

**ADDIS ABABA UNIVERSITY
SCHOOL OF GRADUATE STUDIES**

**Impact of Trade liberalization on the Government Tax
Revenue of Ethiopia by Reducing the Tariff Rate: Using
a Simple Computable General Equilibrium Model**

By

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DECLARATION

I,

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Table of contents	Page
Acknowledgements.....	I
Table of contents.....	II
List of figures.....	IV
List of tables.....	V
List of Appendices.....	VI
List of Acronyms and Abbreviations.....	VII
Abstract.....	VIII
CHAPTER ONE.....	1
1. Introduction.....	1
1.1 Background of the Study.....	1
1.3 Objective of the Study.....	7
1.4 Methodology and Data Source.....	8
1.5 Source of Data.....	9
1.6 Significance of the Study.....	9
1.7. Scope of the Study.....	10
1.8 Limitation of the Study.....	11
1.9 Macroeconomic Performance and Policy in Ethiopia since 1992/93	11
1.9.1 An Overview Recent Economic Performance.....	13
1.9.2 Fiscal Performance.....	14
1.10 Organization of the Paper.....	16
2. LITERATURE REVIEW.....	17
2.1 Historical development from GATT to WTO and Some basic rules and disciplines.....	18
2.1.1 Historical development of WTO.....	18

2.1.2 Some of the Basic Rules and Disciplines of GATT/ WTO	20
2.2 Impact of trade liberalization on the tax revenue and other macro economic variables	25
2.3 Computable General Equilibrium Model.....	37
3. MODEL SPECIFICATIONS	41
3.1 Analytical Framework of the Model.....	41
3.2 Specification of the Equations	43
CHAPTER FOUR.....	46
4. ANALYSIS AND RESULTS	46
CHAPTER FIVE	53
5. CONCLUSION AND RECOMMENDATION	53
REFERENCE:	57

List of figures

Figure1. Before the simulation result.....47

Figure.2. the simulation result First scenario.....48

Figure.3. the simulation result of the model second scenario.....49

Figure.3. the simulation result of the model third scenario.....51

List of tables

Table 1 Federal Government Revenue.....14

Table2. GATT negotiation round.....19

Table 3. Simulation result of the model before tariff reduction.....46

Table 4. Simulation result of the model in Scenario one..... 48

Table 5.Simulation result of the model in second scenario.....49

Table 6.Simulation result of the model in third scenario.....50

Table 7. Coordination of the import tax and domestic tax.....52

List of Appendices

Appendix A the 1-2-3 Computable General Equilibrium Model.....62

Appendix B Recent over view of macroeconomic performance63

LIST OF ACRONYMS AND ABBREVIATIONS

CEF	Constant Elasticity of Transformation
CES	Constant Elasticity of Substitution
CGE	Computable General Equilibrium
GATT	General Agreement on Trade and Tariff
GATS	General Agreement on Trade and Service
GDP	Gross Domestic Product
GFS	Government Financial Statistics
GNP	Gross National Product
IMF	International Monetary Fund
ITO	International Trade Organization
MOFED	Ministry of Finance and Economic Development
MCF	Marginal Cost of Fund
NAD	National Accounts Department
NBE	National Bank of Ethiopia
PBS	Protection Basic Support
QR	Quantitative restriction
SAL	Structural Adjustment Loan
SAP	Structural Adjustment Programme
TRIP	Trade Related Intellectual Right
TRIM	Trade Related on Investment measures
VAT	Value Added Tax
WB	World Bank
WTO	World Trade Organization

ABSTRACT

1999 was the time the military regime relinquished political power and the new government took over the power. The new government initiated a wide range of reform programme some of which are directly related to trade liberalization.

In this paper a two-sector, three-goods simple Computable general Equilibrium (1-2-3 CGE) model, developed by S.Devarajan *et.al.* at the World Bank was used to analyze the impact of trade liberalization that is the reduction of the tariff rate in three scenarion on government tax revenue and saving of Ethiopia. Moreover, it examines the coordination of domestic tax and trade tax with out affecting the total tax revenue of the country using the 1-2-3 CGE model.

The simulation result of the model when reducing tariff rate is an overall decline of the government tax revenue and government saving of the country in the three different scenarios. Furthermore, by increasing domestic tax it possible compensate the loss from tariff reduction with out affecting the total government tax revenue.

Keywords: Trade liberalization, Simple Computable General Equilibrium (1-2-3CGE) Model, Government tax revenue and tariff reduction.

CHAPTER ONE

1. Introduction

1.1 Background of the Study

In the last several decades, there have been ambitious efforts in much of the developing countries to liberalized trade and streamline protectionist tariff regimes. Spurred on by multilateral donors, many countries have been engaging in widespread and complex trade policy reforms. Recognizing that trade reform is vital for economic development and poverty reduction, developing countries policy makers have lowered tariff, reduced non tariff and eliminated many distortions in there economies.

Especially widespread international trade liberalization was under taken in developing countries throughout the 1980s and 1990s .In effect there are two major trade negotiation events that led to significantly lower the international trade tariffs in developing countries. The first event was the Tokyo Round, completed in 1979, in which 99 participating countries agreed to a substantial reduction in tariff rated by 1986. Another important aspect of the Tokyo Round was that developing countries took part in the tariff reductions negotiation for the first time. The second major event is, the Uruguay Round, which started in the 1986 and where 125 countries were participated in the negotiations. With the formal signing, in April 1994 the participated countries reached substantial new

agreement on general tariff reduction. How these two events can be seen from the Ethiopia's point of view? A key feature of this event for Ethiopia is that the conferences were conducted at the time the military regime relinquished political power and the new government took over. In 1991 this new government initiated a wide range reform programs some of which are directly related to the trade liberalization policies. The tax system, the exchange rate, interest rate, trade, activities associated to domestic production and distribution, among others were encompassed by the trade liberalization policies.

