100% import liberalization for products originating from the COMESA-FTA member states.

Accordingly, in the first simulation, with exception of investment and government income, most of the macroeconomic indicators have recorded a positive change. Following tariff reduction, government income has fallen by approximately 2.41%. The impact on the sectoral output is positive. The largest percentage change in output is shown by industrial sector, followed by agricultural and service sector, in that order. Generally speaking, after trade liberalization the welfare of the household groups in the different agro-ecological zones has improved.

In the second and third simulation, government income has increased, which is reflected by the positive change shown by investment. In the third simulation, though the percentage of increment (0.84%) of sales tax rate is lower than that of direct tax rate (2.42%), it has imposed adverse effect on most of the macroeconomic indicators mainly due to its associated price effect. In the second simulation, the overall sectoral output has increased though the percentage change is small. Nonetheless, in the third simulation, the overall sectoral output has indicated a negative change. In nut shell, with exception of some household groups, the welfare of most of the household groups has deteriorated after the increment of tax rate.

In the fourth simulation, pursuing trade liberalization together with direct tax rate adjustment so as to compensate the revenue loss has brought improvement in all of the macroeconomic indicators. However, for some macroeconomic indicators, the percentage of improvement is lower than the first simulation. Similarly, the output of each sector has indicted a positive change though the magnitude of the change is

lower when it is compared with the first simulation. Globally, the welfare impact on the different household groups is positive.

In the last simulation, the implementation of sales tax rate adjustment together with tariff reduction has brought a fall in the percentage of improvement of most of the macroeconomic indicators, and even worse, for some of the macroeconomic indicators, it has indicated a negative changes. With regards to sectoral output, the overall sectoral output has decreased. Altogether, in this simulation, the welfare of almost all of the household groups has deteriorated.

To sum up, in those simulations which included sales tax rate adjustment (third and fifth) has brought adverse effects on the welfare of the different household groups. Therefore, in order to compensate the revenue loss following trade liberalization compared with the sale tax rate modification, it is beneficial to apply direct tax rate modification together with tariff reduction.

6.2 Implications

Based on the simulations results, our study has the following implications with regards to trade liberalization and the operation of counteracting fiscal policy measures in order to offset the revenue loss.

Primarily, following the simultaneous entry into EPA with EU and COMESA-FTA, tariff has been reduced. This process was affirmed by the negative values recorded by the government revenue. Though there is a fall in government revenue, the impact could be manageable. However, as we have seen in descriptive part, tariff revenue is a major source of government; hence it is advisable for policy makers to foresees other alleviation measures so as to compensate the forgone revenue .

Secondly, with the increase in direct and indirect (sales) tax rates, government income has raised which is revealed by the improvement shown by the investment variable. As a revenue source comparing the two sources, even with a lower percentage of increment, sales tax rate adjustment has brought adverse effect on almost all of the economic variables. This is mainly due to the price related effects of the imposition of sales tax. Thus, from the welfare point of view, in any case, if government is required to raise its income it should not be through the adjustment of sales tax rate.

Thirdly, with regards to the combined simulations, tariff reduction together with the application of direct tax rate adjustment, the loss in government revenue has been compensated. Here, the percentage of improvement of most of the economic variables is lower than the one recorded for the case where the individual simulation, tariff reduction alone is considered. Similarly, to offset the revenue loss, the other alternative is the implementation of sales tax rate adjustment together with tariff reduction. Accordingly, through its price related effect, most of the economic variables has revealed a negative change. The welfare of the different household groups has deteriorated. This implies, comparing the above two compensating measures, it is beneficial to operate the direct tax rate modification measure so as to compensate the forgone revenue. However, this alternative measures are not the only compensating measures. Hence, policy makers could also consider other alternative measures, that is, revising the excise and value-added taxing system could also be seen as an important mitigation measure. Subsequently, imposing additional excise tax on some imported luxury goods could be considered. Moreover, broadening the tax base could also be another alternative measure.

