*Addis Ababa University*
*School of Graduate Studies*

# *The potential costs and benefits of WTO membership for Ethiopia: A CGE Model Approach*

*By: Ashebir Seifu*

*A project Submitted to the School of Graduate Studies of Addis Ababa University in Partial Fulfillment of the Requirement for the degree of Master of Art in Economics*

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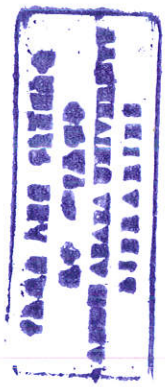

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At first, may all the honor and glory be exalt Heavenly Father, for help, guidance and encouragement which has enabled me to complete my work despite of all difficulties occurred in my life.

This paper has been accomplished with the help of many people to whom I am indebted. My appreciation goes to Dr Girma Estiphanos and Dr Abbi Mamo for his valuable advice and comments. I would like also to thank my friend in Commercial Banks for your support.

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## Abstract

This paper presents a structuralist CGE model for Ethiopia's to assess the potential costs and benefits of WTO membership. The analysis is made based on Ethiopian social accounting matrix (SAM) of 2001/2002 constructed by World Bank. The model is simulated for alternative policies scenarios (import tariff reduction) depicting full and indiscriminating liberalization, gradual and rationalized liberalization and instantaneous tariff liberalization. The simulation experiments suggest that the impact of trade liberalization has mixed effect on the Ethiopian economy.

Import tariff reduction is likely to increase domestic production and export of commodities particularly produced in agriculture and service sector. It also increase gross domestic product of the country but it is not large as stated by many financial institutes Such as World Bank, IMF and WTO.

On the other hand, tariff reduction has negative effects on government revenue, investment and on terms of trade. The result shows there is reduction in investment which is opposite to the expectation. There is a capital flight form the country and it is also disincentive for investors. The government revenue reduction in the short run is high. In addition to this the industrial sector shows reduction in production because of more competition from abroad (due to protection reduced in this sector).

An important policy implication of this analysis is that the successes of trade liberalization critically depend on strategic the government should set and improvements in the institution of the country.

| Table of content | Page |
|---|---|

## List of Table



## Lists of Figures

## ABBREVATIONS AND ACRONYMS

| | |
|---|---|
| ACP | African Caribbean Pacific |
| ADLI | Agriculture Development Lead Industrialization |
| CES | Constant Elasticity of Substitution |
| CET | Constant Elasticity of Transformation |
| CGE | Computable General Equilibrium |
| COMESA | Common Market for Eastern and Southern Africa |
| DTSI | Diagnostic Trade Integration Study |
| EEA | Ethiopian Economic Association |
| ECA | Economic Commission for Africa |
| EPA | Economic Partnership Agreement |
| EU | European Union |
| GAMS | General Algebraic Modeling System |
| GATS | General Agreement on Trade in Service |
| GATT | General Agreement on Tariff and Trade |
| GDP | Gross Domestic Product |
| HDI | Human Development Indicator |
| LDC | Less Developed Countries |
| MEDaC | Ministry of Economic Development and Cooperation (now MoFED) |
| MFA | Ministry of Foreign Affairs |
| MFN | Most Favored Nation |
| MOTI | Ministry of Trade and Industry |
| NIE | New Institutional Economics |
| NTB | Non Trade Barriers |
| OECD | Organization for Economic Cooperation and Development |
| R&D | Research and Development |
| ROW | Rest of the World |
| SAM | Social Accounting Matrix |
| SPS | Sanitary and Phyto Sanitary |
| TRIM | Trade Related Investment Measures |

| | |
|---|---|
| TRIP | Trade Related Intellectual Property |
| UNDP | United Nation Development Program |
| VER | Volunteer Export Restrain |
| WB | World Bank |
| WTO | World Trade Organization |

# CHAPTER ONE

## 1.1 Introduction

The overarching importance of trade has long been recognized as a key element of sustainable development in both developed and developing countries. Inspired by the gains from trade, countries have long adopted an outward looking, export-oriented development approach aiming at restoring internal and external economic stability and enhancing efficiency of resource allocation (Berg and Krueger, 2003). Accordingly, trade liberalization is seen as a means of achieving industrialization and modernization through securing economies of scale, market access and expansion.

In any country, trade liberalization is known to have an impact on the overall economy (on the welfare of the society) in general and the poverty alleviation process in particular. Many studies have attempted to assess the impact of trade liberalization on economic growth, poverty and inequality (distributional aspect of income). However, the results are inconclusive about the relationship between trade liberalization and economic growth and poverty. Though there is no strong evidence that trade liberalization will deepen poverty or vulnerability, there is no guarantee either the poor will always benefit (Chitiga et al., 2005). Moreover, different households may be affected differently resulting from trade liberalization reforms.

With this backdrop, one may inquires whether increased integration to the global economy through world trade organization (WTO) membership and that enhance trade liberalization could help poor countries to substantially reduce poverty and sustainable development. This issue assumes an interesting dimension when formulated in the context of Ethiopia, one of the poorest countries in the world. For years, Ethiopia has been negotiating as part of integration into the world economy including accession to WTO.

## 1.2 Statement of the problem

The primary drive to write the coming paper is that the recent application of Ethiopia government for World Trade Organization (WTO) membership on January 13 2003 and the WTO General Council established a Working party on February 10 2003. Ethiopia is currently to submitted the Memorandum on the Foreign Trade Regime to the WTO, even though, the decision for a membership to WTO marked as an important step for country's process of integration into the global economy, there are both opportunities and challenge that the country face by the acceding to WTO as the case for many developing countries. According to Seifu (P.17), the government of Ethiopia initiated its WTO accession processing for the following reasons:

- That integrate into the multilateral trading system (MTS) is the best way to accelerate economic growth.
- That being party to rule based MTS will create confidence for investors, and hence serve as an instrument to attract foreign direct investment (FDI) in order to diversify the country's production based, and expand its supply capacity.
- That it would secure predictable and transparent market access.
- That, in cooperation with other least developed countries (LDCs), participation in the MTS decision making process would influence the spread, nature and direction of globalization.

To achieve these goals however there are costs that arise form WTO membership for Ethiopia. Some of the costs of membership are the following:

- Applicants often need to implement substantive reforms to align their domestic institutions and policies with WTO disciplines.
- Most developing countries lack the capacity to engage effectively in these negotiations due to the absence of trained personnel, institutional and financial constraints.
- The fiscal costs of reducing import tariffs may be significant because taxes on international transactions are major sources of government revenue in many developing countries.
- A more liberal trade regime encouraged by WTO membership may expose companies in vulnerable economies to stronger competition from abroad and may end up by the de-industrialization of the small countries like Ethiopia.

- The price of joining the WTO now includes commitments that go beyond the GAAT/WTO agreement. It includes WTO plus.

In addition to the above costs the country face the problem of the principle of 'single undertaking' in negotiating with WTO members. This principle requires virtually all items of a negotiation to be part of a whole as an indivisible (a single one) package and cannot be accepted separately. Stated differently, the principle is: "nothing is agreed until everything is agreed."

By considering this into account, Ethiopia's WTO accession is a major challenge that a policy makers and the business community consider with greater care. It raises many questions regarding the place of Ethiopia in the global economy, the potential costs and benefits of WTO membership or non-membership, the macroeconomic performance of the economy, sector base analysis, and at households' level impacts should be taken in different trade liberalization scenarios.

In the paper to answer such questions Computable General Equilibrium (CGE) model and micro simulation will applied to assess the impact of WTO membership on the Ethiopian economy.

## 1.3 Objective of the study

The general objective of the research is to investigate the potential effects of tariff reduction on micro and macroeconomic indicator variables.

Specific objective of the study is:

1. To analyze the impacts of tariff reduction on sectoral analysis.
2. To analyze the impacts of tariff reduction on macroeconomic variables and welfare effect on the economy.

## 1.4 Significant of the study

The significant of the study is that:

- The findings of the research may have relevance in providing information to the stake holder in the process of acceding WTO.

- The research may help policy maker to react proactively for the possible impact of dismantling tariff in the Ethiopian economy.

## 1.5 Methodology

The methodology applied in the paper is CGE model and to identify the impact of trade liberalization on the household's level impact assessment, micro simulation is being used using household income and consumption expenditure survey. Computable general equilibrium (CGE) models are frequently used for economic policy analysis and, since the Uruguay Round, have formed the basis for policy advice and recommendations to developing countries on the potential impact of multi lateral trade liberalization on their economies. CGE models of trade allow researchers to provide a quantitive estimate of the potential economic consequences of different trade liberalization scenarios. This includes the impact on welfare, trade flows, prices, consumption and production (Hammouda and Osakwe, 2006). Because CGE models adopt a multi sector and multi region general equilibrium framework, they are also able to capture interactions of different sectors and markets in a given economy and at the international level. This ability of CGE models to provide a systematic representation of national economies and their links and interactions with the global economy explains their attraction and wide spread use for trade policy analysis.

## 1.6 Scope of the study

The process of integration in to the world economy has a wider range of implication on the economy both at micro and macro level. Rages of variables that are significant to the overall change in any economic environment are likely to be affected explicitly or implicitly when a country move in to world market integration.

Those effects could be, change in: price of imports or exports, transfers from the rest of the world, balance of payment deficit, domestic structural and productive capacity, and resource allocation between sectors of the economy.

On the other hand, economic variable changes such as, increase in export and import volume, commitment to eliminate all non-tariff barriers measures, market access opportunity and other

trade related policy by other WTO members have greater impact in affecting countries economic performance and growth.

However, the area of the study is in assessing the quantitative impacts of trade liberalization, reduction in import tariff, on micro and macro economic indicators on the economy. As the model analyses (only) the impact of tariff reductions it could be argued that its relevance for Ethiopia's WTO accession is limited. Thus, result of the study should be interpreted based on the scope of the study.

## 1.7 Limitation of the study

The main limitation of the study is that the lack of recent year Social Accounting Matrix (SAM), that is after the introduction of value added tax (VAT) in the Ethiopian economy. The paper will focus on the part of trade liberalization that is considering only tariff reduction, because of data problem for Ethiopian economy on non trade barriers (NTB) elimination and tariffication, which is part of trade liberalization, is not taken into account. Due to time constraint the micro simulation is not taking place.

## 1.8 Outline of the study

The underlying concern of the study is the potential impact of trade liberalization on the economy of Ethiopia. This thesis is organized in seven chapters, including the present introductory chapter. The next chapter is devoted to present a review of relevant literature. The chapter develops a conceptual framework that traces the effect of trade liberalization on the economic growth, income distribution and poverty. Chapter 3 describes about function, principles and rules of WTO. In Addition to this the relationship between WTO and less developing countries is also seen in detailed.

Chapter 4 describes the structure of the Ethiopian economy emphasizing on the agricultural, industrial and service sector and how each sector performance have been affected by the policy development. Trade reform in the country is also included in this chapter.

Chapter 5 describes the CGE model in detail and present the methodology applied in the paper. It includes the specification of the model for Ethiopian economy and a clear presentation about the Ethiopian SAM. In Chapter 6, the results from calibration and simulation of the research analyzed. Finally, the last chapter synthesizes the study's findings and offers some policy perspective on the impact of trade liberalization on the country's economy.

# CHAPTER TWO

## 2 Literature review

To evaluate the effect of WTO membership for Ethiopia, the possible impact of trade liberalization should look into detail about the potential benefits and costs. To judge trade reform will benefit the country, one need to have a reasonably good idea of both the expected costs of trade liberalization associated with the reform, and in particular how those costs compare with the expected gains. What is trade liberalization? and its impact on the economy and the welfare effect on the society is consider.

To answer what is trade liberalization, an understanding of the characteristics and institutional context of trade is required. The focus here will be on the multilateral trading system. The most visible trade barrier is the tariff, but trade liberalization is much more than negotiations on tariff rates. Within a multilateral context, first with the general agreement on tariffs and trade (GAAT) and then the WTO, tariffs have fallen considerably over the past 50 years. But other measures aside from tariffs, such as subsidies, Volunteer Export Restrain (VER), quota and government procurement practices they are called in general non trade barriers (NTB) and mentioned in most international trade books, also affected trade. These have long been recognized as often having trade distorting effects and requiring multilateral discipline.

The Uruguay Round of GAAT negotiations, which resulted in the establishment of the WTO, expanded the multilateral trade rule framework to include such issues as trade-related investment measures (TRMIs); trade related intellectual property rights protection (TRIPs), and trade in services. Services, which cover wide range of economic activities such as banking, transportation and telecommunications, are an important component of the economy and of trade. While the details of the WTO's General Agreement on Trade in Services (GATS) are complex, the agreement substantially broadened the economic activities of the subject to multilateral rules (Croome, 1995).

Dispute settlement is another important aspect of trade liberalization. Without an effective dispute settlement mechanism, trade liberalization measures become less secure and predictable for participants in the trading system (WTO, 2003). Yet the dispute settlement mechanism, while significantly different in nature from a tariff, also influences a firm's production decision and how it approaches international trade.

## 2.1 The rationale for trade liberalization

The reduction or elimination of barriers to trade amongst countries encourages firms to produce and trade goods and services in which they have a comparative advantage. Economies will concentrate on goods and services that they produce efficiently, and trade these goods and services for what they produce less efficiently. The economic benefits of trade liberalization are:

First, trade liberalization allows for the greater exploitation of economies of scale. By providing domestic producers increased market access opportunities, the freer market conditions enable firms to undertake specialized production runs that reduce the unit costs of production. For countries with small domestic markets, economies of scale may be extremely important. Economies of scale and specialization in specific product lines also explain why two or more countries may each produce and import and export a particular good, such as shoes. Each producer can have a specific market niches. This specialization in production, and the resulting increase in intra-industry trade (both imports and exports), however, implies change for the domestic industry.

Second, trade liberalization increases competition in both the foreign and domestic markets. This implies that firms will need to respond faster to changing market conditions. Greater competition is likely to provide an incentive for firms to improve their economic performance through cost-saving innovations and to enhance the quality of their products. More competition also leads to lower prices for consumers. The core message of OECD (1998) study is that, on balance, trade and investment liberalization in the long term is beneficial to society. The study gives a balanced assessment of the strengths and weakness of trade, including drawing attention to the fallacy of the argument that "exports are good and imports are bad." Trade liberalization influence both imports and exports. Access to low-cost imports, for example, plays an important role in

enhancing consumers' well being, as well as allowing domestic firms to have access to competitively priced inputs.

Finally, trade liberalization undertaken in a bilateral or multilateral context and which establishes clear trading rules will reduce uncertainty. Without such rules, a country may face unilateral, often damaging, actions from its trade partners. The reduction of uncertainty, while providing more stable access, will also allow firms to make more informed business decisions.

## 2.2 Trade liberalization and cost of its implementation

The major costs of WTO membership that arise form trade liberalization are the following:

### 2.2.1 Customs Revenues reduction

WTO accession may affect customs revenue which is often of an important source of government revenues in countries with relatively low levels of income per capita. This concern is linked to the importance of tariffs as a source of government revenue in many developing countries. But the effect of WTO accession may differ from country to country, and the final outcome is indeterminate a priori. To the extent that accession leads to a reduction of tariff rates in the acceding countries, this will tend to reduce tariff revenues. According to ECA 2004 report (2004, 191) trade liberalization is a potential source of fiscal instability for African countries because of their high dependence on trade taxes for public revenue. Taxes on international trade are important in Africa because when tax administration is inefficient governments tend to concentrate on easy to collect taxes such as trade taxes. In Africa as a whole international trade taxes generated on average 28.2 percent of total current revenues over the last decade; for sub Saharan Africa the share goes up to 30.5 percent. This compares to 0.8 percent for high income organization for Economic Cooperation and Development (OECD) countries. 18.42 percent for lower medium income countries, and 22.5 percent for low income countries. There is a simple explanation for the fact that developing countries, and especially poorer developing countries, tend to be heavily dependent on tariff revenues to support their governments. It is relatively easy to tax goods that are brought into the country at a border crossing, port or airport. By comparison, most other types of taxes-income taxes, payroll taxes or sales taxes- require an extensive tax-collection system, including administration and enforcement that can collect taxes from a large

number of businesses, or an even larger number of individuals, scattered throughout the country. In countries that have poor transportation and communications systems, as well as serious problems with corruption, it can be even more difficult to devise an alternative to tariffs that can be as effective in raising revenue (Weisbort and Baker, 1999). In many cases, a tariff may actually be the most efficient form of tax, since an alternative form of taxation would be very expensive to administer and enforce. In these countries, switching from tariffs to other revenue sources would likely result in large economic loses.

### 2.2.2 Cost of modernization and harmonization

Membership requires fairly large amount of investment into modernize and harmonize with WTO regulations of various institutions directly involved in the conduct of foreign trade and investment. In addition, WTO commitments also imply for some countries significant changes in the conduct of foreign investment policies. WTO membership entails institutional reforms that are not only demanding, but also of a particular kind. One can question, as Michael Finger has eloquently done, the fit between these reforms and the needs of developing countries, particularly of the least developed among them. Finger has calculated that it would cost a typical developing country US. 150 million to implement requirements under the WTO agreements on customs valuation, sanitary and Phytosanitary measures (SPS), and intellectual property rights (IPRs) - a sum equal to a year's development budget for many of the least developed countries. Would this be money well spent? Finger (1999) argues that for the vast majority of developing countries, the answer is no. Although these countries would benefit from the strengthening of their institutions in the relevant areas; the reality is that "WTO obligations reflect little awareness of development problems." "Other alternatives, e.g. basic education for women and girls, would have much more attractive rate-of-return numbers" (Finger, 1999).