According to Pritchett and Sethi (1994) higher tariff create an incentive for importers to evaded tariff of seek exemptions. In turn, tax evasion affects the productivity of the tax system leading to less than proportionate increase in tariff revenue. In the same vein, the reduction of tariff may lead to increase in the tax base by lowering the marginal benefit to avoid taxation hence, a rise revenue following liberalization. Ultimately the elasticity of tariff revenue with respect to tariff rate becomes an important factor in determining the out come of liberalization. In theory, the final out come may also depend on factor such as the price elasticity as well as the type of imports. But in most developing economies a large portion of import constitute necessary capital goods, which are unresponsive to change in their price. In such case, a reduction in trade restriction seldom has any significant influence on the volume of import in particular. One factor that is important in determining the direction of the change in the substitution and income effects that follow a change in the price of import

as a result of lower tariff. If residents prefer foreign commodities to domestic commodities and give that market are open to foreign competition, we can expect the international trade tax base to rise. This in turn may lead to an increase in trade tax revenue following a reduction in trade restriction.

Most of trade barriers and anti-export bias will reduce export growth below potential. Import controls are likely to reduce efficiency, although at the same time they protect the current account balance. The presumption is that trade liberalization will raise the export and import but the implication for the current account are uncertain because this depends on the relative impact of liberalization on export and import growth and on what happens to the price of traded goods. Trade may promote growth from the supply side, but if the current account and government revenue worsen, growth may be adversely affected from the demand side because the payments deficits resulting from liberalization are unsustainable and not easily rectified by relative price change (Kahn and Zahler, 1985)

Reason for imposing trade restriction; vary among individual economies but ranges from protection of domestic industries to acquisition of revenue. On the other hand the argument of trade liberalization is premised on the welfare gains that are predicted by theory to results from such measures. In theory trade liberalization is expected to enhance efficiency in production, international competitiveness and increased the volume of trade (Ebrill *et.al.*, 1999).Among others for trade restrictions,

trade revenue is affected by the removal of trade barriers. However, in theory the direction of change of revenue is ambiguous. The argument is that the elimination of tariff may lead to trade reforms while preserving revenue by broadening the tax base.

Ethiopia has now becoming a relatively open economy and submitted an application to access the World Trade Organization (WTO) in 10 February 2003. The government considers the accession to the WTO as priority for external economic policy and is in the process of carefully examination and revising its trade policies. In order to become a member of the WTO, Ethiopia needs to remove barriers to trade, establish competitive market for both domestic and international goods. Moreover, discuss bilateral trade agreements with other WTO members to accelerate the accession.

The paper analyses effect of tariff reduction can have on government tax revenue, government saving, aggregate saving, income and consumption using simple Computable General Equilibrium (CGE) model. Based on established three scenarios, the paper is attempt to explore the impact of reducing tariff rate of international trade tax by 25% in the first scenario, by 50% in the second scenario and by (100%) total elimination of the tariff rate in the third scenario. It is examine the possibility of how to compensate the loss of international trade tax from domestic tax revenue. Trade liberalization is performed step by step starting from tariff reduction of small amount until the total elimination that is why the above three different scenarios.

1.2 Statement of the Problem

Trade liberalization has frequently been the centrepiece of an economic developing strategy for developing countries like Ethiopia. Developing countries have experienced extensive and rapid trade liberalization in recent years, undertaken in the context of multilateral trade negotiation program agreed with the International Monetary Fund (IMF) and World Bank (WB).

According to standard trade theory, trade liberalization is mainly thought to be linked to tax revenue through its effects on international trade tax revenue, though the precise relationship depends on several variables including the nature of trade liberalization and the response of imports and exports to liberalization. Usually the first step in trade liberalization is the replacement of quantitative barriers with import duties. Of course this could result in higher trade tax revenue depending on the level of duties that are set and the change in the value of imports in response to the liberalization measures. However ultimately trade liberalization leads to the reduction of import duties, and this turn is linked to reduction in international trade tax revenue (Ebrill, Stotsky and Gropp, 1999). Moreover the relationship between trade liberalization and tax revenue, including the domestic revenue is also uncertain and depends on a number of factors, including the structure of tax system and tax administrative capabilities (Ebrill, Stotsky and Gropp, 1999 and Keen and Lighthart, 2002).

One strategy of trade liberalization is to combine tariff cuts that is a point for point increase in domestic consumption taxes (Keen and Lighthart.1999).Under certain condition, this can be shown to lead to an increase in social welfare as well as public revenue. The introduction of value added tax (VAT) in January 2003 in Ethiopia replacing sale tax, in particular, has advantages over other sales and consumption taxes as it discourages tax evasion and does not hamper the competitiveness of domestic producers compared to foreign firms. The VAT has applied a uniform rate of 15 percent on most of consumption goods and services with the exception of exportable and exempted goods and services. The scope of exempted goods and services differs from the sale tax. Under the VAT; the main exempted items are sales of used dwellings, financial services, medical and educational services, electricity, kerosene, water and transport.

Macroeconomic changes also have an influence on tax revenue. Tanzi (1989) presents several wider ranging hypotheses of the relationship between various macroeconomic variables, including inflation and exchange rates and tax revenue. He observed that there is often an inverse relationship between a country's tax revenue and the real level of its official exchange rates.

Developing countries like Ethiopia incur substantial problems from reducing their trade barriers. In many developing countries, tariff revenue accounts for 10-20 percent of the government revenue, and in some case

considerably more. If tariff are reduced or eliminate, the country will have to impose large increase in other domestic tax in order to keep their budget in line. Therefore, in this paper one of the interests is to see how it is possible to compensate the decline of tariff rate from domestic tax without affecting the government tax revenue using simple CGE model in three different scenarios.

In relation to the above issues, this study focuses on the impact of trade liberalization on the Ethiopia's government revenue, government saving, aggregate saving income and consumption. Therefore, the study identifies the problems that could be encountered and developed policy proposals which would enable to address those problems.