Finally, in our study we have assumed the case where tariff reduction following the signing of EPA with EU could be taken automatically (in a single year). However, from the negotiation so far one could conclude that the liberalization could be made in over extended period of time. Consequently, the immediate impact on government revenue would be minimal. With regards to COMESA-FTA, though the implementation is automatic, the impact it imposes is so small when it is compared with the EU-EPA counterpart.

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APPENDICES

Appendix A: The 'Within' Model

In this appendix the full formulation of the ''within''or static CGE model which has been used in our study. For clarity purpose, the sets, parameters and variables are given in appendix A1whereas the model equation is given in appendix A2.

Appendix A1: Sets, Parameters and Variables in the model

Sets

$\alpha \in A$ -activities

$\alpha \in ALEO(\subset A)$ - activities with a Leontief function at the top of the technology nest

$c \in C$ - commodities

$c \in CD(\subset C)$ - commodities with domestic sales of domestic output

$c \in CDN(\subset C)$ - commodities not in CD

$c \in CE(\subset C)$ - exported commodities

$c \in CEN(\subset C)$ - commodities not in CE

$c \in CM(\subset C)$ - imported commodities

$c \in CMN(\subset C)$ - commodities not in CM

$c \in CT(\subset C)$ - transactions service commodities

$c \in CX(\subset C)$ - commodities with domestic production

$f \in F$ - factors

$i \in INS$ - institutions (domestic and rest of the world)

$i \in INSD (\subset INS)$ - domestic institutions

$i \in INSDNG (\subset INSD)$ - domestic nongovernment institutions

$h \in H (\subset INSDNG)$ - households

Parameters (Latin Letters)

$cwts_c$ - weight of commodity c in the CPI

$dwts_c$ - weight of commodity c in the producer price index

ica_{ca} - quantity of c as intermediate input per unit of activity a

$icd_{cc'}$ - quantity of commodity c as trade input per unit c' produced and sold domestically

$ice_{cc'}$ - quantity of commodity c as trade input per exported unit of c'

$icm_{cc'}$ - quantity of commodity c as trade input per imported unit of c'

int a_a - quantity of aggregate intermediate input per activity unit

iva_a - quantity of value-added per activity unit

$\overline{mps_i}$ - base saving rate for domestic institution i

$mps01_c$ - 0-1 parameter with 1 for institutions with potentially flexed direct tax rates

pwe_c - export price(foreign currency)

pwm_c - import price (foreign price)

$qdst_c$ - quantity of stock change

$\overline{qg_c}$ - base – year quantity of government demand

$\overline{qinv_c}$ - base – year quantity of private investment demand

$shif_{if}$ - share for domestic institution i in income of factor f

$shii_{ii'}$ - share of net income of i' to i ($i' \in INSDNG'; i \in INSDNG$)

$\overline{tins_i}$ - exogenous direct tax rate for domestic institution i

$tins01_i$ - 0 - 1parameter with 1 for institutions with potentially flexed direct tax rates

tm_c - import tariff rate

tq_c - rate of sales tax

$trnsfr_{if}$ - transfer from factor f to institution i

Parameters (Greek Letters)

α^{va}_a - efficiency parameter in the CES value – added function

α^{ac}_a - shift parameter for domestic commodity aggregation function

α^{q}_c - Armington function shift parameter

α^{t}_c - CET function shift parameter

β^{h}_{ach} - marginal share of consumption spending on home commodity c from activity a for household h

β^{m}_{ch} - marginal share of consumption spending on marketed commodity c for household h

δ^{ac}_{ac} - share parameter for domestic commodity aggregation function

δ^{q}_{c} - Armington function share parameter

δ^{t}_{c} - CET function share parameter

δ^{va}_{fa} - CES value –added function share parameter for factor f in activity a

γ^{m}_{ch} - subsistence consumption of marketed commodity c for household h

γ^{h}_{ach} - subsistence consumption of home commodity c from activity a for household h