### 2.2.3 The cost of implementation of WTO agreement

Some WTO agreements are costly to implement for developing countries with limited public resources, an insufficient administrative capacity and a poorly developed infrastructure. For instance, TRIPS agreement has associated with substantial costs that arise from the requirement to meet a minimum standard of intellectual property protection. WTO agreement requires developing countries to adopt U.S. style patent and copyright law. This will allow foreign

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corporations to get patents and copyrights that apply to the sale of items such as prescriptions of drug, computer software, recorded music and videos and many other items. As a result of this protection, consumers and business in developing countries will pay far more for these items than they would cost without such protection. The higher prices constitute costs both because they will directly transfer money from developing countries to the industrialized countries and because they will lead to large distortions in the market as a result of raising the price of protected goods far above the cost of production (Weisbort and Baker, 1999).

### 2.2.4 Adjustment Costs and Policy Response

The most controversial cost of accession is adjustment costs resulting from changes in relative prices and competitive conditions following the accession to the WTO. Liberalization of the country's trade regime may change the domestic relative prices of goods and services, which, in turn, will lead to increased competitive pressures on industries that had been until now protected by tariffs (or quotas). This, in turn, will create incentives for resources – capital and labor – to move into sectors which are more profitable and efficient.

This process of resource re-allocation is not without costs as labor is retrenched and must move and be re-trained (or the opportunity costs of unemployed labor must be imputed into the calculations of adjustment costs). Capital is more mobile than labor but investors will also compute their adjustment costs and take into account, inter alias, the sunk costs of capital.

These adjustment costs are principally private costs but they are also likely to have profound implications for economic policy. It would be very rare indeed that the private costs of adjustment would be fully financed by private individuals or firms. More common is for governments to share in financing the costs in order to facilitate the adjustments. The relevant measures include, for example, measures towards labor retraining, unemployment support, etc., all of which force governments to organize their business differently than before. In the next section the relationship between trade, growth and poverty are explained in detail.

## 2.3 Trade, Growth and Poverty Reduction

### 2.3.1 Trade and Growth



The effect of trade and trade related policies on country's economic performance has been debated for more than a century. The idea that the trade policy regime of a country has an impact on the country's growth is not new and goes back at least to Adam Smith. Broadly, there have been three theoretical approaches to the trade and growth nexus: Neoclassical, Endogenous Growth, and the Institutional approach. The predictability of these approaches has so far been mixed at best. Estimation of the impact of trade liberalization on growth gives ambiguous results and the direction and magnitude of the impact appear to depend on the circumstances of the country.

### 2.3.1.1 Neoclassical approach:

The neoclassical approach to the trade-growth nexus invokes general equilibrium models with constant or decreasing returns to scale. Moreover, it is built upon the choices of rational individuals acting solely through markets. Trade patterns among countries are determined by comparative advantage, either in the form of technology differences, as in Ricardian models, or of resource endowments, as in Heckscher-Ohlin models. The neoclassical models of international trade theory in general predict that a country will have static gains from lowering its trade barriers.

Perhaps one of the most important static gains from trade liberalization predicted by neoclassical models is the increase in allocative efficiency. Since trade policy has an important impact on the transmission of international price signals, lowering trade barriers will lead to a reallocation of resources to the sectors with comparative advantage.
As a result, resources are used more efficiently and the welfare of the country as a whole will rise.

Another gain from trade liberalization predicted in some neoclassical studies linking trade and productivity is that lowering trade barriers can create a so-called X-efficiency gain by having a positive impact on the efforts of workers and managers in the economy. Increased foreign competition due to lower barriers has an invigorating effect similar to that of a "cold shower" and workers/managers have to raise their efforts to survive the fiercer foreign competition. Yet the gains from trade liberalization are—by nature of the neoclassical models—static, and trade policy

like other government policies has only level effects, not growth effects a well-known prediction of neoclassical growth models as in Solow (1956) and Swan (1956).

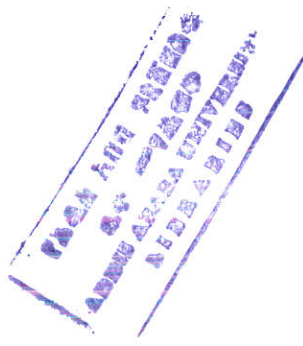
### 2.3.1.2 Critics of the neoclassical approach:

The validity of the key assumptions on which the neoclassical approach is built has been questioned by a number of economists. Most notably, Rodrik (1988) and Devarajan and Rodrik (1989) argue that scale economies and imperfect competition are prevalent in developing countries. They show that under these conditions, the welfare impact of trade liberalization becomes complicated. A welfare change can be decomposed into three components: the well-known neoclassical protection component given by the difference between external and internal prices; an "excess profits" component reflecting imperfect competition; and a component reflecting economies of scale that depends upon, among other things, output. They construct general equilibrium models for Turkey and Cameron to demonstrate how the reduction in the latter two welfare components as a result of trade liberalization may outweigh the neoclassical gain in the first component, and the country can be worse off if trade barriers are lowered. The theoretical possibility of a welfare-reducing impact from trade liberalization in the presence of imperfect competition and increasing returns to scale has been pointed out in other studies such as Ocampo and Taylor (1998) and Eaton and Grossman (1986).

### 2.3.2 Endogenous growth approach:

The dynamic gains of trade liberalization are closely linked to writings on endogenous growth ("new growth") theory that have proliferated since the mid-1980s. Much has been made of the endogenous growth theory, however, in many ways it differs only slightly from the neoclassical model. Certain features are common to all growth models. First, they incorporate a produced "accumulable" factor, which is a durable input whose stock increases over time—physical capital, human capital, or technology. Second, if an increase in the productivity of the inputs producing the accumulable factor occurs at some point, an increase will occur in the rate of accumulation and the growth of output in subsequent periods. A key difference between the neoclassical and endogenous growth models is how long this increased growth lasts. In neoclassical theory, the increase in the growth rate eventually converges to zero, whereas in the endogenous growth theory the increase can be permanent. The source of this difference is the





assumptions about the income share of the accumulable factor. If this share is low, as in the neoclassical model, any increase in, say, capital, in one period does not yield a large increase in production of capital, thus dampening the accumulation process; causing it to converge. If the share is high, as in the endogenous growth models, any increase in capital inputs will yield a larger increase in production of new capital, causing the accumulation process to last longer, possibly indefinitely, in which case permanent growth effects are possible.

According to the endogenous growth theory approach, trade policy can impact on income and long-run growth through (1) scale effects; (2) allocation effects; (3) spillover effects; and (4) redundancy effects.

**Scale effects**: A common feature of endogenous growth models is that the size of markets or scale of factor endowments directly affects the long-run growth rate. The integration of markets through trade can create scale effects via the integration of goods markets or flows of intangible and non-rival "knowledge capital". Examples of dynamic gains from trade via scale effects can be found in the models of Grossman and Helpman (1991a). To focus on scale effects, relative prices or technological designs or blue prints are fixed by assuming a Ricardian structure of the economy. Market expansion created by trade raises the profitability of R&D and leads to an increase in the growth rate. Scale effects remain a disputed property of endogenous growth models. Jones (1995) argues that scale effects are at odds with the existing empirical evidence of OECD countries.

**Allocation effects**: The static gains from the reallocation of resources in neoclassical models can be sustained and transformed into a growth effect if the changes in the composition of national output are related to the production of accumulable factors. If more resources are allocated to the sector producing the accumulable factor, growth will be enhanced.

For developing countries, access to cheap imported capital goods is perhaps the most compelling mechanism linking trade and growth. Protection policies that restrict the import of capital equipment reduce real investment and lower the rate at which physical capital accumulates. As a result, the rate of long-run growth is—as commonly predicted by the endogenous growth

theory—reduced, and if technical progress is embodied in capital goods, the negative impact of protection on growth will be magnified.

**Spillover effects**: One important consequence of international trade is the diffusion and integration of technological knowledge. Integrating world markets facilitates access to the knowledge available in other nations. Technical progress embodied in goods represents an opportunity for countries engaging in international trade to learn from trading partners.

In the literature investigating the nexus between growth and trade via technological spillovers, the diffusion process is modeled in two main ways. The diffusion can be a non-purposeful activity and trade simply provides economies access to a world pool of knowledge that is freely available. This approach is taken by, for instance, Feenstra (1996). Another approach is to model the diffusion as a purposeful activity in which the less developed countries can imitate technology available in the more developed countries. Examples of these leader-follower models of technological progress can be found in Barro and Sala-i-Martin (1995) and Eaton and Kortum (1996).

**Redundancy effects**: The redundancy effect of trade policy on growth is closely related to the characteristics of knowledge. Since knowledge is a non-rival good, opening the economy can reduce the unnecessary waste of resources devoted to R&D from a global point of view. Increased foreign competition in R&D as a result of trade liberalization can eliminate redundancy in research across countries. Consequently, the global resources devoted to R&D will be used more effectively and the larger global stock of knowledge provides an extra boost to growth. Theoretical models in which the redundancy effect is used can be found in Grossman and Helpman (1991a) and Rivera-Batiz and Romer (1991).

Other papers relax this assumption to model technological diffusion between countries explicitly. Technology diffusion may occur through the imitation process, in which the follower country carries out costly imitation of products already developed in the leader country. There could be some hazard to the imitation process if successful innovators seek patents in other (follower) countries, or if there is strong international enforcement of the relevant intellectual property

rights Grossman and Helpman (1991), Barro and Sala-i-Martin (1995, Chapter 8), Eaton and Kortum (1996).

### 2.3.2.1 Possibilities of adverse impact of trade on growth in endogenous growth approach:

It should be noted that in the majority of the models of the trade-growth literature, the ultimate impact of trade policy on growth depends largely on the pattern of comparative advantage. This is particularly true for R&D-based growth models in which the long-run rates of growth are determined by the resources devoted to the R&D sector. If the changes in relative prices associated with trade liberalization cause a movement of resources away from the high-tech or innovative sector, or the sector producing the accumulable factor, a freer trading regime will reduce the rates of long-run growth.

The theoretical possibility that trade liberalization might have a negative effect on economic performance has been demonstrated in various endogenous growth studies. In Lucas (1988), free trade might cause a country sufficiently far from its steady state to become completely specialized in the low-technology good with its short-run comparative advantage, although it has a long-run comparative advantage in high technology goods. In theory, the best option for trade policy in this case is to have restricted or prohibited trade until the economy has gained short -run comparative advantage in the high-tech goods. Young (1991) shows that trade liberalization might cause the less developed countries to specialize in the production of "old" goods with little gains from learning by doing. Consequently, growth could be higher for less developed countries under autarky than under free trade, despite some static gains from free trade. Grossman and Helpman (1991a) also present a model of a growth-contracting impact of trade liberalization if foreign competition tends to reduce incentives to invest in R&D in the host country.

### 2.3.3 Institutional approach:

With the resurgence of institutional economics in the 1990s, economists (and aid donors) have turned their attention to the role of institutional factors in examining the impact of changes in levels of tariffs and quotas on economic performance. In the view of New Institutional Economics (NIE), trade reform is institutional reform and the changes in tariffs and quotas typically constitute only a small part of a much more complex process. Trade liberalization is

associated with changes in the government's relationship with the private sector and with the rest of the world. Trade liberalization sets new rules and expectations regarding how these policy choices are made and implemented, and establishes new constraints and opportunities for economic policy. As North (1990) describes them, economic institutions range from taboos, customs, and traditions in what are called traditional societies, to formal, written constitutions and laws governing economic, political and social behavior in a modern society. North (1990) and Olson (1996) stressed the overriding importance for economic growth of property rights and enforcement of contracts. Well-defined and secure property rights and impartial enforcement of contracts between parties are the basis for a market economy. If these conditions do not hold, market activity will be infeasible or highly sub-optimal. In particular, people will be reluctant to invest in fixed assets and engage in long-term contracts.

Aron (2000:105) sums up the institutional constraints in poor countries as follows:

"When institutions are poorly defined or there are few formal institutions, economic activities are restricted to interpersonal exchanges. In such cases, repeat activities and cultural homogeneity facilitate self-enforcement. Transaction costs may be low in such an environment, but transformation costs are high because the economy operates at a very low level of specialization....It is clear, however, that firms or agents in an environment of weak institutions cannot engage in complex, long-term, and multiple-contract exchange with effective enforcement as they do in industrial countries. A basic structure of property rights that encourages long-term contracting appears essential for the creation of capital markets and growth."

If basic institutions necessary for the creation of capital and full participation of society in economic activity are not in place, trade reforms, investments in infrastructure, education and health, and public sector reforms will be ineffective and will likely only lead to increased income inequality—favoring those who already have access to factor markets. These kinds of basic institutions will likely take a long time to establish. In that case, a poverty reduction strategy will have to give attention to what may be done in the short to medium term to assist in bringing about desirable institutional changes.

While governments may be keen to implement these kinds of measures, there will often be resistance from groups or individuals benefiting from the status quo. However, demand for

changes to institutions and policies may be fostered by actions that increase the value to the community of new institutions and policies. Development assistance agencies can assist countries move toward commitment to these measures through technical assistance that demonstrates the benefits of different institutions and policies. Experience has also shown that high-level training of local people is very effective in leading to ownership of these growth-enhancing measures (Bates and Krueger 1993, Haggard and Webb 1996).

In general, this stream of literature believes that trade liberalization has a positive impact on growth, but the positive direction of the impact is conditional, and incentives created by price reforms such as in external trade and taxation will not work in the absence of appropriate institutions. In this view, trade liberalization now affects economic performance not only through changes in relative prices in a mechanical way, but also through a number of institutional arrangements. The roles of the following five types of market-supporting institutions are argued to be of significance for good economic performance: (i) property rights; (ii) regulatory institutions; (iii) institutions for macroeconomic stabilization; (iv) institutions for social insurance; and (v) institutions for conflict management.

Rodrik (2001) argues that adoption of trade liberalization policies has often entailed the importation of institutions. Membership of the WTO, for example, requires the adoption of a certain set of institutional norms. Imported institutions can be ill-suited or counterproductive and successful institutional reform requires an adequate combination of imported blueprints and local flavor. He also argues that the trade regime must accept, rather than eliminate, institutional diversity. Countries must have the right to protect their institutional and social arrangements.

The centrality of trade liberalization in a country's development strategy has also been questioned by NIE followers and the y argue that trade liberalization can divert financial resources and political capital from more urgent and deserving developmental goals. Integration into the world economy is associated with costly institutional reforms. Finger
(2001) estimates that it would cost a typical developing country US$ 150 million to implement requirements under a WTO accession agreement. He goes on to argue that the vast majority of developing countries would be better off spending this money on other activities with more

attractive rates of return. In sum, NIE followers believe that the degree to which trade reform contributes to the construction of a high-quality institutional environment is more important than a liberal trade regime per se or adherence to WTO rules.

## 2.4 Growth, Inequality and Poverty

### 2.4.1 Impact of growth on poverty:

The relationship between growth, income inequality, and poverty has been one of the central points of discussion in the development literature. There has been tremendous emphasis placed on the probable trade-offs between growth and income inequality. The relationship between growth and income inequality was proposed to resemble an inverted U curve; that is, income inequality increases in the initial phases of development, then declines as growth continues. This view was derived from the path-breaking work of Kuznets (1955) who investigated a time series of inequality indicators for England, Germany, and the United States.

There are some mechanisms that may generate the famous Kuznets curve. One widely cited mechanism is the transfer of labor from a sector with low productivity and low inequality to another sector with higher productivity and higher inequality as in the model proposed by the seminal work of Lewis (1954). The result would hold if the inequality between the sectors was substantially greater than the inequality within them. Aghion and Bolton (1997) propose another mechanism with trickle -down effects of capital accumulation. In their work, the increased wealth of the rich implies more funds available for investment by the poor, and the accumulated wealth of the rich trickles down to the poor through borrowing and lending in the capital market. In the presence of imperfect capital markets, their model can generate a Kuznets curve.

The Kuznets hypothesis has been exposed to a large number of tests over the past four decades. Recent studies using data from developing countries generally refute the inverted-U relationship between the level of income and level of income inequality. Deininger and Squire (1998) provide the most comprehensive test so far of this hypothesis with a data set of relatively good quality and comparable data for several points of time for individual countries. They conclude that "our data provide little support for an inverted-U relationship between levels of income and inequality, when tested on a country-by-country basis, with no support for the existence of a Kuznets curve in about 90 per cent of the countries investigated" (Deininger and Squire, 1998:573). In another



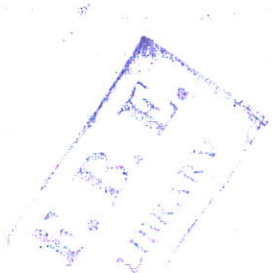
empirical study, Ravallion and Chen (1997) conclude that growth seems to reduce inequality in the transitional economies of Eastern Europe and Central Asia. However, their work and other empirical studies show that the pattern of income distribution in developing countries has been fairly stable over a long period of time (Dollar and Kraay, 2001a and Deininger and Squire, 1998).