1.3 Objective of the Study

The overall objective of the study is to examine and try to answer the following questions with respects to the Ethiopian economy.

General Objective

- Does trade liberalization necessarily worsen government tax revenue performance and government saving?

Specific objectives

- What is impact of trade liberalization on consumption, aggregate saving and income of the country?
- How it is possible to compensate the decline of tariff rate from domestic indirect tax?

- Specifically, the main objective of the study is to suggest the proposed policy implication and indicate the direction of future research focus on the sequence of trade liberalization to expedite and enhance the government tax revenue of the country.

1.4 Methodology and Data Source

Computable General Equilibrium (CGE) modelling involves numerically simulating the general equilibrium structure of an economy, where a general equilibrium is characterised by a set of price and output levels across all sectors of the economy such that market demand equals supply in all market simultaneously. The technique is an important tool in evaluating the economy-wide impact of exogenous shocks, and has proved to be appropriate for economic policy appraisal. CGE modelling has been employed to examine a whole range of policy and other non-policy disturbances in a range of research areas, including questions relating to regional trade agreements (see Lloyd and Maclaren (2004) for a review), public finance (Shoven and Whalley (1984), tax reform (Jorgenson, 1997) and the distributive impacts on different household groups of policy change Bourguignon et al (1992).

The flexibility of a CGE framework and inherent transparency of the model structure mean that the system allows for in-depth analysis of a wide range of complex economic scenarios, which is difficult to achieve with other modelling procedures. As with all economic modelling techniques, however, the CGE modelling is subject to a number of limitations, for example in assigning appropriate numerical values to model parameters

so as to accurately reflect real-world economic relationships. But in this paper I used a simple macro model that is 1-2-3 computable general equilibrium model for the analysing the result of the objective.

1.5 Source of Data

The 1-2-3 CGE model data requirements are rather modest. The data was obtained from the Ministry of Finance and Economic Development (MoFED) National Accounts Department (NAD) and Government Financial Statistics (GFS) , the National Bank of Ethiopia (NBE), from customs, International Monetary Fund(IMF) and the World Bank (WB) for the year 2005/2006 (1998 EFY) as base years of the simple CGE model. The main reason of chosen this year as a base year of the model is that because this is the year having actual data for all variable used, especially for the national accounts data.

1.6 Significance of the Study

Since 1992, Ethiopia has implemented structural adjustment program (SAP) and re-oriented the economy to free market economy strategy. In addition ,as part of its liberalization program, the government has embarked on a comprehensive trade reform program which was aimed at dismantling quantitative and qualitative restrictions on international trade and gradually reducing the level and dispersion of tariff rates.

Apparently there are only few researches that are carried out to investigate the likely impact of trade liberalization on government tax revenue,

government saving, aggregate saving, consumption, income level and coordination of international tax revenue loss with domestic tax gain with out affecting the government total tax revenue using a simple computable general equilibrium model in Ethiopia. To this author's knowledge there is no recent work that has been done on the impact of tariff reduction on government tax revenue and saving, consumption and income using 1-2-3 CGE model for Ethiopia. Moreover, analyse the coordination of domestic tax revenue and trade tax with out affecting the total tax revenue.

Therefore, given the nature of the problem and objectives stated above, the study is make analysis and assessment in order to reach to a certain outcome or funding using recent data /information available.

1.7. Scope of the Study

Trade liberalization is a wide discipline per se, that is reduction of tariff and non tariff barriers. But in this study the author planned to limit himself only to the reduction of international trade tax in three different scenarios and analyze its impact on a specific variable using aggregated simple 1-2-3 computable general equilibrium model for one country, that is, Ethiopia. Moreover, the paper examines how it possible to coordinate the tariff reduction in the three scenarios by increasing of the domestic tax with out affecting the total tax revenue of the government using the simple CGE model.

1.8 Limitation of the Study

In almost all developing countries one of the problems to carry out this kind of study is the availability of consistent data in disaggregated form, In addition, recent materials like published reference books, research documents and the like that are related to trade liberalization can not be available. These problems should be drawbacks for the unavailability of the recent relevant materials may constrain the use and incorporation of current and new developments, and findings in the field.

However, the author strongly believe in the possibility of drawing some lessons regarding the impact of trade liberalization and propose some policy measures that could be useful for policy makers and researchers who under take a similar studies in the future. Using all available data and materials which could be at the disposal of the author are used to analyse the results.

1.9 Macroeconomic Performance and Policy in Ethiopia since 1992/93

After overthrowing of the military government in May 1991, the current government engaged itself in carrying out several structural and macroeconomic reform beginning from the fiscal year 1992/1993 under the Structural Adjustment program (SAP), sponsored by the IMF and World Bank .The principal policy requirement of the program include exchange rate adjustment, public expenditure reduction, trade liberalization, reduction of the role of the state in production and

distribution, controlling price and intervening in the exchange and product market, liberalization of the financial sector and privatization (Fantahun 2002).

The main reason of the reform is to integrate the economy with the world economy and encourage the wider participation of the private sector in the development of the national economy. Such reform include, among others, the following short- term economic stabilizations and structural adjustment measures:

- Deregulation of the domestic price;
- Liberalization of foreign trade;
- Privatization of public enterprises;
- Abolition of all export tax and subsidies;
- Devaluation of the exchange rate following by the introduction of inter-bank foreign currency market and the determination of exchange rate based on market forces;
- Enhancing private sector development and private-public partnership through providing effective industry association; and creating a forum for consultation between the private sector and the government;
- Promulgation of the liberal investment law for the encouragement of private investment both for domestic and foreign;
- Strengthening and enhancing institutional support for the export sector through strengthening or revitalizing existing institutions and establishing new institutions

1.9.1 An Overview Recent Economic Performance

Ethiopian economy witnessed a broad based and sustainable growth over since 1992/93, especially for the past four years owing to the large scale efforts undertaken by the government in the frontiers of infrastructure, agriculture, rural development and poverty alleviation programs and investments in spite of the favourable weather condition prevailed. In line with this an average real GDP growth rate of 11.8 percent has been registered during the period EFY 1996-EFY 1999. The estimated real GDP growth attained in EFY 1998 stood at 10.6 percent with the agricultural and service sectors registered 11.2 and 9.2 percents growth respectively while industry observed 7.4 percent.