θ_{ac} - yield of output c per unit of activity a

ρ^{va}_{a} - CES value – added function exponent

ρ^{ac}_{a} - domestic commodity aggregation function exponent

ρ^{q}_{c} - Armington function exponent

ρ^{t}_{c} - CET function exponent

Exogenous Variables

$\overline{CPI}$ - consumer price index

$\overline{DTINS}$ - change in domestic institution tax share (= 0 for base; exogenous variable)

$\overline{FSAV}$ - foreign savings (FCU)

$\overline{GADJ}$ - government consumption adjustment factor

$\overline{IADJ}$ - investment adjustment factor

$\overline{MPSADJ}$ - savings rate scaling factor (= 0 for base)

$\overline{QFS}_f$ - quantity supplied of factor

$\overline{TINSADJ}$ - direct tax scaling factor (= 0 for base; exogenous variable)

$\overline{WFDIST}_{fa}$ - wage distortion factor for factor f in activity a

Endogenous Variables

$DMPS$ - change in domestic institution saving rates (= 0 for base; exogenous variable)

DPI - producer price index for domestically marketed output

EG - government expenditure

EH_h - consumption spending for household

EXR - exchange rate (LCU per unit of FCU)

$GOVSHR$ - government consumption share in nominal absorption

$GSAV$ - government savings

$INVSHR$ - investment share in nominal absorption

MPS_i - marginal propensity to save for domestic non-government institution

(exogenous variable)

PA_a - activity price (unit gross revenue)

PDD_c - demand price for commodity produced and sold domestically

PDS_c - supply price for commodity produced and sold domestically

PE_c - export price (domestic currency)

$PINTA_a$ - aggregate intermediate input price for activity a

PM_c - import price (domestic price)

PQ_c - composite commodity price

PVA_a - value-added price (factor income per unit of activity)

PX_c - aggregate producer price for commodity

$PXAC_{ac}$ - producer price of commodity c for activity a

QA_a - quantity (level) of activity

QD_c - quantity sold domestically of domestic output

QE_c - quantity of exports

QF_{fa} - quantity demanded of factor f from activity a

QG_c - government consumption demand for commodity

QH_{ch} - quantity consumed of commodity c by household h

QHA_{ach} - quantity of household home consumption of commodity c from activity a for household h

$QINTA_a$ - quantity of aggregate intermediate input

$QINT_{ca}$ - quantity of commodity c as intermediate input to activity a

$QINV_c$ - quantity of investment demand for commodity

QM_c - quantity of import of commodity

QQ_c - quantity of goods supplied to domestic market (composite supply)

QT_c - quantity of commodity demanded as trade input

QVA_a - quantity of (aggregate) value-added

QX_c - aggregated marketed quantity of domestic output of commodity

$QXAC_{ac}$ - quantity of marketed output of commodity c from activity a

$TABS$ - total nominal absorption

$TINS_i$ - direct tax rate for institution i ($i \in INSDNG$)

$TRII_{ii'}$ - transfer from institution i' to i (both in the rest $INSDNG$)

WF_f - average price of factor f

YF_f - income of factor f

YG - government revenue

YI_i - income of domestic non-government institution

YIF_{if} - income to domestic institution i from factor f

Appendix A2: Model Equation

Price Block

[1]Import price

$$PM_c = pwm_c.(1+tm_c).EXR + \sum_{c' \in CT} PQ_{c'}.icm_{c'c} \qquad c \in CM$$