Still, the empirical evidence about the relationship between income inequality and economic performance is fairly mixed and the outcome far from being settled. While Benabou (1996) reports that the vast majority of the empirical studies up to 1995 on this relationship reach the conclusion that there is a negative correlation between inequality and growth, Forbes (2000) employs a new and better quality data set and finds a positive and significant relationship between inequality and growth. However, the difference in empirical studies can be in part attributed to econometric differences, in the econometric approach and the choice of variables.

A clear distinction should be made, however, between income inequality (relative poverty) and absolute poverty. Available data provide overwhelming evidence that economic growth contributes to reductions in absolute poverty, not only in empirical studies investigating individual countries but also in cross-country studies. Ravallion and Chen (1997) claim that there is a statistically significant negative relationship between absolute poverty and growth. In a study of 92 countries spanning four decades, Dollar and Kraay (2001b) find that the average incomes of the poorest one-fifth of society rise in proportion to average incomes. They were unable to isolate any factors that account for this empirical regularity, illustrating how little is known about the relationship. Unlike the trade-growth nexus, however, the relationship between growth and absolute poverty reduction does not generate significant debate among economists and policy makers, although there is some dispute about the rate of economic growth at which absolute poverty begins to fall.

It should be noted that it is possible that growth can be biased against the poor so that with a sufficiently large increase in income inequality, the outcome can be a rise in absolute poverty. This behavior was observed in the Philippines over the period between 1988 and 1991 (Ahuja et al. 1997:47). Import-substitution trade policies that favor capital-intensive industries rather than





labor-intensive industries and forms of exploitation of natural resources that generate benefits concentrated in a small part of the population could have such an impact.

## 2.5 The empirical evidence of liberalization on the Ethiopian economy

Since 1992, Ethiopian implemented Structural Adjustment Program (SAP) and free market economic strategy. As part of its liberalization program, the new government has embarked on a comprehensive trade reform program which was aimed at dismantling qualitative restrictions and gradually reducing the level and dispersion of tariff rates. Currently quantitative import restrictions are only applied to used clothing, harmful drugs and firearms (DTIS, 2004:21). Both tariff levels and their dispersion have been reduced significantly.

Apparently, there are only few researches that are carried out to investigate the possible impact of WTO accession on the Ethiopian economy in general and on poverty and income distribution in particular. Most of them lack rigorous analysis to assess the potential influence. Philip and Tadele (2005) attempted to capture the impacts of trade liberalization resulting from the tariff dismantling policy against the products originating from the trade patterns of Ethiopia. For this purpose, they built a dynamic computable general equilibrium (CGE) Model to calculate the impacts on the main fiscal, economic and social indicators, both at macro-economic and sectoral levels. The analysis of the mechanical effects of tariff dismantling calculated by the model shows both negative and positive effects. The negative effects were mainly the reduction of the government fiscal revenues and the positive effects are the increase of foreign investment and the simulation of domestic demand that could result in higher economic growth due to the improvement of the purchasing power of the households. The study, however, did not address at all the possible impact of tariff dismantling policy on poverty and inequality.

Another study conducted by Solomon Lemma (2007) examine on the short run impacts of WTO accession on the Ethiopian economy using a structuralist CGE model. The simulation experiments suggest that impact of trade liberalization, import tariff reduction, has mixed effect on the Ethiopian economy. The tariff reduction has negative effects on government fiscal revenues, public investment and on terms of trade balance. On the other hand import tariff reduction is likely to increase domestic production and exports of commodities particularly produced in agriculture and service sector. Connected to import tariff reduction, liberalization

also has a positive effect on domestic investment and growth due to increase the demand for investment in agriculture and services sector. The study however did not consider the long run impact of WTO membership for Ethiopia that is the short run is not showing the real impact on growth and poverty reduction.

Finally, to my knowledge there is no work yet that analyzed the potential impact of WTO membership (trade liberalization) on the economic growth and poverty using a CGE model in Ethiopia.

# CHAPTER THREE

# 3 MACRO ECONOMIC PERFORMANCE OF THE ETHIOPIAN ECONOMY

The purpose of this chapter is to highlight recent developments in the Ethiopian macro economy. This will include aggregate growth rates sectoral and, structural change and the overall performance of the economy.

Ethiopia is one of the poorest countries in the world, with a GDP per capita about $95($810 in purchasing power parity terms). It is ranked 169 out of 175 in the UNDP's HDI (2003), and a little over 80 percent of the population survives on less than a dollar a day. Indicators of social development in Ethiopia are obviously very poor, with 44 percent of the population classified as undernourished; more than half of primary school aged children not enrolled; only 12 percent of the rural population with access to sage drinking water; and one of the highest maternal mortality rates in the world (only six percent of births are attended by skilled health person) (UNDP, 2003).

## 3.1 Trends in real gross domestic product (GDP)

The Ethiopian economy has been growing at an average annual rate of 2.7 percent for the last four and half decades (1960/61-2004/05). In the same period, the population has been growing by almost the same rate at which the GDP has been growing nullifying the growth rate in per capita income. The agricultural sector has been the least performing in the period under consideration except for the last three consecutive years.

Even though the agricultural sector performed well in recent years, the annual growth rate of its GDP fluctuated from year to year. Growth rate was negative in 2001/02 and 2002/2003, while it was positive and robust then after. This variation was largely associated with weather condition. Moreover, expansion in the size of cultivated land (and land converted from other uses like grazing, forest and fallow) and improvement in the use of fertilizers had also contributed to the recent improvement in the performance of the sector.

**Table 3.1: Sectoral growth performance**

| Sectors/Year | 1960/61-73/74 | 1974/75-90/91 | 91/92-04/05 | 1960/61-04/05 |
|---|---|---|---|---|
| Agriculture and its allied activities | 2.1 | 0.6 | 2.3 | 1.4 |
| Industry | 7 | 3.6 | 5.7 | 3.4 |
| Distributive sector | 7.8 | 2.5 | 6.4 | 3.6 |
| Other sector | 6.9 | 4.7 | 7.6 | 5.8 |
| GDP | 3.7 | 2 | 4.2 | 2.7 |
| Per capita GDP | 1.4 | -0.5 | 1.7 | 0.1 |

Source: EEA (Report on the Ethiopian economy page 7)

During the imperial era, the economy had been growing at a rate of 3.7 percent per annum. As the population was growing at about 2.3 percent per annum, the per capita GDP had been growing at 1.6 percent. The period was largely characterized as a market based and privatized economy. During this period modernization of the economy was started (Jonse, 2002). Other features of the economy during the period include more or less openness to the rest of the world and out ward orientation.

Since the year 1971/72, the growth rate of the economy started to decline but remained positive. Post 1973/74, it experienced tremendous fluctuations. The peaks were usually recoveries from recessions rather than actual booms. Hence the peaks and deep troughs offset giving a resultant of a mere 2.6 percent economic growth for the entire Derge period. This rate was not capable of catching with the population growth as a result of which the per capita GDP declined by about 0.7 percent per annum for the period.

The Derge regime (the period 1974 to 1991) had changed the over all policy of the country towards socialist oriented command economy. Large and medium private enterprises were nationalized. The development strategy became inward oriented which is based on import substitution external trade strategy. During this period, the trade regime was marked by its over valued exchange rate, foreign exchange rationing, wide use of subsidies to some selected sectors and groups of people. Tariff and non-tariff trade barriers mainly intended to raise government revenue, discourage private imports

and thereby restrict foreign exchange demand were other features of the foreign sector in this period.

After the fall of the Derge in 1991 the Ethiopian People Democratic Front (EPRDF) took power. Under this period that is 1991/92 to 2005/06, the growth rate in GDP has been positive but experienced fluctuations. After the abnormal year 1991/92 (there was political instability), it is in the year 1997/98, 2001/02 and 2002/03 that registered negative growth rate. On average, the economy has been growing at about 4.2 percent for the period 1991/92 to 2004/05. This is in fact one of the 'fast' growing economies of Africa for the decades. The gains in growth in per capita terms during the last decade were, however, just recoveries as it is witnessed by the fact that it is in the year 2000/01 and the 2003/04 and onwards that the per capita GDP surpassed the maximum level of per capita GDP that had been achieved during the imperial regime (Birhanu and Seid, 2005; Dercon, 2000).

In 1992 the socialistic development policy was replaced by the out ward oriented market economy accompanied by series of structural adjustment, macroeconomic stabilization, and institutional reform measures. The reform in the external sector includes liberalization, tariff rationalization, and devaluation of the currency (MEDaC, 1999). In the next section the contribution of each sector to the real GDP are analyzed.

## 3.2 Growth and sectoral performance

Like many Sub-Saharan African countries, economic growth has been highly volatile and unsustainable in Ethiopia for the last half of a century. This high degree of volatility and unsustainability of the economy performance is due to the relative contribution of each economic sectors particularly agriculture, industry and service to the overall national income. Therefore, in the next section detail contribution to the GDP and its performance will be studied.

### 3.2.1 The agricultural sector

Agriculture contributed more than 60 percent to GDP until the mid 1970s and about 50 percent since then and it contributes about 90 percent of the total foreign exchange earnings. Owing to its size, the influence of the agriculture sector on the Ethiopian economy is overwhelming. In short, it influences the growth, variability and hence the future path of the economy both in terms of its

impact on output and overall employment. Consequently, the performance of the economy is a mirror image of the performance of the agricultural sector and the latter on the availability of sustainable weather conditions in a given year (EEA, 2005).

The agricultural sector is dominated by small scale farmers who have been adopting low inputs and low output rain fed mixed farming with traditional techniques. Small scale farmers on average account farmers on average account for 95 percent of the total agriculture output. Moreover, 94 percent of food corps and 98 percent of coffee is produced by small scale farmers while the remaining 6 percent of food crops and 2 percent of coffee generated from commercial farms (state or private). Commercial and/or state farms comprise about 4 percent of the total cultivated land and 3 percent of the crop output (MEDaC, 1999). According to Girma (2006, cited in EEA, 2007), among many factors, the government policies and strategies marginalized the large scale commercial agriculture and discouraged their development.

### 3.2.1.1 The agricultural sector policy

The government recognizes that the key to transformation from peasant agriculture to a modern internationally trading nation is to raise agricultural productivity. To achieve this goal the government adopted the Agricultural Development Lead to Industrialization (ADLI) strategy in 1992. The objective of ADLI is to strengthen the interdependence between agriculture and industry by increasing productivity of peasant farmers, expanding large scale private commercial farms, and by reconstructing the manufacturing sector in such a way that it can make use of the country's natural and human resources. Owing that the country endowed with large number of working age population and sizeable arable land with scarce capital, ADLI's strategy is to use labor extensively and land intensively by promoting the use of technology that are labor intensive and land augmentation through the use of fertilizer and improved seeds (Rahel, 2003).

Despite that, the interrelationship between the agriculture and industry and their interdependent and integration play key role in order to accelerate the country's development and to bring about socio economic changes, in Ethiopian, under the prevailing circumstance of the interrelationship and interdependence, the two productive sectors has remained very weak. Moreover, since the economy

of the country is highly dependent on rain fed agriculture, the impact of ADLI on the economic growth has been ineffective.

### 3.2.2 Industrial sector

The Ethiopian industrial sector exhibits all the characteristics of an underdeveloped economy. The share of the industrial sector in GDP has hovered around the 10 percent mark and its overall sectoral growth rate between five and seven percent since the 1960s. Hence such a small share and weak long term growth is unlikely to absorb the huge growth in the labor force (flowing from natural increases and rural urban migration) and improve trade balance. It could not even supply basic industrial goods for domestic used in the production process are imported since the sector is incapable of providing such goods (EEA, 2005; UNCATD, 2002).

The biggest sub sector within industrial sector is the large and medium scale industries which accounts for about 39 percent of the total sectoral output followed by construction which constitutes about 24 percent since the early 1990s. The small scale industries and handicrafts sub sector contributed about 18 percent to the sector's total output during the same period. The smallest sub sectors in this category are electricity and water and mining and quarrying which, on average, contributed about 15 percent and 4 percent respectively, to the sector's output during the last decade or so.

**Table 3.2: Growth performance in the industrial sub sectors**

| Sub sector | Share in sector | Share in GDP | Growth | | | | |
|---|---|---|---|---|---|---|---|
| | 1991/92-04/50 | 1991/92-04/05 | 1991/92-04/05 | 2001/02-04/05 | 2002/30 | 2003/04 | 2004/05 |
| Industry | 100 | 11.3 | 6.2 | 6.0 | 4.6 | 6.9 | 6.6 |
| Mining & Quarrying | 4.4 | 0.5 | 7.2 | 6.2 | 4.1 | 6.5 | 8.0 |
| Large & medium scale Industries | 38.0 | 4.6 | 8.0 | 5.3 | 5.0 | 6.0 | 5.0 |
| Small scale Industries & Handcrafts | 17.6 | 2.1 | 4.4 | 4.0 | 0.1 | 7.0 | 5.0 |
| Elec. City & water | 14.9 | 1.8 | 4.0 | 5.8 | 4.3 | 7.1 | 6.0 |
| Construction | 25.1 | 3.0 | 6.5 | 8.0 | 7.4 | 8.2 | 8.5 |

Source: EEA (Report on the Ethiopian economy page 14)

The two domain characteristics of this sector are its small and stagnant contribution to GDP and its stable growth rate over the years. Hence, the growth rates in output in individual years are not significantly different from the decade average. Or, the average value added created by the sector during 1960/61 to 1973/74 is identical to that created in 2004/05 (or about thirty years latter). This is a clear indication that the industrial sector has not gone any structural transformation that could enable the sector to increase its share in total GDP and kick off dynamic growth. While in terms of growth rate within the sector, the construction sector has recorded the highest average growth rates both over the last five and three years while the small scale industries and handcrafts has recorded the highest average growth rate over the last fifteen years.

In recent years, however the government has started to initiate new policy measures. One noticeable measure that has taken place recently is the establishment of an industrial development fund. Connected with the establishment of this special fund, the Development Bank of Ethiopia has started disbursing funds to enterprises that are engaged in the export market. A proclamation is also

enacted to establish a public private partnership. As a means to resolve some policy problems, the government has also started forming a consultative group in which representatives from the private sector, sector institutions and Ministry of Trade and Industry are members. Following this initiative, joint consultation has already begun focusing on the textile sector. Similarly, to promote the operation of the leather sector, a training institution has been established and in some sectors contracting and leasing of management has started (Haile et al, 2003).

### 3.2.3 The service sector

This sector constitutes two major sub sectors, namely, distributive services and the 'other' services sectors. Distributive services include trade, hotels and restaurants and transport and communication; and the other service sector is composed of banking and insurance, public administration and defense, education, health and domestic and other services. Over the last fifteen year, trade, hotels and restaurants and public administration and defense have has dominant shares in the respective sub sectors. On the whole, the share of the services sector in GDP has reached about 43 percent in the last 15 year, making it the second largest sector in the economy.

The two sub sectors of the service sector had been registered a significant growth following the reform period that started in the early 1990s. The service sector is also important source of foreign exchange having, contrary to the trade balance, a positive balance for a considerable period of time. Despite the expansion, the sector is strongly protected and expected to be affected most by WTO accession, due to commitments that will be made in terms of market access and national treatment (Solomon, 2007).

## 3.3 Ethiopia's Trade Performance

### 3.3.1 Exports structure and its performance

Like most of the Least Developed Countries (LDCs) in Africa, Ethiopia exports few commodities that are mainly primary goods in the international market. Indeed, around 80% of total exports comprised agricultural and food products over the period 1995-2002. Leather and leather products, textiles and garments represented 17%, while mining products represented 2%. Among the agricultural exports, coffee represented as much as 50% in 2002, followed by vegetable products

(13%) and dried beans (12%), sesame seed (12%) and raw cane sugar (6%)(Chane et al, 2004). The five major partners of Ethiopia in terms of exports were respectively in decreasing order the EU, Djibouti, Japan, Saudi Arabia and the United States since 1995. Over the period 1995-2002, the EU, within which Italy, Germany and the United Kingdom represented the major players, remained the first buyer of Ethiopian exports. The export structure has experienced some limited improvements in terms of products and destination diversification as well as in terms of higher degree of processing (Chane et al., 2004). Regarding exports performance, export as a share of GDP has slightly decreased after liberalization in 1990. Similarly, the ratio of export to import has declined. Yet, the average growth rate of export earnings shows a significant improvement after trade liberalization. (Chane et al, 2004).

Ethiopia's export bundle is generally subject to higher tariffs in both developing and developed countries. On average, across the whole spectrum of countries, the tariff imposed on products exported by Ethiopia is 25 percent higher (17 versus 13 percent).

Non-tariff barriers represent a serious problem for Ethiopian exporters, over and above tariff barriers especially in the QUAD countries. Their incidence fall on a large part of Ethiopia exports namely agriculture and livestock related products. Sanitary and phyto-sanitary requirements in QUAD markets for these products are high, costly to meet when technically possible.

Tariffs and non-tariff barriers abroad act as important barriers to the export diversification effort of Ethiopia. The present study has made estimates of potential export gains for Ethiopia associated with the elimination of these barriers through multilateral, regional or bilateral trade negotiations (DTIS, 2004).