Owing to the boom in real estate and business activities, hotels and restaurants, financial services and education and health service activities the contribution of the service sector to the overall gross domestic product is constantly increasing averaging its share to 40.4 percent during EFY 1996-1999 while its contribution in EFY 1998 stood at 40.3 trying to balance to the agricultural share. Similarly, the industrial share is also marginally increasing with the booming construction activities. In contrast, the share of agriculture is constantly falling from its level of 56.7 percent in EFY 1989 to 47.3 percent in EFY 1998. This clearly shows that the economy is in a way of transformation or structural change (See Appendix B).

9.1.2 Fiscal Performance

During the fiscal year 2005/06, the Federal Government the overall revenue collection accounted for 89.9 percent of the annual budget, of which the domestic and the grant (Protecting Basic Services (PBS) and Debt Relief) components performed 89.1 and 92.7 percents of their corresponding annual plan respectively. Tax revenue and PBS grant collections contributed much for the better performance of the overall revenue collection as the collection from each sources stood at 93.1 and 109.5 percents of their annual budgets respectively; the contributions of the revenue mobilized from these two sources makes 80.3 percent of the total revenue mobilized. Compared to the previous fiscal year, the overall revenue collection increased 29.9 percent while the percentage increase of domestic and foreign components are 12.0 and 174.4 percents respectively.

Table 1 Federal Government Revenue

In Million Birr

Item	Annual			Difference from		
	2005/06		2004/05	2004/05		
	Budget 2005/06	Actual	In % of the budget	Actual	In Birr	In percent
Total Revenue, Protecting Basic Services (PBS) & Debt Relief	24551	22079	89.9	16993	5086	29.9
Domestic Revenue	18994	16931	89.1	15117	1814	12.0
Tax Revenue	14647	13637	93.1	11304	2334	20.6
<i>Direct Taxes</i>	2858	2785	97.4	2183	602	27.6
<i>Domestic Indirect Taxes</i>	3551	3156	88.9	2534	622	24.5
<i>Foreign Trade Tax</i>	8237	7697	93.4	6587	1110	16.8
None-Tax Revenue	4348	3293	75.7	3813	(520)	(13.6)
PBS & Debt Relief	5557	5149	92.7	1876	3273	174.4
<i>PBS Support</i>	3735	4091	109.5	950	3141	330.7
<i>HIPC & MDRI Relief</i>	1822	1057	58.0	926	131	14.2

Source: MoFED

During the fiscal year under review an increase of 12 percent compared to the level of the same period of the previous fiscal year. Out of the total domestic sources, 61.8 percent constitutes direct and indirect taxes while the rest 14.9 percent is generated from non-tax sources. Improvement is registered in the contribution of tax revenue to the overall domestic revenue mobilization; its share being elevated to 80.5 percent in 2005/06 from 74.8 in 2004/05 while in contrast the share of non-tax revenue in the domestic revenue declined to 19.5 percent in 2005/06 from 25.2 percent in 2004/05 witnessing the impacts of the tax revenue measures to ascertain the source of financing of government budget in sustainable and reliable sources.

Out of the total tax revenue collected, 20.4 percent is mobilized from direct taxes, 23.1 percent and 56.4 percent are from domestic indirect taxes and foreign trade taxes, respectively. The performance of the revenue collection from direct tax, stood at 97.4 percent of its annual budget, which exhibiting an increase 27.6 percent over the level of the preceding fiscal year; showing an immense resurgence. Similarly, domestic indirect tax performing 88.9 percent of its annual budget showed an increase of 24.5 percent over the level the previous fiscal year; significantly contributing to the under performance of the overall tax revenue collection. With regard to foreign trade tax, the performance stood at 93.4 percent of its annual budget and showed a significant increase of 16.8 percent compared to the level of the same period of the previous fiscal year.

The non-tax revenue performance, for the period under review, stood at 75.7 percent of the budgeted amount and declined by 13.6 percent compared to the level of the same period of the previous fiscal year.

During the period under review a considerable amount of foreign grant in the form of PBS support and HIPC relief has been secured with the PBS component over performing of its budgeted amount while a significant shortfall is observed in the HIPC component.

1.10 Organization of the Paper

The rest of the paper is organized as follows. Section two of this study deals with literature review on the historical development from General Agreement on Trade and Tariff (GATT) to WTO and relationship of GATT/WTO and trade liberalization, development of the Computable general equilibrium (CGE) model and some empirical analysis regarding the trade liberalization and its impact on the government tax revenue. Moreover, assessing the effect of trade liberalization specifically reduction of tariff barriers on the Aggregate saving, consumption and income of the country. It also discusses possibilities of compensating the tariff loss from the domestic indirect tax. Section three explains specification of the simple 1-2-3 CGE model. Section four reports the empirical result of the model. Section five conclusion and recommendations. Finally describe reference and appendices.

CHAPTER TWO

2. LITERATURE REVIEW

In the following review of the literature, I first discussed some point on the historical development of trade reform from General Agreement on Trade and tariff (GATTs) to World Trade Organization (WTO) and basic some rules and disciplines. Second assess the impact on the economic performance of membership countries in the WTO. Third, analyse the impact of trade liberalization on the government tax revenue, current account balance and other variables. Moreover, the tool that is chosen in this particular study is a simple Computable General Equilibrium (CGE) model. I had to discuss the theoretical foundations, nature, type and application of the model. Lastly, I consider the measurement and analysis of the government tax revenue with in the simple general equilibrium model that is 1-2-3 Computable General equilibrium Model framework. Though attempt is made to consider a wide range of issue in the review, it is by no means exhaustive, and time and space constraints allowed focus only on a few important and relevant issues on each subject. In all the sub section the available empirical evidence is presented along with the theoretical framework when appropriate.