[2] Export price

$$PE_c = pwe_c.EXR - \sum_{c' \in CT} PQ_{c'}.ice_{c'c} \qquad c \in CE$$

[3] Demand price of domestic non-traded goods

$$PDD_c = PDS_c + \sum_{c' \in CT} PQ_{c'}.icd_{c'c} \qquad c \in CD$$

[4] Absorption

$$PQ_c.(1-tq_c).QQ_c = PDD_c.QD_c + PM_c.QM_c \qquad c \in (CD \cup CM)$$

[5] Marketed output value

$$PX_c.QX_c = PDS_c.QD_c + PE_c.QE_c \qquad c \in CX$$

[6] Activity price

$$PA_a = \sum_{c \in C} PXAC_{ac}.\theta_{ac} \qquad a \in A$$

[7] Aggregate intermediate input price

$$PINTA_a = \sum_{c \in C} PQ_c.ica_{ca} \qquad a \in A$$

[8] Activity revenue and costs

$$PA_a.QA_a = PVA_a.QVA_a + PINTA_a.QINTA_a \qquad a \in A$$

[9] Consumer price index

$$\overline{CPI} = \sum_{c \in C} PQ_c.cwts_c$$

[10] Producer price index for non-traded market output

$$DPI = \sum_{c \in C} PDS_c.dwts_c$$

Production and Trade Block

[11] Leontief technology: Demand for aggregate value-added

$$QVA_a = iva_a.QA_a \qquad a \in ALEO$$

[12] Leontief technology: Demand for aggregate intermediate input

$$QINTA_a = \text{int}\, a_a.QA_a \qquad a \in ALEO$$

[13] Value-added and factor demands

$$QVA_a = \alpha^{va}{}_a \left(\sum_{f \in F} \delta^{va}{}_{fa}.QF_{fa}{}^{-\rho^{va}{}_a} \right)^{-\frac{1}{\rho^{va}{}_a}} \qquad a \in A$$

[14] Factor Demand

$$WF_f.\overline{WFDIST}_{fa} = PVA_a.QVA_a\left(\sum_{f\in F'}\delta^{va}{}_{fa}.QF_{fa}{}^{-\rho^{va}{}_a}\right)^{-1}.\delta^{va}{}_{fa}.QF_{fa}{}^{-\rho^{va}{}_a-1} \quad a\in A\,;f\in F$$

[15] Disaggregated intermediate input demand

$$QINT_{ca} = ica_{ca}.QINTA_a \qquad a\in A\,;c\in C$$

[16] Commodity production and allocation

$$QXAC_{ac} + \sum_{h\in H} QHA_{ach} = \theta_{ac}.QA_a \qquad a\in A\,;\ a\in CX$$

[17] Output aggregation function

$$QX_c = \alpha^{ac}{}_c.\left(\sum_{a\in A}\delta^{ac}{}_{ac}.QXAC_{ac}{}^{-\rho^{ac}{}_c}\right)^{-\frac{1}{\rho^{ac}{}_c-1}} \qquad c\in CX$$

[18] First-order condition for output aggregation function

$$PXAC_{ac} = PX_c.QX_c\left(\sum_{a\in A'}\delta^{ac}{}_{ac}.QXAC_{ac}{}^{-\rho^{ac}{}_c}\right)^{-1}.\delta^{ac}{}_{ac}.QXAC_{ac}{}^{-\rho^{ac}{}_c-1} \quad a\in A\ ;\ c\in CX$$

[19] Output transformation (CET) function

$$QX_c = \alpha^t{}_c.(\delta^t{}_c.QE_c{}^{\rho^t{}_c} + (1-\delta^t{}_c).QD_c{}^{\rho^t{}_c})^{\frac{1}{\rho^t{}_c}} \qquad c\in(CE\cap CD)$$

[20] Export-domestic supply ratio

$$\frac{QE_c}{QD_c} = \left(\frac{PE_c}{PDS_c}.\frac{1-\delta^t{}_c}{\delta^t{}_c}\right)^{\frac{1}{\rho^t{}_c-1}} \qquad c\in(CE\cap CD)$$