### 3.3.2 Import structure and its performance

During the period 1995-2002, Ethiopia's imports were composed of capital and consumer goods. These products are mainly processed goods such as machinery and equipment, chemicals, mainly fertilizers (urea, ammonium), as well as petroleum and its by-products. Ethiopia's imports originated from five major partners: the EU, China, the United States, the United Arab Emirates and Japan. The EU share in Ethiopia's imports included machinery and transport equipment.

Within the EU, Italy, Germany and the United Kingdom were respectively the first three suppliers of European goods to Ethiopia. At the regional level, Kenya, Egypt and Djibouti were the three most important partners within COMESA. Over this period, Ethiopian imports have generally increased in terms of average import values and average import growth rate, and the EU remained the first partner.

Finally, it can be observed that Ethiopia's trade is concentrated on the EU market according to its exports and imports structure. Ethiopia is dependent on a few primary commodities such as coffee, whose prices are volatile and renders the local economy vulnerable. As well, the country faces very high transport costs and has weak institutions to facilitate trade. In this context, Ethiopia needs to improve its benefits from international trade through an increased diversification of exports and partners and through a higher level of processing. These elements should be taken into account during the negotiations of the EPA. Further, Ethiopia could benefit from more trade with the other African countries and specifically with the COMESA members.

### 3.3.3 Tariff revision

Import duties are important sources of revenue to the country. It accounted about 43 percent of tax revenue in 2002/03. It is a preferred source of revenue as it is stable and its collection is administratively easy as compared to other types of tax revenue (Demirew, 2005). Despite its importance and advantages as a source of revenue, tariffs are not considered as optimal source of revenues because of their distortion effect on the economy when they drive a wedge between domestic and international prices and introduce inward bias on the economy. Moreover, the current international trends of globalization and regional integration demand liberalization of trade barriers.

Trade liberalization in the country started in the country in 1993 by tariffication of quantitative restrictions and lowering of tariffs. The government of Ethiopia has undertaken tariff revisions six times, slashing the maximum tariff rate from 230 percent during the pre-reform period to 35 percent since January 2003. Accordingly, a weighted average tariff rate has been reduced from 41.6 percent in the pre-reform period to 17.5 percent since January 2003. The existing tariff amendment has been worked out on the bases of the version 2002 Harmonized Commodity Classification and Coding system (six digit HS code) of World Customs Organization. A summary of tariff measures

undertaken since 1993 are shown on the table 3.3. The table showed that the liberalization process, by and large deepened and the protection level of domestic economy reduced to the large extent. The tariff reduction measure with no doubt has a negative effect on government revenue. To minimize the effect and even raise the revenue, the government has substantially reduced the exempted items and broadens the local tax bases. Moreover, by revitalizing the economy and encouraging investment and export, the government has tried to boost its foreign trade tax revenue. As a result of import boost, the foreign trade tax revenue has increased substantially.

**Table 3.3: Tariff measures**

| Descriptions | Before 1993 | 1st revision (Aug. 1993) | 2nd revision (Jan. 1996) | 3rd revision (Dec. 1996) | 4th revision (Jan. 1998) | 5th revision (Dec. 1998) | 6th revision (Jan. 2003) |
|---|---|---|---|---|---|---|---|
| Maximum tariff rate | 230 | 80 | 60 | 50 | 50 | 40 | 35 |
| No. of items tax exempted | 327 | 138 | 169 | 170 | 168 | 167 | 179 |
| Weighted average tariff rate | 41.6 | 29.6 | 24.6 | 23.6 | 21.5 | 19.5 | 17.5 |
| Tariff dispersion | 225 | 75 | 55 | 45 | 45 | 35 | 30 |
| Total no. of items | 1821 | 5332 | 5294 | 5295 | 5486 | 5426 | 5608 |
| Tariff band | 23 | 9 | 8 | 7 | 7 | 7 | 6 |

Source: MOFED and Ethiopian Custom Authority



## 3.4 Trade and trade related policy making institutions

A strong institutional arrangement for trade is a crucial requirement for a sound trade policy framework. Ethiopia, like other less developed countries, faces a challenge of putting in place an effective policy framework for trade. In order to ensure trade facilitating economic growth and development, there is a need for a well structured national institutional framework that would not

only formulate and analyze trade policies, but also ensure its implementation, monitoring and evaluation. Such institutional set up is essential to ensure 1) an effective policy making organization for investment and trade: 2) provision of effective support for export development and promotion: and 3) policy reforms are properly implemented and their impact on the welfare of the society at large. Ethiopia has a number of public as well as private institutions involved with trade; however their effectiveness is very limited. In the public sector, the Ministry of trade and Industry; the Ministry of Foreign Affairs and the Ethiopian Export promotion Agency are the three important institutions. The Ministry of Trade and Industry (MOTI) is the institution, which is directly responsible for trade policy matters. The Ministry of Foreign Affairs (MFA) on its part is responsible for signing agreements including trade related agreements, with other countries. MFA also the selects and appoints commercial attaches abroad. However inter institutional coordination between MOTI and MFA is limited and lack of clear demarcation of functions related to trade between the two ministries.

**Trade Analysis**: ability to analyze trade related information is suffers from a serious limitation in Ethiopia due to a smaller access to such information in the country. In addition, MOTI and the other trade support institutions lack experienced trade analysts.

Policy and Strategy formulation: Ethiopia's capacity to formulate a sound trade policy framework would be improved if an effective mechanism for intra-governmental policy coordination were put in place. Equally important is the involvement of all stake holders including private sector and the civil society.

**Negotiations**: Ethiopia is involved in a number of trade agreements/negotiations the main ones being COMESA, ACP/EU and WTO. Ethiopian government needs to enhance its understanding of WTO agreements and multilateral trading system. The training of officials on trade negotiating skills is crucial if Ethiopia is to actively participate in COMESA, ACP/EU negotiations and the WTO. Ethiopia's representatives at these forums need to have the appropriate know how and level of understanding of trade issues as well as a thorough knowledge of Ethiopia's interests and concerns. Coordination between MFA, the ministry responsible for appointing offers abroad and MOTI becomes crucial here.



The export promotion Agency has the specific mandate of promoting Ethiopian exports. Like other institutions, its effectiveness is hampered by lack of skilled personnel and inadequate facilities.
Export support services in the private sector practically do not exist beyond routine work by traditional institutions. In the private sector, the main institutions involved with trade include the Ethiopian Chamber of Commerce, the Addis Ababa Chamber of Commerce, and the Ethiopian Coffee Exporters Association. The Chambers of Commerce are faced with financial and human constraints as well as an absence of a coherent policy framework. In addition, knowledge of trade related issues is weak. The main objectives of the Ethiopian Coffee Exporters Association include advocating the views and options of its members to the government and other agendas on measures regarding production, quality and trading of coffee.

Creating a cooperative environment between the public and private sector would help promote trade in Ethiopia . Currently the Ethiopian Chamber of Commerce represents the private sector in discussions with the government. The capacity of the Chamber needs to be strengthened if the objective of enhancing the interface with the government is to be achieved. The establishment in 2002 of the Public-Private Dialogue Forum, chaired by Minister of Trade and Industry, is an important step towards the improvement of the relationships between the public and private sector.
There is no apex institution in Ethiopia responsible for trade policy analysis, formulation, negotiation, monitoring and implementation. The recently created National Steering Committee, chaired by the Minister for Trade and Industry, could act as an apex institution on trade. There is also a need for an independent body to monitor trade reform. The National Steering Commit is chaired by the Minster for Trade and Industry is composed of various Ministries, Agencies and other stake holders. A WTO unit with in the Ministry of trade and Industry has also been created to assist the WTO accession process.

# CHAPTER FOUR

## 4 International trade arrangements

### 4.1 World Trade Organization (WTO)

Partly in response to trade disruptions during the Great Depression, the United States and some of its allies sought to impose order on trade flows after World War two. The first major post war step toward liberalization of world trade was the General Agreement on Tariffs and Trade (GATT), signed in 1947. GATT was crafted as an agreement among contracting parties, the member nations, to decrease trade barberries and to place all nations on an equal footing in trading relationships. GATT was never intended to become an organization; instead, it was a set of bilateral agreements among countries around the world to reduce trade barriers (Carbaugh, 2004).

The World Trade Organization (WTO) was established in 1995, following the Uruguay Round of negotiations under the General Agreement on Tariffs and Trade (GATT). Its "clear" legal status and mandate was regarded as "the crossing of an important threshold in international trade relations" (Gallagher 2005, 2). International trade governance had been, until then, conducted under the auspices of the GATT, a provisional agreement dating back to 1947. The WTO renewed and incorporated the GATT negotiated in 1994, but in itself is a new legal entity that is not 'provisional' as the GATT was but a formal intergovernmental agreement with the status of an international treaty. In comparing the WTO to the GATT, the first obvious difference is the size of the agreement itself: the WTO comprises 60 agreements, compared to ten under the GATT. The WTO consists as well of some 60 different formal councils and committees, while the GATT included less than one-third of this number even in its last years. It formalized a great many of the subjects covered in the GATT in separate agreements, thus vastly expanding the scope of the institutional arrangements. Subjects such agricultural trade, trade in textiles and clothing, have been transformed into individual agreements under the WTO, each with its own detailed schedules, footnotes, and annexes (Kim, 2004). The General Agreement on Trade in Services (GATS) extends GATT rules for trade in "intangibles," to reflect the importance of the fast-growing service sector, which as of 2004, accounted for almost 20% of global trade. And the Agreement on Trade-Related Aspects of Intellectual Property Rights (TRIPS) provides for minimum standards of protection for the intellectual property of WTO Members. The WTO also linked these agreements as a "single undertaking," requiring Members to accept the full set of agreements concluded in the Uruguay

Round. Reform of the multilateral system also became a major item on the agenda of the newly minted WTO. Although the word is nowhere to be found in the GATT, it is mentioned 10 times in the WTO Agreement on Agriculture alone, including the first line. It suggests that, more than the GATT, the WTO is more strongly directed toward affecting policy choices in member countries (Gallagher 2005, 8).

## 4.2 Basic principles of WTO

### 4.2.1 Trade without discrimination

A country should not discriminate between its trading partners (giving them equally 'most-favored-nation' or MFN status); and it should not discriminate between its own and foreign products, services or nationals (giving them 'national treatment'). These and other basic principles will be discussed in more detail (WTO, 2003).

#### 4.2.1.1 Most-favored-nation (MFN): treating other people equally

Under the WTO agreements, countries cannot normally discriminate between their trading partners. Grant someone a special favor (such as a lower customs duty rate for one of their products) and you have to do the same for all other WTO members.

This principle is known as most-favored-nation (MFN) treatment (*see box*). It is so important that it is the first article of the General Agreement on Tariffs and Trade (GATT), which governs trade in goods. MFN is also a priority in the General Agreement on Trade in Services (GATS) (Article 2) and the Agreement on Trade-Related Aspects of Intellectual Property Rights (TRIPS) (Article 4), although in each agreement the principle is handled slightly differently. Together, those three agreements cover all three main areas of trade handled by the WTO.

Some exceptions are allowed. For example, countries can set up a free trade agreement that applies only to goods traded within the group .discriminating against goods from outside. Or they can give developing countries special access to their markets. Or a country can raise barriers against products that are considered to be traded unfairly from specific countries. And in services, countries are allowed, in limited circumstances, to discriminate. But the agreements only permit these exceptions under strict conditions. In general, MFN means that every time a country lowers a trade

barrier or opens up a market, it has to do so for the same goods or services from all its trading partners-whether rich or poor, weak or strong.

### 4.2.1.2 National treatment: Treating foreigners and locals equally

Imported and locally-produced goods should be treated equally-at least after the foreign goods have entered the market. The same should apply to foreign and domestic services, and to foreign and local trademarks, copyrights and patents. This principle of "national treatment" (giving others the same treatment as one's own nationals) Which is also found in all the three main WTO agreements (Article 3 of GATT, Article 17 of GATS and Article 3 of TRIPS), although once again the principle is handled slightly differently in each of these.

National treatment only applies once a product, service or item of intellectual property has entered the market. Therefore, charging customs duty on an import is not a violation of national treatment even if locally-produced products are not charged an equivalent tax.

### 4.2.1.3 Freer trade: gradually, through negotiation

Lowering trade barriers is one of the most obvious means of encouraging trade. The barriers concerned include customs duties (or tariffs) and measures such as import bans or quotas that restrict quantities selectively. From time to time other issues such as red tape and exchange rate policies have also been discussed.

Since GATT's creation in 1947.48 there have been eight rounds of trade negotiations. A ninth round, under the Doha Development Agenda, is now underway. At first these focused on lowering tariffs (customs duties) on imported goods. As a result of the negotiations, by the mid-1990s industrial countries' tariff rates on industrial goods had fallen steadily to less than 4%.

But by the 1980s, the negotiations had expanded to cover non-tariff barriers on goods, and to the new areas such as services and intellectual property.

Opening markets can be beneficial, but it also requires adjustment. The WTO agreements allow countries to introduce changes gradually, through .progressive liberalization. Developing countries are usually given longer to full fill their obligations.

### 4.2.1.4 Predictability: through binding and transparency

Sometimes, promising not to raise a trade barrier can be as important as lowering one, because the promise gives businesses a clearer view of their future opportunities and predictability. With stability and predictability, investment is encouraged, jobs are created and consumers can fully enjoy the benefits of competition, choice and lower prices. The multilateral trading system is an attempt by governments to make the business environment stable and predictable.

In the WTO, when countries agree to open their markets for goods or services, they 'bind' their commitments. For goods, these bindings amount to ceilings on customs tariff rates. Sometimes countries tax imports at rates that are lower than the bound rates. Frequently this is the case in developing countries. In developed countries the rates actually charged and the bound rates tend to be the same.

A country can change its bindings, but only after negotiating with its trading partners, which could mean compensating them for loss of trade. One of the achievements of the Uruguay Round of multilateral trade talks was to increase the amount of trade under binding commitments. In agriculture, 100% of products now have bound tariffs. The result of all this: a substantially higher degree of market security for traders and investors.

The system tries to improve predictability and stability in other ways as well. One way is to discourage the use of quotas and other measures used to set limits on quantities of imports, administering quotas can lead to more red-tape and accusations of unfair play. Another is to make countries, trade rules as clear and public ('transparent') as possible. Many WTO agreements require governments to disclose their policies and practices publicly within the country or by notifying the WTO. The regular surveillance of national trade policies through the Trade Policy Review Mechanism provides a further means of encouraging transparency both domestically and at the multilateral level.

### 4.2.1.5 Promoting fair competition

The WTO is sometimes described as a 'free trade' institution, but that is not entirely accurate. The system does allow tariffs and, in limited circumstances, other forms of protection. More accurately, it is a system of rules dedicated to open, fair and undistorted competition.

The rules on non-discrimination, MFN and national treatment, are designed to secure fair conditions of trade. So too are those on dumping (exporting at below cost to gain market share) and subsidies. The issues are complex, and the rules try to establish what is fair or unfair, and how governments can respond, in particular by charging additional import duties calculated to compensate for damage caused by unfair trade.

Many of the other WTO agreements aim to support fair competition: in agriculture, intellectual property, services, for example. The agreement on government procurement (a 'plurilateral' agreement because it is signed by only a few WTO members) extends competition rules to purchases by thousands of government entities in many countries and so on.

### 4.2.1.6 Encouraging development and economic reform

The WTO system contributes to development. On the other hand, developing countries need flexibility in the time they take to implement the system's agreements. And the agreements themselves inherit the earlier provisions of GATT that allow for special assistance and trade concessions for developing countries.

Over three quarters of WTO members are developing countries and countries in transition to market economies. During the seven and a half years of the Uruguay Round, over 60 of these countries implemented trade liberalization programs autonomously. At the same time, developing countries and transition economies were much more active and influential in the Uruguay Round negotiations than in any previous round, and they are even more so in the current Doha Development Agenda.

At the end of the Uruguay Round, developing countries were prepared to take on most of the obligations that are required of developed countries. But the agreements did give them transition

periods to adjust to the more unfamiliar and, perhaps, difficult WTO provisions - particularly so for the poorest, 'least-developed' countries. A ministerial decision adopted at the end of the round says better-off countries should accelerate implementing market access commitments on goods exported by the least-developed countries, and it seeks increased technical assistance for them.

More recently, developed countries have started to allow duty-free and quota-free imports for almost all products from least-developed countries. On all of this, the WTO and its members are still going through a learning process. The current Doha Development Agenda includes developing countries' concerns about the difficulties they face in implementing the Uruguay Round agreements.

## 4.3 WTO Accession process

The WTO rules governing accession is dealt under Article XII of the Marrakesh Agreement Establishing the World Trade Organization. As per this Article, "Any State or separate customs territory possessing full autonomy in the conduct of its external commercial relations or for the other matters provided for in this Agreement and the Multilateral Trade Agreement may accede to this Agreement, on terms to be agreed between it and the WTO".

Article XII does not give any membership criteria, 'terms to be agreed' and the procedure for negotiation. As Lanoszka (2001) puts it: "Article XII does not stipulate any membership criteria, and this signals perhaps the most problematic legal aspect of the accession process...No guidance is given on the 'terms to be agreed', these being left to the negotiations between the WTO Members and the Candidate. Furthermore, Article XII does not identify any concrete steps, nor does it provide any advice when it comes to the procedures to be used for negotiating the terms of accession".