2.1 Historical development from GATT to WTO and Some basic rules and disciplines.

2.1.1 Historical development of WTO

The idea of founding an international organization to develop and coordinate international trade was put forward in the 1994 at a conference on economic matters held in Bertton Woods. After the founding of the United Nation (UN) in 1945, multilateral trade negotiations were conducted with in the framework of the UN Economic and Social Council, which in 1946 adopted a resolution in favour of forming an International Trade Organization (ITO).

After the failure of ITO the General Agreement on Tariff and Trade (GATTs) evolved into an international organization. GATTs obligations lower tariff by limiting tariff charges to those agreed in the Schedules of Concessions (Article II) and giving the benefit of these concessions to all GATT contracting parties. As shown in table 2 there are eight GATTs negotiation rounds of multilateral trade negotiations. These rounds were held periodically to reduced tariff and other barriers to international trade and were increasingly complex and ambitions. All were successful. The principal accomplishment of the GATT was its success in reducing tariff and other trade barriers on worldwide basis.

The various negotiations rounds were named after the place in which the negotiations began or the name of the person associated with initiating the

round. The name, date and number of participating countries are listed in the table below.

Table2. GATT negotiation round

Place	Date	Number of countries
Geneva	1947	23
Annecy	1949	33
Torquay	1950	34
Geneva	1956	22
Dillon	1960-61	45
Kennedy	1962-67	48
Tokyo	1973-79	99
Uruguay	1986-94	125

Source: World Trade Organization (WTO).

The objectives of the early GATT negotiation rounds are primarily to reduce tariffs. Non-tariff barriers emerged as a vital concern as well. Especially the main objective of the Tokyo and Uruguay round were primarily to reduce non-tariff barriers and increasing the participation of developing countries for the first time.

The Uruguay round culminated in the creation of an immense new body of international law related to trade. Furthermore, the final act signed in Marrakesh, Morocco on 15 April 1994, of the Uruguay Round transformed the GATT in to the fully fledged International organization called World Trade organization would come in to being on 1 January

1995. WTO is now in the midst of the complex Doha round which was expected to complete in 2007 but it is not (Matsushita et., al.. 2006)

2.1.2 Some of the Basic Rules and Disciplines of GATT/ WTO

The implications of the WTO can be divided into four parts: the three multilateral agreements (GATT, the GATS, and the TRIPs agreement), and their enforcement through consultation, transparency and dispute settlement mechanisms. The three substantive agreements have both institutional and policy implications (Hoekman and Kostecki, 1995).

The GATT requires that trade policies and their implementation must be non discriminatory. The use of quantitative restrictions (QRs) is in principle prohibited. Governments are subject to requirements relating to reduction of support granted to agricultural production, and export subsidies, if any. Developing countries that have a per-capita GNP above U.S. \$1000 become subject to GATT's prohibition on the export subsidies. All trade-related investment measures (TRIMs) such as local content requirements that violate GATT's national treatment principle or its prohibition on QRs must be removed. The WTO's rules relating to product standards and sanitary/phyto-sanitary measures require that new regulations and conformity assessment procedures be based on international standards. The basis for customs valuation is to be the importer's invoice (transactions value).

Under the GATS, nondiscrimination principles also extend to measures affecting trade in services. While MFN is a general obligation, the sectoral coverage of national treatment and market access obligations is determined by country schedules. Six types of market access restrictions are in principle prohibited under GATS. These consist of limitations on: (i) the number of service suppliers allowed, (ii) the value of transactions or assets, (iii) the total quantity of service output, (iv) the number of natural persons that may be employed, (v) the type of legal entity through which a service supplier is permitted to supply a service (e.g., branches vs. subsidiaries for banking), and (vi) participation of foreign capital in terms of a maximum percentage limit of foreign shareholding or the absolute value of foreign investment. National treatment is defined as treatment no less favourable than that accorded to like domestic services and service providers. Each GATS Member decides which service sectors will be subject to market access and national treatment disciplines, and what measures will be kept in place for that sector that violate market access and/or national treatment, respectively (Matsushita et., al., 2006)

The TRIPs agreement requires WTO members to protect six types of intellectual property, including trademarks (to last at least 7 years; equal treatment to be given to service and trade marks; prohibition on compulsory licensing), geographical indications (prohibition on indications that mislead or constitute 'unfair' competition), industrial designs (duration of protection of new and original designs to be at least 10 years; no protection required for designs dictated essentially by technical or

functional considerations), and layout designs of integrated circuits (duration of protection at least ten years; protection to extend to products embodying layout design infringements; allowance of compulsory licensing). In the area of copyright, Members are required to comply with most of the substantive provisions of the Berne Convention (1971). Computer software is to be protected as a literary work under the Berne Convention. Copyright protection is to last for at least 50 years. Criminal procedures and penalties are to be applicable to copyright abuses on a commercial scale. Last but not least, countries must comply with the substantive provisions of the Paris Convention (1967) on patents. Patent protection is to be provided for almost all inventions, and is to be of at least 20 years duration after the date of filing.

Members must ensure that enforcement procedures are available under their national laws that permit effective action against any act of infringement of intellectual property rights. There are provisions on evidence supporting claims of violation of intellectual property rights, injunctions, damages, right of information, indemnification of defendants, and existence of effective provisional measures to prevent an infringement of any intellectual property right from occurring, and procedures to enable right holders suspecting the importation of counterfeit trademark or pirated copyright goods to lodge an application for the suspension of importation. Penalties in cases of willful trademark counterfeiting or copyright piracy on a commercial scale must include imprisonment and/or fines sufficiently large to constitute an effective deterrent.