[21] Output transformation for non-exported commodities

$$QX_c = QD_c + QE_c \qquad c\in(CD\cap CEN)\cup(CE\cup CDN)$$

[22] Composite supply (Armington) function

$$QQ_c = \alpha^q{}_c.(\delta^q{}_c.QM_c{}^{-\rho_c{}^q} + (1-\delta^q{}_c).QD_c{}^{-\rho_c{}^q})^{-\frac{1}{\rho_c{}^q}} \qquad c\in(CM\cap CD)$$

[23] Import-domestic demand ratio

$$\frac{QM_c}{QD_c} = \left(\frac{PDD_c}{PM_c} . \frac{\delta^q_c}{1-\delta^q_c} \right)^{\frac{1}{1+\rho_c^q}} \qquad c \in (CM \cap CD)$$

[24] Composite supply for non-imported outputs and non-produced imports

$$QQ_c = QD_c + QM_c \qquad c \in (CD \cap CMN) \cup (CM \cup CDN)$$

[25] Demand for transaction services

$$QT_c = \sum_{c' \in C'} (icm_{cc'}.QM_{c'} + ice_{cc'}.QE_{c'} + icd_{cc'}.QD_{c'}) \qquad c \in CT$$

Institutional Block

[26] Factor income

$$YF_f = \sum_{a \in A} WF_f . \overline{WFDIST}_{fa} . QF_{fa} \qquad f \in F$$

[27] Institutional factor incomes

$$YIF_{if} = shif_{if} . \left[YF_f - trnsfr_{rowf} . EXR \right] \qquad i \in INSD ;\ f \in F$$

[28] Income of domestic, non-government institutions

$$YI_i = \sum_{f \in F} YIF_{if} + \sum_{i' \in INSDNG'} TRII_{ii'} + trnsfr_{gov} . \overline{CPI} + trnsfr_{irow} . EXR \qquad i \in INSDNG$$

[29] Intra-institutional transfers

$$TRII_{ii'} = shii_{ii'} . (1 - MPS_{i'}) . (1 - TINS_{i'}) . YI_{i'} \qquad i \in INSDNG ;\ i' \in INSDNG'$$

[30] Household consumption expenditure

$$EH_h = \left(1 - \sum_{i \in INSDNG} shii_{ih} \right) . (1 - MPS_h) . (1 - TINS_h) . YI_h \qquad h \in H$$

[31] Household consumption demand for marketed commodities

$$PQ_c . QH_{ch} = PQ_c . \gamma^m_{ch} + \beta^m_{ch} . \left(EH_h - \sum_{c' \in C} PQ_{c'} . \gamma^m_{c'h} - \sum_{a \in A} \sum_{c' \in C} PXAC_{ac'} . \gamma^h_{ac'h} \right) \quad c \in C ;$$

$$h \in H$$

[32] Household consumption demand for home commodities

$$PXAC_{ac}.QHA_{ach} = PXAC_{ac}.\gamma^{h}_{ach} + \beta^{h}_{ach}.\left(EH_{h} - \sum_{c'\in C} PQ_{c'}.\gamma^{m}_{c'h} - \sum_{a\in A}\sum_{c'\in C} PXAC_{ac'}.\gamma^{h}_{ac'h} \right)$$

$a \in A\,; c \in C\,;\ h \in H$

[33] Investment demand

$$QINV_{c} = \overline{IADJ}.\overline{qinv_{c}} \qquad c \in CINV$$

[34] Government consumption demand

$$QG_{c} = \overline{GADJ}.\overline{qg_{c}} \qquad c \in C$$

[35] Government revenue

$$YG = \sum_{i\in INSDNG} TINS_{i}.YI_{i} + \sum_{c\in CM} tm_{c}.pwm_{c}.QM_{c}.EXR + \sum_{c\in C} tq_{c}.PQ_{c}.QQ_{c}$$

$$+\sum_{f\in F} YIF_{govf} + trnsfr_{govrow}.EXR$$

[36] Government expenditure

$$EG = \sum_{c\in C} PQ_{c}.QG_{c} + \sum_{i\in INSDNG} trnsfr_{i\ gov}.\overline{CPI}$$