Since the WTO is an inter-governmental organization, which does not have any power to negotiate accession agreement with the aspirants, it is the member countries that dictate the terms and conditions for such entry (Adhikari, 2002). The provision of the above-mentioned Article is being interpreted by the developed member countries as providing them *Carte Blanche* to impose

unreasonable conditions (often known as "WTO plus" conditions) on the acceding countries. For all practical purpose, the accession process has become akin to obtaining the membership to a golf club where the existing members decide the terms and conditions. Those members who agree to comply with the requirements will be admitted to the club and those who cannot do so, will never be admitted at all (Adhikari, 2003)! Each accession is a negotiation between the WTO Members and a particular country with typically different economic conditions, each accession is unique. The best that can be said about the process is that the process is largely governed by unwritten rules derived from precedents and previous rulings (Darbek and Bacchetta, 2004).

The WTO accession process can be divided into three phases. In the first stage, a country wishing to become a member of the WTO submits an application to the General Council of the WTO. The General Council establishes a Working Party of all interested WTO members. The applicant then submits to the Working Party a detailed memorandum on its foreign trade regime, describing, among other things, its economy, economic policies, domestic and international trade regulations, and intellectual property policies. In the next stage the Working Party members submit written questions to the applicant to clarify aspects of its foreign trade regime. After all necessary background information has been acquired; the Working Party begins meetings to focus on issues of discrepancy between the applicant's international and domestic trade policies and laws and WTO rules and laws. The final stage of the accession process consists of series of bilateral negotiations between the applicant and WTO members. When the bilateral talks conclude, the Working Party sends an accession package, which includes a summary of all Working Party meetings and the Protocol of Accession to the General Council or the Ministerial Conference. Once the General Council or the Ministerial approves of the terms of accession, the applicant must accept the protocol of accession. Thirty days after the applicant accepts the protocol of accession it becomes an official member of the WTO.

By its very nature, the multilateral trading system aims to be universal, and the accession of new members is therefore welcomed in principle by all current members. Nevertheless, accession negotiations have become protracted for all applicant countries, and excessively slow for some. With approximately three accessions per year, the processing of the remaining applications would

take more than a decade. However, such a long-drawn-out process would be undesirable as would deny the full benefits of WTO membership to most applicants for many years to come. Fo many applicant countries, accession to the WTO has been, and still is, a frustratingly slow process.

Previous studies have identified several reasons for the slow pace of accessions. Michalopoulos (1998) argues, *inter alias*, that the administrative resources available to deal wit accession issues are insufficient not only in the (mostly poor) applicant countries, but also in th WTO Secretariat and on the part of current WTO members. A modest increase in funding fo training and human resource development on the part of applicant countries, along with a (temporary) increase in staff at the WTO Secretariat, would go a long way towards alleviating th shortage.

Most substantial issues that slow down accession negotiations arise from several crucial differences between the current situation and accession to GATT 1947. First, WTO rules are far more complex than those of GATT 1947 as they apply not only to border measures, but also to a much wider variety of domestic policies (for example, export subsidies for industry and agriculture, intellectual property rights). Furthermore, the WTO agreements integrate a number of previously neglected sectors into the rules based system (agriculture. textiles and clothing, services) (WTO, 2003). Negotiations tend to become protracted whenever these additional areas are particularly sensitive, such as in the case of Chinese textiles and clothing exports to high-income countries or in the case of access to the Chinese service sector.

Second, acceding countries under GATT 1947 were mostly developing countries that enjoyed considerable discretion in the conduct of their foreign trade policies under Article XVIII of GATT 1947. By contrast, today's candidates are mostly transition economies that will be subject to more or less the same WTO rules as current high-income WTO members. Since the functioning of WTO rules depends on members being market economies, the whole transition process in the applicant countries necessarily comes under close scrutiny in accession negotiations. As yet, very few applicant countries have in place the full set of institutions and policies required for the functioning of a market economy, Taiwan being the main exception (Langhammer and Luke, 1999).

Third, while these difficulties go some way towards explaining the slow pace of negotiations, the situation is further complicated as several important WTO members (particularly the US, the EU, and Japan) are using their leverage in accession negotiations to extract commitments from applicant countries that go considerably further than commitments by current members. While commitments to liberalize trade are in principle in the long-term economic interest of acceding countries, the multilateral trading system does permit members to pursue different policies in accordance with their political preferences (within the agreed framework for liberalization). To force acceding countries to adopt very liberal policies where these are not required by binding WTO rules and hence are not applied by all incumbent members is neither consistent with the spirit of the multilateral trading system nor does it serve to expedite accession negotiations(Langhammer and Luke, 1999) .

# CHAPTER FIVE

## 5 Computable general equilibrium (CGE) model for Ethiopia

### 5.1 The main features of the CGE model

CGE models are in essence computer-based simulations, like laboratory experiments. They compute how today's economy will look in the future as a consequence of a specified set of policy changes. In the trade field, CGE models are used to gauge the trade and income effects of different liberalization scenarios. They identify the sources of income gains or losses from further opening up to trade and show how these are distributed among countries or regions. The simulation results can then be taken into account by policy-makers as they consider their options.

A CGE model works by simulating the interaction of various economic agents across markets subject to behavioral and institutional constraints (Dervis, de Melo and Robinson, 1982 and Shoven and Whalley, 1992).

CGE models are general models in that they represent the economy in its entirety, albeit at a high level of abstraction and aggregation, as composed of a set of inter-related markets. CGE models are equilibrium models because they embody the assumption that each market clears, through the movement of prices that equate supply and demand. CGE models are computable in that they use equations specified with parameters that assume real values (Typically, some parameters are based on econometric estimates reported on the literature, while others are computed when the model is calibrated to a set of benchmark data) (Bernow, Rudkevich, Ruth and Peters, 1998).

Most CGE models have another feature, which is not reflected in their name. They are "consistent with micro-foundations" i.e. the demand and supply functions contained in the models are consistent with (in other words: can algebraically be derived from) the utility and profit maximization calculus which is the core of the neoclassical economic theory of consumer and producer behavior. This theory rests on a number of assumptions, pertaining to technologies, behavior, and institutional factors (Bernow et al., 1998).

According to Robinson (1989), a CGE model must contain four components: (i) specification of the economic agents whose behavior is to be analyzed; (ii) identification of the behavioral rules and

conditions under which they operate, e.g., optimization behavior of producers and consumers; (iii) specification of the signals such as prices used in economic agents' decision-making; and (iv) identification of the "rules of the game" that characterize the institutional structure of the economy, e.g., the assumption of perfect competition.

A general equilibrium analysis explicitly accounts for all the links between sectors of an economy - households, firms, governments and countries. It imposes a set of constraints on these sectors so that expenditures do not exceed income and income, in turn, is determined by what factors of production earn. These constraints establish a direct link between what factors of production earn and what households can spend.

## 5.2 Advantages and disadvantages of the CGE model for policy makers

The main advantage of CGE models for policy analysis compared to traditional macroeconomic models is that, the former incorporate microeconomic mechanisms and institutional features within a consistent macroeconomic framework, and avoids the representation of behavior in reduced form. This allows for investigating a number of policy issues, which are relevant for policy analysis in developing countries, such as those indicated above. Modern CGE models are better equipped than standard macro models to handle the microeconomic phenomena for which they are designed; for example, the effects of trade liberalization on sectoral resource allocation.

However, the main limitation of CGE models is that they are predominantly microeconomic in character. In addition, the models have a mainly single-period comparative-static orientation. Some new CGE models have tried to incorporate traditional macroeconomic relationships, although the macro dynamics are still relatively simple.

Moreover, from an econometric point of view, it may be argued that a simple CGE model has serious limitations in the sense that if parameterization is done in a naïve way it sheds no light on the dynamics (such as the path to equilibrium) and often builds the policy implications into the model in the first place. However, when dynamics and estimation are introduced into a CGE model, the resulting model is very close to a LMM than a CGE model.

Because of the different closure rules, traditional CGE models are not well suited to policy analysis involving short-term growth and inflation. Moreover, the dynamics in most CGE models are too simple to capture complex interactions among macroeconomic variables, given that some intertemporal links are omitted. CGE models do not provide a satisfactory tool for macroeconomic policy analysis and forecasting.

The introduction of dynamics in CGE models of trade policy was triggered by at least three factors. First, static CGE models contained an analytical inconsistency. The same producers and consumers who solved complex optimization problems to determine their within-period decisions, such as allocating expenditures between clothing and food, became myopic (and stopped optimizing) when it came to between-period decisions, such as savings and investment. This contradiction did not escape several observers, and led to some harsh critiques of that generation of CGE models (see e.g., Srinivasan [1982]). In a sense, the equilibrium prices of these models were not in equilibrium over time, so that policy conclusions derived from them were suspect.

Secondly, many of the questions that these models were designed to answer were dynamic questions. For instance, the differential effects of lowering tariffs on capital versus consumer good imports could not be discerned from a static model. To take an extreme case, calculations of the optimal import tariff using a static model typically resulted in the highest tariff being on capital good imports, because that was the closest thing to a lump sum tax in these models. Increases in the capital import tariff only lowered investment, which had no welfare effects since the capital stock was fixed (Dahl et al., 1993). Plainly, to answer the most important questions of trade policy, a dynamic model was needed.

Thirdly, static modelers were faced with a dilemma. Despite overwhelming theoretical and reasonably strong empirical evidence on the benefits of trade liberalization, most static CGE models showed that the welfare gains of eliminating tariffs were less than one percent of GDP (see e.g. Srinivasan and Whalley, 1986). This was potentially embarrassing, especially since a series of major trade liberalization exercises (the Uruguay Round, NAFTA, etc.) had already started using CGE models to underpin their programs. One reason for the low welfare gains, it was thought, was that most of these models were static, and hence did not capture the "dynamic gains" from trade liberalization. Some tried to show this by assuming that trade liberalization will lead to faster

### 5.3.2 The recursive sequence equilibrium approach

It assumes that the model is solved for a sequence of static equilibria. The equilibria are connected through capital accumulation, while other variables are updated exogenously (e.g. population). They do not incorporate intertemporal aspects of decision making. Dixon and Parmenter (1996) distinguish two categories of recursive CGE models according to the type of expectations from which the behavior of economic agents is derived: myopic (static) expectations and adaptive expectations. In recursive CGE with myopic expectations the savings rates are exogenous and investment is given by total savings within the period. In the second case, investment in year $t$ depends on the expected rate of return in year $t+1$. However, under the adaptive expectations assumption economic agents consider only the past for their optimization problem. Therefore, the expected rate of return in year $t+1$ is determined by the rate of return and the cost of capital in year $t$. The first attempt to introduce dynamic elements into a CGE model was made by Ballard, Fullerton, Shoven and Whalley (1985). They extend the Shoven and Whalley model (1972) and implement it for the U.S. economy. Consumers have myopic expectations regarding future prices, especially regarding the future rate of return to capital. The production side is completely static. An example of recursive dynamics with adaptive expectations is provided by Dixon and Rimmer (2002) in the Monash model for the Australian economy.

### 5.3.3 The fully dynamic approach

This model assumes that consumers' and producers' behavior is derived from both intra- and intertemporal optimization. All these models incorporate some form of life-cycle behavior. The household maximizes an additive separable time-invariant intertemporal utility function, while the producer's optimal behavior is determined by the maximization of the market value of the firm or by the maximization of the present discounted value of net cash flows. The market value of the firm is usually represented as the present discounted value of the future steam of dividends. These models are based upon the perfect foresight hypothesis and describe the transition path to the new equilibrium point. Intertemporal dynamic CGE models generally require a great computational effort because all the equations defined over the whole time horizon are solved at once. Therefore, they usually comprise only few production sectors.



Dynamic production and investment behavior are induced by the existence of capital adjustment costs and linked to Tobin's q theory. Adjustment costs are introduced to capture the installation costs of capital and the incomplete mobility of capital across industries. Dynamic features have also been included in modeling government behavior, the foreign sector and financial markets.

## 5.4 Models based on SAM

CGE models are based on numerical data describing the structure of a real-world economy. In order to accomplish this it is convenient to organize data in the form of a social accounting matrix (SAM) (Bergman, 2003).

A SAM is a simple and effective method to demonstrate the fundamental economic principle that for every income there is a corresponding outlay or expenditure (Pyatt, 1988). A SAM is not an economic model, but simply a method to represent a model; therefore, every model may be designed by a SAM. To a certain extent, a SAM may be considered an expansion or a generalization of Leontief's input-output table, in other words, an input-output table characterized by a higher degree of closure. While the productive system in that case receives the main focus of attention, a SAM allows for a much broader perspective. An input-output table describes, in brief, the relationships which exist: a) between productive activities; b) between productive activities and what we call "primary factors"; c) between productive activities and final demand; d) between productive activities and the rest of the world. The basic flaw of this method is that it fails to describe the direct linkages between production factors and final demand, thereby making it impossible to study the manner in which income from production factors is allocated (Muro and Salvatici, 2001).

Each row of the SAM represents the incomes of a sector, factor or institution. The corresponding column represents the outgoings of the sector, factor or institution. A key feature of a SAM is that the sum of the row elements is equal to the sum of the corresponding column elements. Thus the incomings and the outgoings of each sector, factor and institution have to be equal (Bergman 2003 and Round, 1981a).

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The SAM is an approach for data organization, reconciliation, and descriptive analysis of the structure of the economy. "The most important feature of a social accounting matrix is that it provides a consistent and convenient approach to organizing economic data for a country and it can provide a basis for descriptive analysis and economic modeling in order to answer various economic policy questions" (Pleskovic and Trevino, 1985).

**Table five one: structure of SAM**

| | | Expenditures | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | | Activities | Factors | Households | Enterprises | Government | Capital account | Rest of world | Total |
| Receipts | Activities | Intermediate inputs | | Household consumption | | Government consumption | Investment | Exports | Total demand |
| | Factors | Value added | | | | | | | Factor income |
| | Households | | Wages | Transfers | Distributed profits | Transfers | | Foreign remittances | Household income |
| | Enterprises | | Gross profits | | | Transfers | | Profits received from abroad | Enterprise income |
| | Government | Indirect taxes | | Direct taxes | Enterprise taxes | | | | Government receipts |
| | Capital account | | | Household savings | Retained earnings | Government savings | | Net capital inflow | Total saving |
| | Rest of world | Imports | Factor incomes to abroad | Imports | Profits distributed abroad | | Asset purchases from abroad | | Payments to abroad |
| | Total | Gross output | Value added | Household expenditure | Enterprise expenditure | Government expenditure | Total investment | Foreign exchange outlay | |

Source: Miro and Salvatore (2001)

A SAM provides comprehensive one-period information on variables, such as the structure, composition and the level of production, the distribution of income among households, and the factorial value-added. It can similarly provide statistical information on consumption and production pattern of the economy, imports, exports, investment and so on. Moreover, it may have more detailed information, depending on the data availability and particular interest, on income distribution, tax structure and monetary variables. Therefore, SAM can be used to improve the capabilities of countries to obtain descriptive analysis of the economy, indicating its income distribution picture, institutional and industrial structure. In a SAM, the information which takes place in public sector statistics is represented as a component of whole economy. A SAM can thus provide a comparison opportunity for the public sector with either the private sector or the economy as a whole (Sen, 1996).

The SAM is an approach for data organization, reconciliation, and descriptive analysis of the structure of the economy. "The most important feature of a social accounting matrix is that it provides a consistent and convenient approach to organizing economic data for a country and it can provide a basis for descriptive analysis and economic modeling in order to answer various economic policy questions" (Pleskovic and Trevino, 1985).

**Table five one: structure of SAM**

| | | Expenditures | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | | Activities | Factors | Households | Enterprises | Government | Capital account | Rest of world | Total |
| Receipts | Activities | Intermediate inputs | | Household consumption | | Government consumption | Investment | Exports | Total demand |
| | Factors | Value added | | | | | | | Factor income |
| | Households | | Wages | Transfers | Distributed profits | Transfers | | Foreign remittances | Household income |
| | Enterprises | | Gross profits | | | Transfers | | Profits received from abroad | Enterprise income |
| | Government | Indirect taxes | | Direct taxes | Enterprise taxes | | | | Government receipts |
| | Capital account | | | Households savings | Retained earnings | Government savings | | Net capital inflow | Total saving |
| | Rest of world | Imports | Factor payments to abroad | Imports | Profits distributed abroad | | Asset purchases from abroad | | Payments to abroad |
| | Total | Gross output | Value added | Household expenditure | Enterprise expenditure | Government expenditure | Total investment | Foreign exchange inflow | |

Source: Mero and Safaei (2011)

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### 5.4.1 The Ethiopian SAM

The primary source of the Ethiopian SAM is Alemayehu and Fadele (1999) which later on modified to WB-2001/2002 SAM (modified by World Bank). The 1999/2000 Ethiopian SAM is a 40x40 matrix and contains an account each for fifteen production activities, four factors of production, eight commodities, transactions costs, eight institutions, public investment, savings/investments of institutions other than the government, food aid, and the rest of world( net of food aid). On the other hand, the 2002 World Bank SAM is also a 40x40 matrix and contains an account each of twelve production activities, four factors of production, eight commodities, transactions costs, ten institutions, public investment, savings/investments of institutions other than the government, food aid, and rest of the world.