In addition to substantive obligations, there are many notification and other transparency requirements, all of which require the existence of appropriate bodies or agencies that have the responsibility of satisfying them. All state trading enterprises must be notified to the Council for Trade in Goods, independent of whether or not imports or exports occurred. The introduction of or any changes in the import restrictions justified for balance-of-payments purposes, or any changes in the time schedules for the removal of such measures must be reported to the WTO. A consolidated notification, including all changes in laws, regulations, policy statements or public notices, must be provided each year. All changes in sanitary or phytosanitary measures must be notified. Technical regulations whether sanitary or product standards more generally that diverge from international standards and have a potential significant effect on trade flows must be notified, with the added requirement of indicating the objective and rationale of the proposed regulation. The same applies to conformity assessment procedures that are not in accordance with relevant guides and recommendations issued by international standardizing bodies. Technical regulations of local governments on the level directly below that of the central government that diverge from international standards must also be notified. Members which maintain import licensing procedures or change them must notify the relevant Committee within sixty days of publication. All subsidy programs must be notified, with adequate information provided to allow

other Members to evaluate their trade effects and to understand their operation.

Enquiry points must be created with the responsibility for answering questions and providing relevant documents regarding sanitary or phytosanitary measures adopted or proposed; control and inspection procedures, production and quarantine treatment, pesticide tolerance and food additive approval procedures. An enquiry point must also exist to deal with similar questions regarding technical regulations and conformity assessment procedures for products which are operated within the territory of a Member by central or local government bodies. Yet another enquiry point must provide specific information to WTO Members, upon request, on all relevant measures of general application which pertain to or affect the operation of the GATS (Matsushita et., al., 2006).

There are many requirements concerning the procedures to be followed with respect to the imposition of contingent protection like, safeguards, countervailing subsidized imports and antidumping .Space constraints prohibit even a summary, but the implications for the institutions that implement such mechanisms are significant. Technically, competent and trained personnel are required to administer the relevant laws. Methodise and manuals should be developed to ensure consistent application and interpretation of legal provisions and the various substantive criteria that must be satisfied. Measures relating to qualification requirements and procedures, technical standards and licensing requirements may not

unnecessarily restrict trade in services and should be based on objective and transparent criteria, such as competence and the ability to supply the service; and not be more burdensome than necessary to ensure the quality of the service.

2.2 Impact of trade liberalization on the tax revenue and other macro economic variables

A key concern about trade liberalization is that it will reduce government revenue. The share of trade taxes in total revenue is negatively associated with the level of economic development, with many low-income countries earning half or more of their revenue from trade taxes. This reliance may reflect various factors, including difficulties in administering a tax system effectively and the relatively small share of the formal sector (Ebrill, Stotsky, and Gropp 1999). Neil McCulloch, L. Alan Winters, and Xavier Cirera (2001) show that, of the 96 countries for which these data are available over 1994–96, 58 report a share exceeding 5 percent, with an unweighted average of 20.3 percent, and sixteen countries report a share of over 25 percent.

Neither theory nor evidence suggests a simple link between trade reform and revenues, however. Theoretically, a number of factors are important (David Greenaway and Chris Milner 1991). In the case of tariffs, revenue will increase with liberalization if the initial tariff level exceeds its revenue

maximising level. It can also increase in the many instances where reforms involve the replacement of quantitative restrictions by tariffs, provided, as is usual, that the government did not previously capture the quota rent associated with the restriction. Rod Falvey (1994) shows that a welfare-improving revenue-enhancing tariff reform will always exist unless the compensated radial elasticities of all goods are the same which is highly unlikely in practice given that tariffs reflect protective as well as revenue-raising motives. However, designing such a package is well beyond most governments (Sebastian Edwards 1997), especially since short and long-run responses may differ (David Bevan 2000). And, of course, once the condition is approximately met, reductions in tariff rates will cut revenues.

Improvements in collection efficiency can also increase revenue. Official ad valorem tariff rates are often substantially higher than the ratio of tariff revenue to import values of collected rates. Lant Pritchett and Geeta Sethi (1994) find for a sample of developing countries that official rates and collected rates are only weakly correlated, and that the divergence between them increases with the level of the official tariff. Evasion and exemptions are the key factors here, and tightening them up can yield substantial revenue gains. For instance, according to official estimates, the revenue foregone via tariff exemptions in Tanzania in 1986 was almost equivalent to total revenue collected (Greenaway and Milner 1991). Trade reforms that simplify tariff structures also often have favourable revenue effects by simplifying administration and reducing opportunities and incentives for evasion which of course are also reduced by lower levels of tariffs. This is

one of the main practical motivations behind proposals for uniform tariff rates.

Turning to the empirical evidence, Greenaway and Milner (1991) focus on five countries which received World Bank Structural Adjustment Loans (SALs) requiring important trade policy reforms. Three of these countries experienced revenue enhancement (Mauritius, Kenya, and Jamaica) and two revenue depletion (Morocco and Côte d'Ivoire). The authors identify a number of clues as to why. First, revenue tends to fall if the existing tariffs are below the revenue maximising rate as in Morocco and Côte d'Ivoire, but not in the other three countries. Second, in all the revenue enhancing cases, some kind of temporary tariff surcharge was introduced when quantitative restrictions were removed; in the revenue depleting cases no such taxes were introduced. Third, the induced changes in the import/export base appear to have been important, particularly in the case of Mauritius. And finally, of the two cases where export incentives were planned, the Mauritian reforms were successful because they were administratively simple, funded by the introduction of other nontrade taxes, and the exchange rate was allowed to depreciate. In the other case—Côte d'Ivoire—none of these conditions applied and the reforms failed. The revenue enhancing cases also involved significant changes in tariff exemption arrangements but this was also at least formally true of the revenue depleting cases.