System Constraint Block

[37] Factor market

$$\sum_{a\in A} QF_{fa} = \overline{QFS_{f}} \qquad f \in F$$

[38] Composite commodity markets

$$QQ_{c} = \sum_{a\in A} QINT_{ca} + \sum_{h\in H} QH_{ch} + QG_{c} + QINV_{c} + qdst_{c} + QT_{c} \qquad c \in C$$

[39] Current account balance for the rest of the world (in foreign currency)

$$\sum_{c\in CM} pwm_{c}.QM_{c} + \sum_{f\in F} trnsfr_{rowf} = \sum_{c\in CE} pwe_{c}.QE_{c} + \sum_{i\in INSD} trnsfr_{irow} + \overline{FSAV}$$

[40] Government balance

$$YG = EG + GSAV$$

[41] Direct institutional tax rates

$$TINS_i = \overline{tins_i}.(1 + \overline{TINSADJ}.tins01_i) + \overline{DTINS}.tins01_i \qquad i \in INSDNG$$

[42] Institutional savings rates

$$MPS_i = \overline{mps_i}.(1 + \overline{MPSADJ}.mps01_i) + DMPS.mps01_i \qquad i \in INSDNG$$

[43] Saving-investment balance

$$\sum_{i \in INSDNG} MPS_i.(1 - TINS_i).YI_i + GSAV + EXR.\overline{FSAV} = \sum_{c \in C} PQ_c.QINV_c + \sum_{c \in C} PQ_c.qdst_c$$

[44] Total absorption

$$TABS = \sum_{h \in H} \sum_{c \in C} PQ_c.QH_{ch} + \sum_{a \in A} \sum_{c \in C} \sum_{h \in H} PXAC_{ac}.QHA_{ach} + \sum_{c \in C} PQ_c.QG_c$$

$$+ \sum_{c \in C} PQ_c.QINV_c + \sum_{c \in C} PQ_c.qdst_c$$

[45] Ratio of investment to absorption

$$INVSHR.TABS = \sum_{c \in C} PQ_c.QINV_c + \sum_{c \in C} PQ_c.qdst_c$$

[46] Ratio of government consumption to absorption

$$GOVSHR.TABS = \sum_{c \in C} PQ_c.QG_c$$

Appendix B: The ''Between '' Model

[1] Average capital rental rate

$$AWF_{ft}^{\ a} = \sum_{a}\left[\left(\frac{QF_{fat}}{\sum_{a'} QF_{fa't}}\right).WF_{ft}.WFDIST_{fat}\right]$$

[2] Share of New Capital

$$\eta^{a}{}_{fat} = \left(\frac{QF_{fat}}{\sum_{a'} QF_{fa't}}\right).\left(\beta^{a}.\left(\frac{WF_{ft}.WFDIST_{fat}}{AWF_{ft}^{\ a}} - 1\right) + 1\right)$$

[3] Quantity of new capital by sector

$$\Delta K^{a}{}_{fat} = \eta^{a}{}_{fat}.\left(\frac{\sum_{a} PQ_{ct}.QINV_{ct}}{PK_{ft}}\right)$$

[4] Unit price of capital

$$PK_{ft} = \sum_{c} PQ_{ct}\frac{QINV_{ct}}{\sum_{c'} QINV_{c't}}$$

[5] Average capital rental rate

$$QF_{fat+1} = QF_{fat}.\left(1 + \frac{\Delta K^{a}{}_{fat}}{QF_{fat}} - v_{f}\right)$$

[6] Average capital rental rate

$$QFS_{ft+1} = QFS_{ft}.\left(1 + \frac{\sum_{a}\Delta K_{fat}}{QFS_{ft}} - v_{f}\right)$$

Declaration

I, the undersigned, declare that this thesis is my original work and has not been presented for a degree in any other university, and that all sources of materials used for the thesis have been duly acknowledged.

The examiners' comments have been duly incorporated.

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