In this study, in order to meet the desired objective, the researcher aggregates the WB-2002 SAM in to 16x16 matrix which contains three production activities (agriculture, industry and service), three commodities agriculture, industry and service; two factors of production (capital and labor) and four institutions (households, firms, government and rest of the world), two taxes (direct and import tax) and saving investment accounts see table in the annex one for detailed structure of the SAM. The following section explains how the CGE model treats production, price, domestic institutions and the rest of the world.

## 5.5 Model Description

The Ethiopian model described below has developed from the neoclassical structuralist modeling tradition originally presented in Dervis et al (1982), and has at its core the static CGE model described in Lofgren et al (2002). The model is formulated as a set of simultaneous linear and non-linear equations, which define the behavior of economic agents, as well as the economic environment in which these agents operate. This environment is described by market equilibrium conditions, macroeconomic balances.

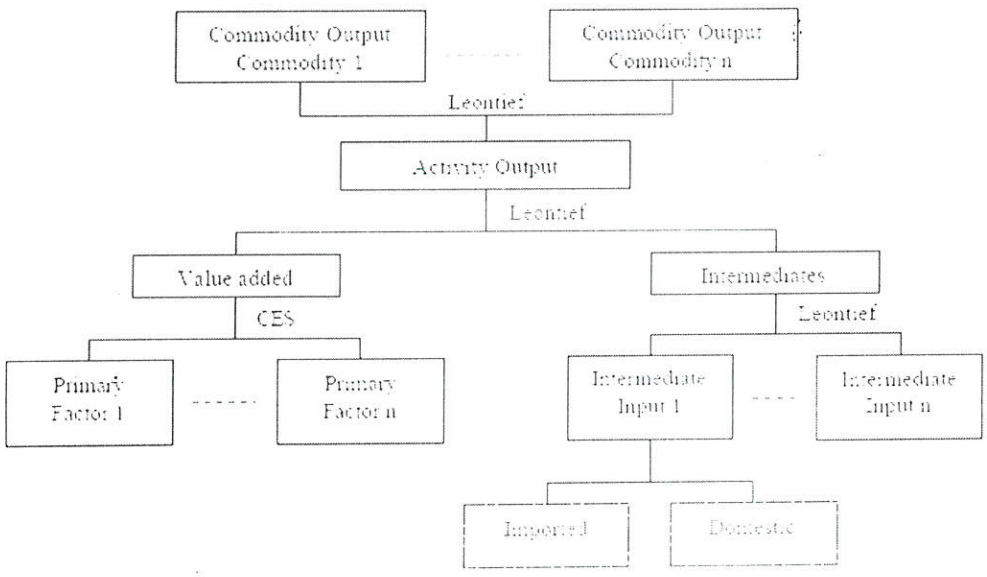
### 5.5.1 The structure of CGE model for Ethiopia

#### 5.5.1.1 Production and Prices

The model identifies 3 productive sectors or activities that combine primary factors with intermediate commodities to determine a level of output. The two factors of production identified in

the model include capital and labor. The technology underlying production is depicted for a single producer in Figure one Producers in the model make decisions in order to maximize profits subject to constant returns to scale, with the choice between factors being governed by a constant elasticity of substitution (CES) function. This specification allows producers to respond to changes in relative factor returns by smoothly substituting between available factors so as to derive a final value-added composite. Profit maximization implies that the factors receive income where marginal revenue equals marginal cost based on endogenous relative prices. Once determined, these factors are combined with fixed-share intermediates using a Leontief specification. The use of fixed-shares reflects the belief that the required combination of intermediates per unit of output, and the ratio of intermediates to value added, is determined by technology rather than by the decision- making of producers. The final price of an activity's output is derived from the price of value-added and intermediates, together with any producer taxes or subsidies that may be imposed by the government per unit of output.

**Figure one Production Technology**




Note: 'CES' is a constant elasticity of substitution aggregation function. 'Leontief' is fixed shares.

In addition to its multi-sector specification, the model also distinguishes between activities and the commodities that these activities produce. This distinction allows individual activities to produce more than a single commodity and conversely, for a single commodity to be produced by more than one activity. Fixed-shares govern the disaggregation of activity output into commodities since it is

assumed that technology largely determines the production of secondary products. These commodities are supplied to the market.

Substitution possibilities exist between production for the domestic and the foreign markets. This decision of producers is governed by a constant elasticity of transformation (CET) function, which distinguishes between exported and domestic goods, and by doing so, captures any time or quality differences between the two products. Profit maximization drives producers to sell in those markets where they can achieve the highest returns. These returns are based on domestic and export prices (where the latter is determined by the world price times the exchange rate adjusted for any taxes or subsidies). Under the small-country assumption, Ethiopia is assumed to face a perfectly elastic world demand at a fixed world price. The final ratio of exports to domestic goods is determined by the endogenous interaction of relative prices for these two commodity types.

Domestically produced commodities that are not exported are supplied to the domestic market. Substitution possibilities exist between imported and domestic goods under a CES Armington specification (Armington, 1969). Such substitution can take place both in final and intermediates usage. The Armington elasticities vary across sectors, with lower elasticities reflecting greater differences between domestic and imported goods. Again under the small country assumption, Ethiopia is assumed to face infinitely elastic world supply at fixed world prices. The final ratio of imports to domestic goods is determined by the cost minimizing decision-making of domestic demanders based on the relative prices of imports and domestic goods (both of which include relevant taxes).

Transaction costs are incurred on exports, imports and domestic sales. These costs are treated as a fixed share per unit of commodity, and generate demand for trade and transportation services. The final composite good, containing a combination of imported and domestic goods, is supplied to both final and intermediate demand. Intermediate demand, as described above, is determined by technology and by the composition of sectoral production. Final demand is dependent on institutional incomes and the composition of aggregate demand.

### 5.5.1.2 Institutional Incomes and Domestic Demand

The model distinguishes between various institutions within the Ethiopian economy, including enterprises (Firms), the government, and households. Figure two summarizes the interaction between institutions in the model.

The primary source of income for households and enterprises are factor returns generated during production. The supply of capital is fixed within a given time-period and is immobile across sectors, thus implying that capital earns sector-specific returns. Each activity pays an activity-specific wage that is the product of the economy-wide wage and a fixed activity-specific wage distortion term. This specification, in which factor returns are sector-specific, is preferable to the use of simple average wages, since average factor returns in Ethiopia are observed to vary both across occupations and sectors. Final factor incomes also include remittances received from and paid to the rest of the world.

Households and enterprises earn factor incomes in proportion to the implied share that they control of each factor stock. Enterprises or firms are the sole recipient of capital income, which they transfer to households after having paid business profit taxes (based on fixed tax rates), saved (based on fixed savings rates), and remitted profits to the rest of the world. Households are assumed to have identical preferences, and are therefore modeled as 'representative' consumers. In addition to factor returns, which represent the bulk of household incomes, households also receive transfers from the government, other domestic institutions, and the rest of the world.

Household disposable income is net of personal income tax (based on fixed rates), savings (based on fixed marginal propensities), and remittances to the rest of the world. Consumer preferences are represented by a linear expenditure system (LES) of demand, which is derived from the maximization of a Stone-Geary utility function subject to a household budget constraint. Given prices and incomes, these demand functions define households' real consumption of each commodity. The LES specification allows for the identification of supernumerary household income that ensures a minimum level of consumption.

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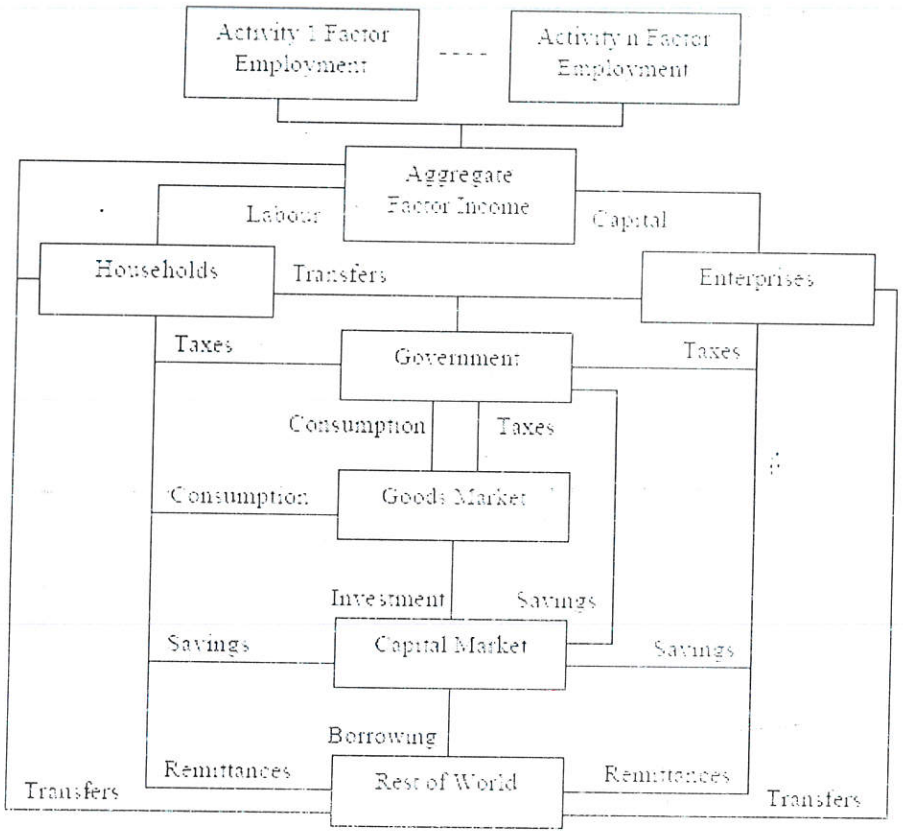
**Figure Two: Institutional Incomes and Domestic Demand**




The government earns most of its income from direct and indirect taxes, and then spends it on consumption and transfers to households. Both of these payments are fixed in real terms. The difference between revenues and expenditures is the budget deficit, which is primarily financed through borrowing (or dissaving) from the domestic capital market. Although not shown in Figure 2, the government also makes payments to the rest of the world. In the current model the government's role as a consumer is treated separately from the production of government services. The latter is specified as an activity producing services for which the government institution is the primary consumer.

Savings by households and enterprises are collected into a savings pool from which investment is financed. This supply of loan able funds is diminished by government borrowing (or dissaving) and augmented by capital inflows from the rest of the world. There is no explicit modeling of the investment decision or the financial sector within a particular time-period, with savings equaling investment as per the ex post accounting identity. This implicitly assumes that the necessary adjustment in the interest rate takes place to ensure that savings equals investment in equilibrium.

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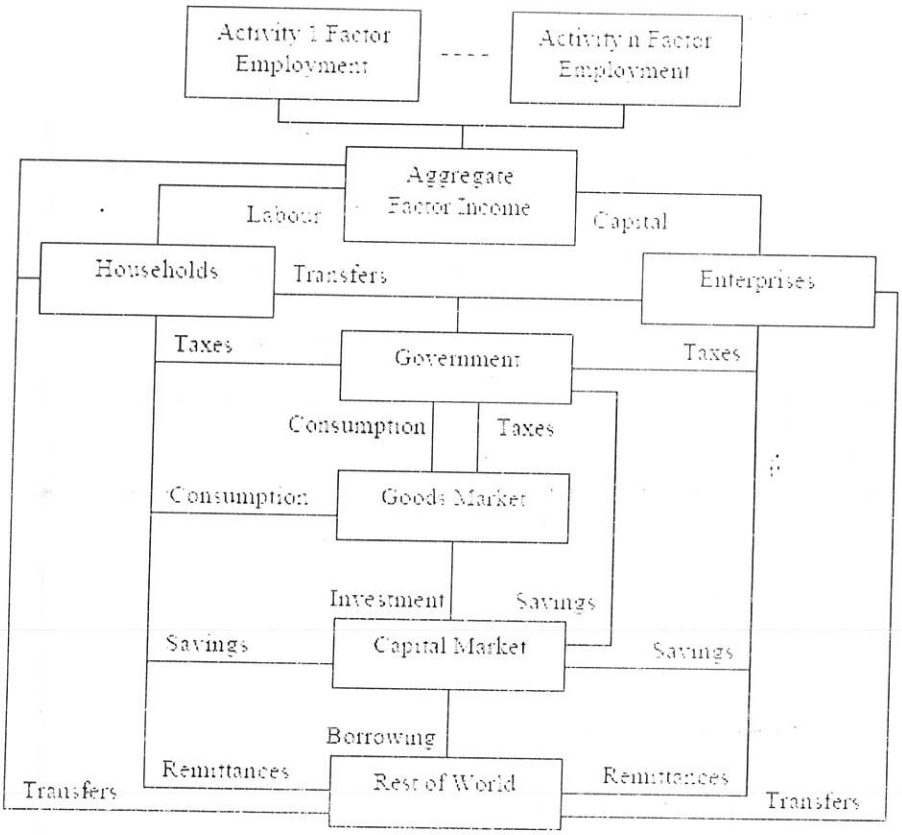


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The disaggregation of investment into demand for final commodities is done using fixed shares, with changes in aggregate investment leading to proportional increases in the demand for individual commodities. Therefore there is no real compositional shift in investment following changes in relative commodity prices.

Production is linked to demand through the generation of factor incomes and the payment of these incomes to domestic institutions. Balance between demand and supply for both commodities and factors are necessary in order for the model to reach equilibrium. This balance is imposed on the model through a series of system constraints.

### 5.5.1.3 System Constraints and Macroeconomic Closures

Equilibrium in the goods market requires that demand for commodities equal supply. Aggregate demand for .each commodity comprises household and government consumption spending, investment spending, and export and transaction services demand. Supply includes both domestic production and imported commodities. Equilibrium is attained through the endogenous interaction of domestic and foreign prices, and the effect that shifts in relative prices have on sectoral production and employment, and hence institutional incomes and demand.

The model includes three broad macroeconomic accounts: the current account, the government balance, and the savings and investment account. In order to bring about equilibrium in the various macro accounts it is necessary to specify a set of 'macro closure' rules, which provide a mechanism through which adjustment is assumed to take place.

Finally, the consumer price index is chosen as the numéraire such that all prices in the model are relative to the weighted unit price of households' initial consumption bundle. The model is also homogenous of degree zero in prices, implying that a doubling of all prices does not alter the real allocation of resources.

## 5.6 Definition of Scenario

**Scenarios in addressing the objective of the study**

The key scenarios that have been performed in this paper are related to the potential impacts of tariff reduction on the economic sectors that is impact on the agricultural, industrial and service sectors; in the households and government as well.

The three scenarios that have been built for this impact study are discussed as follow:

Base line or reference scenario: no change in duties.

- **Scenario one: a fifty percent reduction of import tariff.**
- **Scenario two: a ten percent reduction of import tariff.**
- **Scenario three: total elimination of import tariff.**

# CHAPTER SIX

## 6 Simulation results

The Ethiopian applied computable general equilibrium model represents a structuralist version of marketed and non marketed relation in the country's economy. Therefore, it can be used to simulate the impact of import tariff, change on major sectors and macroeconomic indicators. In this section, multi sectoral CGE model developed with General Algebraic Modeling System (GAMS) using the data for Ethiopia and apply the analysis of three different simulations regarding the effects of trade liberalization measures on the country's economy.

In a general equilibrium model all relative prices and quantities are determined simultaneously. However, to disentangle the trade policy reform effects on the economy, it is helpful to describe the adjustment process as if it were sequential. First, tariffs are reduced and impact import flows, which in turn displaces domestic production and generates resource reallocations. These shifts, by interacting with factor supply and demand, determine factor prices, and combined with new goods prices, ultimately affect the household's real income level. Then, changed household incomes feed back into the system through changes in consumption choices and the process continues until a new equilibrium is reached. Three main elements determine the *position* – i.e., the values of the endogenous variables – of the new equilibrium: 1) the starting level of some key variables in the initial equilibrium, i.e., the prices and quantities implicit in the initial SAM; 2) the functional forms of the model's behavioral equations; and 3) some key parameters, namely substitution elasticities among factors in the production process and, for a trade reform analysis, the elasticities of substitution in demand between domestic and imported commodities and the elasticity of transformation in supply between domestic and foreign markets. A broad consensus has emerged about the appropriate functional forms, and the model used here is in line with this consensus. In the following section the rationale of the three simulations is explained.

**Simulation one: ten percent decrease in import tariff**

WTO entry implies the introduction of a more liberal trade policy but not one of the complete free trade. Therefore, with the rules and discipline of WTO, each country can negotiate as to how restrictive or liberal its trade regime will be. Though, there is specific rule that states the maximum level at which a country has to bind its tariff or how its service sector to liberalize, countries have a



strategic choice during the negotiations phase of how liberal their trade regime should be consistent with WTO discipline.

Under the WTO rules, less developed countries allowed up to thirty percent average tariff. Thus the first scenario will be analyzing the impact of ten percent reduction of tariff because the government of Ethiopia applied thirty five percent of tariff (ten percent of thirty five is approximately thirty percent).