Liam Ebrill, Janet Stotsky, and Reint Gropp (1999) draw a similar set of lessons from detailed studies of trade liberalization in Argentina, Malawi, Morocco, the Philippines, Poland, and Senegal. Furthermore, in a cross country panel regression they found that countries that reduced tariffs over the period 1980–92 did not have significantly lower revenue from import tariffs as a proportion of GDP than those that did not. On the other hand, those which dismantled quantitative restrictions did have significantly higher revenue from import tariffs as a proportion of GDP than those that did not.

Khattry and Rao (2002), using a raw Government Financial Statistics (GFS) data examine the extent to which trade tax revenue have been replaced from other source, but do so in the form of tabulations. These lead them to some what pessimistic conclusions as to the extent to which trade tax revenue have indeed been recovered, especially in low income countries but these conclusions, being based on simple correlations, might simply reflecting a failure to condition on change in other variables tending to be associated with lower tax revenues from other sources.

Thomas Baunsguard and Micheal Keen (2004) analyse for the high income countries and low income countries over the last 25 years. The results show that, for high income countries, yes, it is possible to replace lost trade tax revenue by revenue from other sources, for others, no. The middle income countries ultimately lost about 45-65 cent of the total revenue for each dollar of lost trade tax revenue. Low income countries,

more starkly still recover almost nothing; revenue losses from trade liberalization have been permanent of course there are exceptions to these generalization: Jordan , for instant , managed a significant switch away from trade taxes over the 1990s whilst maintaining overall tax revenue broadly constant.

Moreover, the empirical result, there is no systematic evidence , for instant ,that countries with a Value Added Tax (VAT) find it easier to replace trade tax revenue from other sources. There is more to be learned, perhaps from case studies: there are important differences across type of VAT that is not capture by simple VAT. The result suggests that there has in the past been too little coordination between trade liberalization and the strengthening of the domestic tax system.

The trade reforms which have reduced trade tax revenue in developing countries were unwise (Baunsgaard *et.al.*2004). Revenue is clearly not the only policy concern and indeed it is possible that indirect effects operating through higher level of income and openness associated with trade reforms have more than offset the direct loss of revenue. From the perspective of fiscal prudence, however, the results do suggest that revenue problem to be faced in taking forward liberalization in a serious one, which has received too little attention from analysts and policy makers alike (Baunsgaard *et.al.*2004).

Yitzhaki and Slemrod (1991) made insight use of the concentration curves in the realm of public economics to analyse issue of tax reform. It is

becoming rather conventional in the literature to look at the structure of indirect tax systems, and the possibility –welfare function of the community subject to government revenue constraint.

Due to the loss of revenue the total domestic saving was far below the level of investment, and this resulted in a government deficit of 10 percent of the GDP per annum in the last decades (Geda 2005). The deficit also pointed to the country's dependence on external resource in bridging its resource gap. This is more obvious in the financing of the government capital expenditure than any where else, current expenditure is largely financed by government revenue which is a positive development (Geda 2005).

In Africa, where trade taxes are still higher compared to the rest of the world, countries like Ghana, Nigeria, Tanzania and Zaire have recently started to liberalize their trade policies. Ebrill, Stotsky and Gropp (1999) report that in a group of selected developing countries in Africa, trade taxes account for about 5.5 percent of GDP on average in 1995. Keen and Lightart (1999) reveal that tariff revenue accounts for approximately 27 percent of the total tax revenue in Africa, and Matusz and Tarr (1999) report that explicit trade taxes account for 38 percent (19 percent) of total revenues in low (middle) income countries. According to Evenett and Madani (2000), as a consequence of this heavy reliance on trade taxation, “certain developing countries have postponed, slowed or reversed trade

liberalization measures on the grounds that losses in trade tax revenues undermine their government's budget constraint.”

Although the most recent round of trade talks in Doha, Qatar, were brought to a standstill in the fall of 2003, recently all participants showed interest to carry on with promises to liberalize trade further. There are high expectations from this liberalization process. The cost of raising revenue through domestic taxes is very high in developing countries such as African countries. The lack of necessary infrastructure to monitor, administer and collect domestic taxes makes it easier to rely on tariffs.

Anderson's (1999) study by investigating in more depth the Marginal Cost of Funds (MCF) calculations for distortion taxation. MCF for any tax increase is given by the ratio of the incremental compensation, which is required to maintain real income to the incremental tax revenue. After finding the MCF for two different types of taxes, a revenue neutral shift from the tax with high MCF to the tax with low MCF is welfare improving.

Clarete and Whalley (1987) find that, at the margin, trade taxes have considerably higher distortionary costs per unit of tax revenue raised. According to the theoretical paper of Keen and Lightart (1999), combining any tariff cut with a consumption tax reform, which leaves the consumer prices unchanged, increases both welfare and public revenue. Tariff

reforms are favourable in the context of coordinated tariff-tax packages. Rajaram (1994) examines whether the revenue effects of tariff reform proposals of the World Bank were anticipated and complemented by other tax measures. He finds out that in many cases they are neither anticipated, nor complemented. Abed (1998) stresses the link between trade liberalization and domestic tax reform and details the types of tax reforms that would support trade reform by generating the compensatory revenue and, in the long run, reduce the distortionary effects of tax and tariff systems. Findings in outcome of these studies suggest the necessity for further investigation.

Devarajan, Squire and Suthiwart-Narueput (1995) stress the usefulness of MCF, especially for projects that are characterized by public costs and private benefits. Other papers by Mayshar (1991) and Allgood and Snow (1998) try to define the different methods of calculating MCF estimates and explain the wide discrepancy between the estimates in the literature. Devarajan, Thierfelder and Suthiwart-Narueput (2000) argue, “if the MCF across different tax instruments varies greatly, directions for revenue-neutral tax reform are readily apparent”. They provide MCF estimates for three developing countries – Cameroon, Bangladesh and Indonesia, and conclude that “the potential for revenue-neutral (or even revenue-increasing) tax reforms in developing countries is enormous.” They claim that MCF analysis provides the necessary groundwork for tax reform efforts.