**Simulation two: fifty percent reduction in import tariff**

The second simulation imposes a fifty percent decrease in import tariff. The choice of this value is based on the policy of WTO that assumes a further progressive reduction on import tariff level. It is not consider the preferential and different treatment for developing countries principles.

**Simulation three: total removal of import tariff**

Total removal of import tariff scenario is not a realistic policy option but considered here to show how large the maximum cost to society that arises from the most radical liberalization foreign trade.

## 6.1 Sectoral impact of tariff reduction

The main determinants of trade liberalization effects are: sectoral prices, values of trade elasticities, the share of imports and exports, the cost of inputs, and general equilibrium effects of supply and demand. The experiences of most developing countries show that elimination of domestic distortions which is caused by tariff reduction leads to more efficient factor reallocation between sectors to the benefits of the export oriented sectors by making worse off the import computing sector. The same result is obtained for Ethiopia that opening of market to the world has a contractionary effect particularly for industrial sector and expansionary effect on both agriculture and service sectors (see table six one below).

**Table Six One: Tariff rate and Output of Sectors**

| Indicators | Symbol | Base Value | Scenario one | Scenario two | Scenario three |
|---|---|---|---|---|---|
| Import tariff on | Tm | | | | |
| Agriculture sector | Tm(c) | 0.158 | 0.142 | 0.079 | 0.000 |
| Industrial sector | | 0.252 | 0.226 | 0.126 | 0.000 |
| Service sector | | 0.126 | 0.114 | 0.063 | 0.000 |
| Agricultural activity | QA | 42562.073 | 42700.758 | 43285.725 | 44096.571 |
| Industrial activity | QA | 15477.664 | 15476.092 | 15470.114 | 15463.574 |
| Service activity | QA | 39517.397 | 39645.094 | 40190.636 | 40963.943 |

## 6.1.1 Impacts on sectoral prices

The channel through which liberalization affects the domestic economy is by changing the value of commodity prices both produced domestically and imported form the rest of the world. Tariff elimination primarily reduces import prices, which leads to an increase in import demand and a decrease in domestically produced commodities. The change in domestic good demand influences their prices and supply. These price changes also impose its effect on composite good price, factor demands and remunerations, and value added prices (see table six two).

**Table Six Two: Import price, Composite price and price of value added in different sectors**

| Indicators | Symbols | Base Value | Scenario one | Scenario two | Scenario three |
|---|---|---|---|---|---|
| Import price of | PM | | | | |
| Agricultural comm. | | 0.977 | 0.972 | 0.954 | 0.930 |
| Industrial comm. | | 0.977 | 0.966 | 0.921 | 0.861 |
| Services comm. | | 0.977 | 0.974 | 0.966 | 0.956 |
| Export price of | PE | | | | |
| Agricultural comm. | | 0.977 | 0.986 | 1.024 | 1.077 |
| Industrial comm. | | 0.977 | 0.986 | 1.024 | 1.077 |
| Service comm. | | 0.977 | 0.986 | 1.024 | 1.077 |
| Composite price of | PQ | | | | |
| Agricultural comm. | | 1.005 | 1.007 | 1.014 | 1.024 |
| Industrial comm. | | 0.991 | 0.986 | 0.967 | 0.940 |
| Service comm. | | 0.993 | 0.995 | 1.004 | 1.018 |
| Price of value added | PA | | | | |
| Agricultural sector | | 0.872 | 0.874 | 0.882 | 0.894 |
| Industrial sector | | 0.727 | 0.727 | 0.726 | 0.725 |
| Service sector | | 0.517 | 0.520 | 0.532 | 0.549 |
| Factor demand for | QF(lab) | | | | |
| Agriculture lab. | | 21738.130 | 21859.136 | 22372.588 | 23092.445 |
| Industrial lab. | | 3716.096 | 3714.954 | 3710.613 | 3705.867 |
| Service lab. | | 7699.155 | 7765.393 | 8052.371 | 8470.350 |

After the simulation we notice that, as expected, all import prices fall. The most protected sector, industrial sector shows the largest fall in prices. We notice therefore that imports for these sectors go up as shown in table six three. This trend is also shown in service and agriculture sector, although to a lesser extent. The increase in imports which implies reduction in domestic demand forced domestic price to fall. The domestic price fall and as a result, there is a relatively higher price for exporters compared to domestic goods. Exports increase in all exporting sector, with the largest increase in agriculture. The supply of domestically produced commodity to the international

market increase and which consequently enhances productivity benefiting sectors engaged in export. We recall the assumption that Ethiopia is price taker in the world market. Because of this closure rule, the increase in export price dose not affects the demand for domestically produced commodity.

**Table Six three: Quantity import and export**

| Indicators | Symbol | Base Value | Scenario one | Scenario two | Scenario three |
|---|---|---|---|---|---|
| Quantity of imports | QM | | | | |
| Agricultural comm. | | 774.431 | 779.624 | 801.224 | 830.143 |
| Industrial comm. | | 15940.184 | 16070.157 | 16634.474 | 17459.966 |
| Service comm. | | 3266.384 | 3282.644 | 3350.947 | 3444.413 |
| Quantity of export | QE | | | | |
| Agricultural comm. | | 3286.097 | 3340.657 | 3578.122 | 3927.199 |
| Industrial comm. | | 502.854 | 513.402 | 559.764 | 629.171 |
| Service comm. | | 3919.88 | 3977.542 | 4223.863 | 4572.852 |

Domestic price of domestically produced commodity has shown an increase in the entire scenario's both for agricultural and services sector. This effect partly explained by excess demand for domestically produced commodity due to liberalization is not followed by output rather price adjustment. That is, supply tends to be inherently price elastic in the short run and therefore price tends to be sensitive to be change in demand. However, the domestic price will decrease for industrial sector for that reason that import tariff reduction will result in increase imports of industrial commodity in which foreign producers have a comparative advantage. From the same table one can observe that the price for composite commodity shows an increase for agriculture and service sector while for industry sector it is decrease.

In general, from the reduction of import tariff highly protect sector in our case the industrial sector has faces a higher competition from the rest of the world and there is also a reallocation of resources from it to the other sector that is agriculture and services sectors (both of these sectors are most efficient one). Therefore, one should focus on strategic sector in order to benefit from the integration in to the world economy.

### 6.1.2 Impact on sectoral factor price

Tariff reduction has a positive impact on factors of production particularly for labor remuneration in agriculture sector. The labor price in agriculture and service sector show an increase for the entire scenarios, this could be probably due to increases in agricultural and services sectors production which likely lead to increases demand for wage labor in those sectors. However, there is a significant decrease in factor price for labor in the industrial sector. This could be due to lack of competitiveness and shortage of demand in industrial commodity in both domestic and foreign markets.

The combination of these sectoral results underlines that even if the impact of trade liberalization stimulates the economic activity, the substitution of local goods by imported goods put pressure on the production remuneration, particularly for those in import computing sector.

In general the import tariff reduction has a positive impact for labor demand across agriculture and service sectors and negative on import computing sector- industry.

### 6.1.3 Impacts on sectoral output

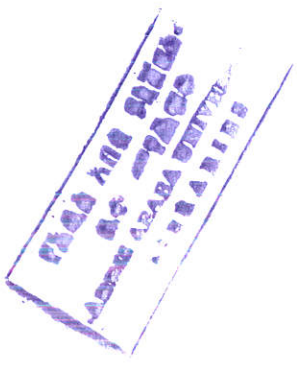
On the production side, the simulation results shows that improvement of the households' purchasing power benefits all sectors of the economy, and increase of imports dose not hamper production of local goods, particularly for agriculture and services sectors. This is partly explained by a rise in price of these sectoral outputs in domestic market gives an incentive for producers in those sectors. The out put in the industrial sector shows an increase but with a lesser extent.

## 6.2 Impact on macroeconomic variables

### 6.2.1 Households saving

The simulation suggests that tariff reduction will have a positive impact on households saving. This is resulted from the consumers have an advantage on commodity price fall due to tariff reduction, in addition to these expansion of production for export increase the income of the households.





### 6.2.2 Fiscal impact

The revenue obtained from the simulation shows that there is a reduction in total government revenue which is large on the other hand government expenditure rises, as a result government budget deficit increase in all three scenarios and special on the total removal of tariff. This effect may hamper government spending on public goods on those national institutions which play a crucial role for development

### 6.2.3 Impact on exchange rate

The simulation result shows that there is a depreciation of domestic currency in terms of foreign currency. The main reason for this depreciation is the balance of payment deterioration that arises from the foreign trade. It has a positive impact on the export producer.

### 6.2.4 Impact on final consumption

The household have an alternative commodities and lower price that arises from the reduction of import tariff. As the result of this consumption are increases. However the rise in consumption is not so high it is expected. One reason for this is the rise in the price of agricultural and services commodities.

**Table Six Four: Macro economic variables**

| Indicators | symbol | Base value | Simulation one | Simulation two | Simulation three |
|---|---|---|---|---|---|
| GDP at factor price | GDPFC | 68784.857 | 69163.764 | 70788.785 | 73112.638 |
| Government revenue | YG | 8342.074 | 8073.287 | 6897.954 | 5153.725 |
| Exchange rate | EXR | 0.977 | 0.986 | 1.024 | 1.077 |
| Government Expen. | EG | 8188.52 | 8345.157 | 8268.65 | 8366.343 |
| Private consumption | PRVCON | 51384.013 | 51595.782 | 52469.129 | 53621.761 |
| Government cons. | GOVCON | 7154.515 | 7169.349 | 7234.653 | 7332.343 |
| Investment | INVEST | 22231.705 | 22156.251 | 21842.107 | 21418.269 |
| Export | EXP | 7528.694 | 7718.281 | 8558.387 | 9835.273 |
| Import | IMP | 15922.84 | 16188.916 | 17355.510 | 19095.007 |
| Indirect tax | NITAX | 3591.229 | 3286.983 | 1959.981 | 0.0000 |
| Household inc. | YH(HHD) | 37231.541 | 37445.381 | 38340.063 | 39660.730 |
| Firms income | YH(FIRM) | 35631.475 | 35824.281 | 36651.399 | 37843.976 |
| Household inc. from | YF(LAB) | 33153.382 | 33339.483 | 34135.572 | 35268.663 |
| Household inc. from | YF(CAP) | 35631.475 | 35824.281 | 36653.214 | 37843.976 |

### 6.2.5 Impact on investment

The result of the simulation shows that there is a reduction in investment. The negative impact is resulted from two main reasons, one, the investors have loss their incentive due to open up of the economy (investors loss incentive with liberalizations shows that they are invest in the protected industrial sector). The second reason is that there may be a capital flight which occurs in many Latin American countries in the 1980s and 1990s. Investors' loss their confidence in the domestic economy began to invest in other part of the world.

### 6.2.6 Impact on aggregate economy

The results of the simulations shows that an increase of GDP. The positive impact is comes from the price of intermediate commodity fall and it is enhance production in agricultural and services sector. Another potential reason for the rise of GDP is that the demand for domestically produced exportable is rises and it has an incentive for producers in the export sector.

In general we can see that more radical trade liberalization have more benefit to the country. But this is not applicable to the country due to supply constraint and our trade partner restrict our product from their market because of sanitary and phyto sanitary measures.

# CHAPTER SEVEN

## Conclusions and policy implication

In this paper, attempts were made to look at the impact of WTO accession on the Ethiopian economy using a structuralist CGE modeling approach. For this purpose World Bank 2001/2002 SAM are used as a data base. The import tariff reduction calculated by the model has far-reaching sectoral and macroeconomic consequences. In the process it has found that import tariff reduction has both positive and negative impact on economic variables.

To start with the positive impact of tariff liberalization, import tariff reduction raises the price of export and domestically produced commodities particularly for agricultural and service sectors. Domestic producers increase their export volumes in responses, simultaneously reducing their local sales. The combination of reduced local sales and increased export price raises domestic consumer price. As local price increase relative to import prices, consumer substitute towards imports. But have a negative impact on balance of payment deterioration in the country. As a result this exchange rate will deprecate.

The model results shows that, import tariff reduction increases the domestic production of agricultural goods to increase in the entire scenarios implying that the accession to the WTO will permit the country to utilize its resources in the context of comparative advantage. In addition to this, WTO accession is compatible with agriculture leads to industrialization policy.

Import reduction has a positive impact on the GDP growth but not at higher rate this is due to the economy have many problem including supply constraints and institutional problem as well.

Tariff reduction has an adverse impact on the production of import competing industrial sector. This could be due to low productivity and low competitiveness of a sector with the rest of the world. These results imply that the government will have to closely supervise the liberalization process in order to minimize labor displacement and job losses in the industrial sector.

In addition to this, it appears also a relatively clear that substitution of locally produced goods by imported goods should be rather weak on a macro economic and even sectoral view point, but it

nevertheless would make a strong and progressive pressure on factor remuneration. In other words, the trade liberalization policy should not directly reduce local output.

The policy implications of this study are the following:

Firstly, government should take measures to broaden domestic tax bases to curb the problem of government revenue reduction and in addition to this the negotiators on behalf of the Ethiopian government should request technical support from the WTO which is declared in Doha round.

Secondly, to fully benefit from integration in the WTO regime Ethiopia has to strengthen its domestic industries and increase the export capacity of its products. The following mechanisms can be used to achieve this:

- Build the capacity of existing manufacturers and improve their efficiency and productivity.
- Intensify privatization of state owned industries, as private ownership has been proved to be the best mechanism to improve profitability of a business.
- Economic infrastructure which is crucial for improved productivity, such as energy provision, transportation and telecommunications, needs to be strengthened.

Thirdly, Ethiopia will have to increase its agricultural productivity which is low by Sub Saharan Africa standard, it support trade liberalization as the means of foreign currency income and reduced poverty in the country. Agricultural productivity is important both for domestic food security and for diversification of agricultural exports.

Fourthly, the government will have to closely supervise the liberalization process in order to prevent importer margins. Monitoring of price levels will be required in this regard, as will be a strengthening of market surveillance and consumer protection

Consequently, adapted and realizable adjustments will have to be elaborated in order to compensate the possible negative impact of trade liberalization and avoid them to hamper the economic growth of Ethiopia

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| FIR | GOV | ROW | DT | ETA | MTA | A1 | A2 | A3 | C1 | C2 | C3 | SAV | TOT |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | | | | | 2132 | 3704 | 7743 | | | | | 32771 |
| | | | | | | 1506 | 7507 | 1281 | | | | | 35387 |
| 20964 | 1034 | 3117 | | | | | | | | | | | 59827 |
| | | | | | | | | | | | | | 35387 |
| | | 2660 | 2393 | 3163 | 3601 | 168 | | | | | | | 11984 |
| | 548 | | | | | | | | 646 | 1247 | 2854 | | 16612 |
| 1726 | | | | | | | | | | | | | 2393 |
| 1470 | | | | | | | | | | | | | 3163 |
| | | | | | | | | | 102 | 3138 | 361 | | 3601 |
| | | | | | | | | | 3496 | 7121 | | | 42085 |
| | | | | | | | | | | 1546 | | | 15461 |
| | | | | | | | | | 5044 | 3257 | 3130 | | 39601 |
| | | 3433 | | | | 1882 | 349 | 198 | | | | | 40923 |
| | | 525 | | | | 2001 | 2482 | 4886 | | | | 3073 | 41447 |
| | 7203 | 4060 | | | | 1647 | 1419 | 1395 | | | | 1771 | 34516 |
| 11227 | 3200 | 2818 | | | | | | | | | | 1600 | 22385 |
| 35387 | 11985 | 16613 | 2393 | 3163 | 3601 | 4208 | 1546 | 3960 | 4075 | 4144 | 3451 | 2238 | |

| | LAB | CAP | HHD |
|---|---|---|---|
| LAB | | | |
| CAP | | | |
| HHD | 32771 | | 1942 |
| FIR | | 35387 | |
| GOV | | | |
| ROW | | | 95 |
| DTA | | | 667 |
| ETA | | | 1693 |
| MTA | | | |
| A1 | | | |
| A2 | | | |
| A3 | | | |
| C1 | | | 31821 |
| C2 | | | 13841 |
| C3 | | | 4629 |
| INV | | | 5140 |
| TOT | 32771 | 35387 | 59827 |

LAB LABOR

CAP CAPITAL

HHD HOUSEHOLDS

FIR FIRMS (ENTERPRISES)

GOV Government

ROW REST OF THE WORLD

DTA DIRECT TAX

ETA INDIRECT TAX

MTA IMPORT TAX

A1 AGRICULTURAL ACTIVITY

A1 INDUSTRIAL ACTIVITY

A3 SERVICE ACTIVITY

C1 AGRICULTURAL COMMODITY

C2 INDUSTRAIL COMMODITY

C3 SERVICE COMMODITY

SAV SAVING

INV INVESTEMENT

## ANNEX 2

**Price Block**

*Import Price*

$$PM_c = (1 + tm_c) \cdot EXR \cdot pwm_c \qquad c \in CM$$

$$\begin{bmatrix} import \\ price \\ (dom.\ cur.) \end{bmatrix} = \begin{bmatrix} tariff \\ adjust- \\ ment \end{bmatrix} \begin{bmatrix} exchange\ rate \\ (dom.\ cur.\ per \\ unit\ of\ for.\ cur.) \end{bmatrix} \begin{bmatrix} import \\ price \\ (for.\ cur.) \end{bmatrix} \quad (1)$$

*Export Price*

$$PE_c = (1 - te_c) \cdot EXR \cdot pwe_c \qquad c \in CE$$

$$\begin{bmatrix} export \\ price \\ (dom.\ cur.) \end{bmatrix} = \begin{bmatrix} tariff \\ adjust- \\ ment \end{bmatrix} \begin{bmatrix} exchange\ rate \\ (dom.\ cur.\ per \\ unit\ of\ for.\ cur.) \end{bmatrix} \begin{bmatrix} export \\ price \\ (for.\ cur.) \end{bmatrix} \quad (2)$$

The exogeneity of foreign currency import and export price indicates that we are modeling the country that is relatively small to the rest of the world markets (the "small country" assumption).

**Absorption**

$$PQ_c \cdot QQ_c = \left[ PD_c \cdot QD_c + (PM_c \cdot QM_c)_{for.\ cur.} \right] \cdot (1 + tq_c) \qquad c \in C$$

$$[absorption] = \left( \begin{bmatrix} domestic\ sales\ price \\ times \\ domestic\ sales\ quantity \end{bmatrix} + \begin{bmatrix} import\ price \\ times \\ import\ quantity \end{bmatrix} \right) \begin{bmatrix} sales\ tax \\ adjustment \end{bmatrix} \quad (3)$$

For each commodity, absorption- total domestic spending on the commodity at domestic demander prices- is expressed as the sum of spending on domestic output and imports, including an upward adjustment for the sales tax. The fact that this condition holds follows from the linear homogeneity of the composite supply (Armington) function (equation 11; the conditions is referred to as Euler's theorem). The import part only applies to imported commodities. The composite price, $PQ_C$, is paid by domestic demanders (households, the government, the producers, and investors); hence it replaces $P_C$ in all relative equations. The composite price, implicitly defined by this equation, could easily be derived by dividing through by $QQ_C$, (See discussion of Equations 11 and 12 for further details.)

*Domestic Output Value*

$$PX_c \; QX_c = PD_c \; QD_c + PE_c \; QE_c \qquad c \in C$$

$$\begin{bmatrix} producer \\ price \\ times \\ domestic \\ output\ quantity \end{bmatrix} = \begin{bmatrix} domestic \\ sales\ price \\ times \\ domestic \\ sales\ quantity \end{bmatrix} + \begin{bmatrix} export \\ price \\ times \\ export \\ quantity \end{bmatrix} \qquad (4)$$

For each commodity, domestic output value at producer prices is stated as the sum of the value of domestic output sold domestically and the export value (in domestic currency). This equation reflects the fact t hat the CET (constant-elasticity-of-transformation) function (Equation 1 4) is linearly homogeneous. The export part only applies to exported commodities. The producer price, PXc, can be derived by dividing through by QXc. Note that, in this model, the domestic output quantity is referred to as QXc (as opposed to Qc in earlier models). See discussion of Equations 14 and 15 for further details.

*Activity Price*

$$PA_a = \sum_{c \in C} PX_c \; \theta_{ac} \qquad a \in A$$

$$\begin{bmatrix} activity \\ price \end{bmatrix} = \begin{bmatrix} producer\ prices \\ times\ yields \end{bmatrix} \qquad (5)$$

*Value-added Price*

$$PVA_a = PA_a - \sum_{c \in C} PQ_c \; ica_{ca} \qquad a \in A$$

$$\begin{bmatrix} value\text{-}added \\ price \end{bmatrix} = \begin{bmatrix} activity \\ price \end{bmatrix} = \begin{bmatrix} input\ cost \\ per\ activity \\ unit \end{bmatrix} \qquad (6)$$

Note that in this equation, there is a change in notation for the price applying to intermediate inputs (the composite supply price).

**Production and Commodity Block**

In this block, Equations 7–10 are allocate domestic supply of composite commodities between imports and domestic output, and transform domestic output to exports and domestic sales. Simpler expressions apply to commodities that are not imported and/or not exported.

*Activity Production Function*

$$QA_a = ad_a \prod_{f \in F} QF_{fa}^{\alpha_{fa}} \qquad a \in A$$

$$\begin{bmatrix} activity \\ level \end{bmatrix} = f \begin{bmatrix} factor \\ inputs \end{bmatrix} \tag{7}$$

*Factor Demand*

$$WF_f \cdot WFDIST_{fa} = \frac{\alpha_{fa} \cdot PVA_a \cdot QA_a}{QF_{fa}} \qquad f \in F, a \in A$$

$$\begin{bmatrix} marginal\ cost \\ of\ factor\ f \\ in\ activity\ a \end{bmatrix} = \begin{bmatrix} marginal\ revenue \\ product\ of\ factor \\ f\ in\ activity\ a \end{bmatrix} \tag{8}$$

*Intermediate demand*

$$QINT_{ca} = ica_{ca} \cdot QA_a \qquad c \in C, a \in A$$

$$\begin{bmatrix} inter- \\ mediate \\ demand \end{bmatrix} = f \begin{bmatrix} activity \\ level \end{bmatrix} \tag{9}$$

*Output Function*

$$QX_c = \sum_{a \in A} \theta_{ac} \cdot QA_a \qquad c \in C$$

$$\begin{bmatrix} domestic \\ output \end{bmatrix} = f \begin{bmatrix} activity \\ level \end{bmatrix} \tag{10}$$

*Composite Supply (Armington) Function*

$$QQ_c = ac_c \left( \delta_c^q \cdot QM_c^{\rho_c^q} + (1 - \delta_c^q) \cdot QD_c^{\rho_c^q} \right)^{\frac{1}{\rho_c^q}} \qquad c \in CM$$

$$\begin{bmatrix} composite \\ supply \end{bmatrix} = f \begin{bmatrix} import\ quantity,\ domestic \\ use\ of\ domestic\ output \end{bmatrix} \tag{11}$$

The composite commodities are used by all domestic demanders. Imperfect sustainability between imports and domestic output sold domestically is captured by a CES (constant elasticity of substitution) aggregation function in which the composite commodity that is supplied domestically is "produced" by domestic and imported commodities, and enters this function as "inputs." Economically, this means that demander preferences over imports and domestic output are

expressed as a CES function. This function, with a domain that is limited to elements in CM, is often called an Armington function after the originator of the idea of using a CES function for this purpose. The restriction on the value of $\rho_c^q$ ($-1 < \rho_c^q < \infty$) assures that the corresponding isoquant is convex to the origin, in terms of production economics equivalent to a diminishing technical rate of substitution.

*Import-Domestic Demand Ratio*

$$\frac{QM_c}{QD_c} = \left( \frac{PD_c}{PM_c} \frac{\delta_c^q}{1-\delta_c^q} \right)^{\frac{1}{1+\rho_c^q}} \qquad c \subset CM$$

$$\begin{bmatrix} import\text{-}\\ domestic\\ demand\ ratio \end{bmatrix} = f \begin{bmatrix} domestic\text{-}\\ import\\ price\ ratio \end{bmatrix} \qquad (12)$$

Equation 12 defines the optimal mix between imports and domestic output. Its domain is also limited to imported commodities. Together, Equations 3, 11, and 12 constitute the first-order conditions for cost minimization given the two prices and subject to the Armington function and a fixed quantity of the composite commodity.

*Composite Supply for Nonimported Commodities*

$$QQ_c = QD_c \qquad c \subset CNM$$

$$\begin{bmatrix} composite\\ supply \end{bmatrix} = \begin{bmatrix} domestic\ use\ of\\ domestic\ output \end{bmatrix} \qquad (13)$$

For commodities that are not imported, the Armington function is replaced by the above statement, which imposes equality between "composite" supply and domestic output used domestically.

*Output Transformation (CET) Function*

$$QX_c = at_c \left( \delta_c^t QE_c^{\rho_c^t} + (1-\delta_c^t) QD_c^{\rho_c^t} \right)^{\frac{1}{\rho_c^t}} \qquad c \subset CE$$

$$\begin{bmatrix} domestic\\ output \end{bmatrix} = f \begin{bmatrix} export\ quantity,\ domestic\\ use\ of\ domestic\ output \end{bmatrix} \qquad (14)$$

Imperfect substitutability between imports and domestic output sold domestically is paralleled by imperfect transformability between domestic output for exports and domestic sales. The latter is

captured by Equation 14. The CET function, which applies to exported commodities, is identical to a CES function except for negative elasticities of substitution. The isoquant corresponding to the output transformation function will be concave to the origin given the restriction imposed on the value of $\rho^t$ ($-1 < \rho_c^t < \infty$). In economic terms, the difference between the Armington and CET functions is that the arguments in the former are inputs, those in the latter are outputs.

*Export-Domestic Supply Ratio*

$$\frac{QE_c}{QD_c} = \left[\frac{PE_c}{PD_c}\ \frac{1-\delta_c^t}{\delta_c^t}\right]^{\frac{1}{\rho^t - 1}} \qquad c \in CE$$

$$\begin{bmatrix} export\text{-}\\ domestic\\ supply\ ratio \end{bmatrix} = f\begin{bmatrix} export\text{-}\\ domestic\\ price\ ratio \end{bmatrix} \qquad (15)$$

Equation 15 defines the optimal mix between exports and domestic sales. Equations 4, 14, and 15 constitute the first-order conditions for maximization of producer revenues given the two prices (export and domestic) and subject to the CET function and a fixed quantity of domestic output.

One important difference between the equations for import demand (12) and export supply (15) is that the quantity demanded of the imported commodity (QMc) is inversely related to the import price, whereas the quantity supplied of the exported commodity (QEc) is directly related to the export price.

*Output Transformation for Nonexported Commodities*

$$QX_c = QD_c \qquad c \in CNE$$

$$\begin{bmatrix} domestic\\ output \end{bmatrix} = \begin{bmatrix} domestic\ sales\ of\\ domestic\ output \end{bmatrix} \qquad (16)$$

For commodities that are not exported, the CET function is replaced by a statement imposing equality between domestic output sold domestically and domestic output.

**Institution Block**

*Factor Income*

$$YF_{hf} = shry_{hf} \sum_{a \in A} WF_f \cdot WFDIST_{fa} \cdot QF_{fa} \qquad h \in H, f \in F$$

$$\begin{bmatrix} household \\ factor \\ income \end{bmatrix} = \begin{bmatrix} income \\ share\ to \\ household\ h \end{bmatrix} \begin{bmatrix} factor \\ income \end{bmatrix} \qquad (17)$$

*Household Income*

$$YH_h = \sum_{f \in F} YF_{hf} + tr_{h,gov} + EXR \cdot tr_{h,row} \qquad h \in H$$

$$\begin{bmatrix} household \\ income \end{bmatrix} = \begin{bmatrix} factor \\ incomes \end{bmatrix} + \begin{bmatrix} transfers\ from \\ government\ \& \\ rest\ of\ world \end{bmatrix} \qquad (18)$$

*Household Consumption Demand*

$$QH_{ch} = \frac{\beta_{ch} \cdot (1 - mps_h) \cdot (1 - ty_h) \cdot YH_h}{PQ_c} \qquad c \in C, h \in H$$

$$\begin{bmatrix} household \\ demand\ for \\ commodity\ c \end{bmatrix} = f \begin{bmatrix} household\ income, \\ composite\ price \end{bmatrix} \qquad (19)$$

*Investment Demand*

$$QINV_c = \overline{qinv_c} \cdot IADJ \qquad c \in C$$

$$\begin{bmatrix} investment \\ demand\ for \\ commodity\ c \end{bmatrix} = \begin{bmatrix} base\text{-}year\ investment \\ times \\ adjustment\ factor \end{bmatrix} \qquad (20)$$

*Government Revenue*

$$YG = \sum_{h \in H} ty_h \; YH_h + EXR \; tr_{gov,row} + \sum_{c \in C} tq_c \; (PD_c \; QD_c + PM_c \; QM_c)_{c \in CM}$$
$$+ \sum_{c \in CM} tm_c \; EXR \; pwm_c \; QM_c + \sum_{c \in CE} te_c \; EXR \; pwe_c \; QE_c \qquad (21)$$

$$\begin{bmatrix} government \\ revenue \end{bmatrix} = \begin{bmatrix} direct \\ taxes \end{bmatrix} + \begin{bmatrix} transfers \\ from \\ RoW \end{bmatrix} + \begin{bmatrix} sales \\ tax \end{bmatrix} + \begin{bmatrix} import \\ tariffs \end{bmatrix} + \begin{bmatrix} export \\ taxes \end{bmatrix}$$

*Government Expenditures*

$$EG = \sum_{h \in H} tr_{h,gov} + \sum_{c \in C} PQ_c \; qg_c$$

$$\begin{bmatrix} government \\ spending \end{bmatrix} = \begin{bmatrix} household \\ transfers \end{bmatrix} = \begin{bmatrix} government \\ consumption \end{bmatrix} \qquad (22)$$

**System Constraint Block**

This block defines the constraints that are satisfied by the economy as a whole without being considered by its individual agents. The model's *micro* constraints apply to individual markets for factors and commodities. With the few exceptions discussed below (for labor, exports, and imports), it is assumed that flexible prices clear the markets for all commodities and factors. The *macro* constraints apply to the government, the savings-investment balance, and the rest of the world. For the government, savings clear the balance, whereas the investment value adjusts to changes in the value of total savings. For the rest of the world, the alternatives of a flexible exchange rate or flexible foreign savings are permitted in the current formulation.

*Factor Markets*

$$\sum_{c \in A} QF_{fc} = QFS_f \qquad f \in F$$

$$\begin{bmatrix} demand\ for \\ factor\ f \end{bmatrix} = \begin{bmatrix} supply\ of \\ factor\ f \end{bmatrix} \qquad (23)$$

For the two factors, the closure rule are unemployment with fixed, activity-specific real wages for labor and fixed capital use for each activity. This is achieved by fixing the following variables at base values: WFDISTlab,a, WFlab, QFcap,a, and WFcap.

*Composite Commodity Markets*

$$QQ_c = \sum_{a \in A} QINT_{ca} + \sum_{h \in H} QH_{ch} + qg_c + QINV_c \qquad c \in C$$

$$\begin{bmatrix} composite \\ supply \end{bmatrix} = \begin{bmatrix} composite\ demand: \\ sum\ of\ intermediate, \\ household, government, \\ \&\ investment\ demand \end{bmatrix} \qquad (24)$$

The equilibrium condition imposes equality in the composite commodity market with the demand side represented by all types of domestic commodity use while the supply comes from the Armington function (or its substitute for non imported commodities) that aggregates imports and domestic output sold domestically. The variable PQc clears this market.

In addition to the composite commodity, the model includes quantity (and associated price) variables for the following commodities and activities: *QM, QE, QX, QD, QA*. These variables represent both the quantities supplied and demanded (that is, the equilibrium quantity has been substituted for the quantities supplied and demanded throughout the model). For exports and imports, the quantities demanded and supplied clear the markets (infinitely elastic world market demands and supplies at fixed foreign-currency prices).For the remaining three quantities, the associated price variables (*PX, PD,* and *PA*) serve the market clearing role.

*Current Account Balance for RoW (in Foreign Currency)*

$$\sum_{c \in C} pwe_c \cdot QE_c + \sum_{i \in I} tr_{i,row} + FSAV = \sum_{c \in CM} pwm_c \cdot QM_c$$

$$\begin{bmatrix} export \\ revenue \end{bmatrix} = \begin{bmatrix} transfers \\ from\ RoW \\ to\ households \\ \&\ government \end{bmatrix} = \begin{bmatrix} foreign \\ savings \end{bmatrix} = \begin{bmatrix} import \\ spending \end{bmatrix} \qquad (25)$$

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The current-account equation (which is expressed in foreign currency) imposes equality between the country's earning and spending of foreign exchange. Foreign savings is equal to the current-account deficit. Careful counting of equations and variables in the current model would indicate that the number of variables exceeds the number of equations by one. This is related to the fact that the model includes two variables that may serve the role of clearing the current-account balance—the foreign exchange rate (*EXR*) and foreign savings (*FSAV*).

*Savings-Investment Balance*

$$\sum_{h \in H} mps_h \cdot (1 - tv_h) \cdot YH_h + (YG - EG) + EXR \cdot FSAV = \sum_{c \in C} PQ_c \cdot QINV_c + WALRAS \qquad (26)$$

$$\begin{bmatrix} household \\ savings \end{bmatrix} + \begin{bmatrix} government \\ savings \end{bmatrix} + \begin{bmatrix} foreign \\ savings \end{bmatrix} = \begin{bmatrix} invest- \\ ment \\ spending \end{bmatrix} + \begin{bmatrix} WALRAS \\ dummy \\ variable \end{bmatrix}$$

Foreign savings, converted into domestic currency, in Equation 26. As long as either the exchange rate or foreign savings is fixed, their presence does not influence the savings investment closure of the model, according to which the savings value determines the investment value.

*Price Normalization*

$$\sum_{c \in C} PQ_c \cdot cwts_c = cpi \qquad (27)$$

$$\begin{bmatrix} price\ times \\ weights \end{bmatrix} = [CPI]$$

## Declaration

I the undersigned, declare that this Project is my original work and has not been presented in any other University and that all sources of materials used for this thesis (project) have been duly acknowledged.

Declared By:

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Signature _____

Date 30/06/08

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Signature _____

Date June 30/2008