The results of the empirical part of Erbil (2004) indicate that for 26 out of 32 countries investigated in his study, trade taxes are the “more expensive” distortion. In other words, a tariff cut, financed by raising the indirect taxes to compensate the government for the lost tariff revenue, would be welfare increasing. The relevant policy recommendation that emerges from these results is that there is still a strong potential for many countries to liberalize their trade. This would not only satisfy international organizations that advocate for freer trade, but also be welfare improving for the liberalizing country.

Detailed individual country studies bear all this out. Graham Glenday (2000), for example, examines the impact of Kenyan trade liberalization of the country for the year 1989–99 on import duty revenue. The simple average import duty rate was approximately halved over this period and import licensing requirements and foreign exchange controls were abolished. However, duty as a share of imports rose, as did import duty revenues as a proportion of GDP. The expansion of the revenue base appears to have been an important factor here, along with tighter exemption management, increased duty rates on oil products and certain agricultural commodities, and a shift in imports towards high duty classes. However, improvements in customs administration and the introduction of a pre-shipment inspection program could also have accounted for some of the improvement.

The first response is to seek alternative non-trade sources of revenue. Clearly the impact of replacement taxes upon the poor depends on the choice of fiscal instrument, and in general there is no economic reason why the burden should fall on the poorest.

Nonetheless, both the evidence and common sense suggest caution, particularly where simple low cost trade tax instruments are replaced by more complex and higher cost domestic ones. Some CGE models suggest that the welfare significance of tariff revenue losses depends on the nature of the replacement taxes introduced (Denise Konan and Keith Maskus 2000, and Harrison, Rutherford, and Tarr 2002). But there is little ex post evidence on these issues.

The alternative response to a fall in revenue is to cut public expenditure. There is a large literature describing the effects of structural adjustment in developing countries on poverty and the impact felt via public expenditure and social sector expenditure in particular. But the evidence for adjustment resulting in cuts in social expenditure is mixed at best (Jacques van der Gaag 1991; David Sahn 1992). While there have been major declines in social expenditure in some countries, the consensus is that social expenditures have been relatively protected, especially compared with capital expenditures. Van der Gaag (1991) examines spending in the three years before and after donor financed adjustment programmes began, and finds no pattern of increase or decrease in real levels of total and social sector expenditures. Similarly, David Sahn, Paul Dorosh, and Stephen Younger (1999) argue that, except in a very few

cases, those declines in social expenditure that have occurred have not been “part of an extended attempt to balance the government’s fiscal position.”

The East Asian crisis—a shock far greater than any trade shock—also provides evidence that, with political will and careful planning, social sector spending can be protected. World Bank (2001) reports Korea’s large expansion of social spending in the face of the crisis, while Lisa Cameron (2002) reports the success of Indonesia’s targeted scholarships at keeping up school enrolments in the face of declining incomes. There is strong evidence that social expenditures in many developing countries are not well targeted to the poor (Florencia Castro-Leal et al. 1999), and Peter Lanjouw and Martin Ravallion (1999) show how some schooling and anti-poverty programmes in India are captured by the non poor. However, this does not necessarily mean that cuts on social expenditures have less impact upon the poor; in fact conventional methods for assessing benefit incidence can underestimate the gains to the poor from higher public outlays and underestimate the losses from cuts (Lanjouw and Ravallion 1999). Thus there are latent dangers even in the absence of direct evidence.

A number of empirical cross-country studies by Dollar (1992), Ben-David (1993), Sachs and Warner (1995), Edwards (1998), and Frankel and Romer (1999) that indicate that trade openness is associated with more rapid economic growth. However, the debate about a positive empirical

association between trade openness and economic growth remains far from settled. In spite of the recent movement towards trade reforms for most developing countries, there remain some major controversies regarding certain aspects of trade and development policies. One major issue is the fact that, until recently, theoretical models had been unable to link trade policy to faster equilibrium growth. Second, despite these theoretical advances, the quality of empirical results is influenced by data problems. Rodriguez and Rodrik (1999) also argue that the empirical literature does not consistently and reliably demonstrate a positive link between trade liberalization and economic growth. Their primary concern is that the empirical studies have not adequately controlled for instrumental variables representing other economic policies. In certain cases, plausible control variables may have been omitted. Levine and Renelt (1992) similarly critique that such policies may be correlated with growth. Third, there is an ongoing debate on the merits and nature of further trade liberalization toward development.

On the one hand, international organizations, including the WTO, support rapid and sweeping liberalization. The appeal of opening up to global markets is based on the simple premise that economic integration will improve economic performance. As developing countries, in particular, open up to international trade, and build the necessary capacity to effectively negotiate within the established rules of the WTO, the expectation is that trade would be enhanced and economic growth will increase. This in turn will reduce poverty and improve the standard of

living for the majority of residents of those countries. There are a number of recent empirical studies that deal with the determinants

2.3 Computable General Equilibrium Model

Even though the first applied Computable General Equilibrium (CGE) model was formulated by Johanson in 1960, its theoretical foundation dates back much farther. The theoretical framework of general equilibrium models, Declauwe *et.al.*, (1988) and note is that that of the general system of L.walars (1926).

In 1936 Wald provided a proof of the existence of static market equilibrium under perfect competition. Following that in 1940s and 1950s some work has been done to develop the proof of existence, uniqueness, optimality and stability of equilibrium under general equilibrium conditions.

As a very nice summary on the theoretical development of the CGE model by Wobst (2000) revealed, after Johansen's linear approximation in 1960, much work in the period focused around developing the theoretical proof concerning the general equilibrium model. This was, however, until Scarf (1967) developed another approach in solving general equilibrium models by developing a fixed-point algorithm capable of solving a nonlinear CGE equation system directly, without a prior linear approximation. This approach, known as Scarf algorithm, was based on specifying an excess

demand system characterized by non negative solution of price. With its finite convergence properties, the algorithm guaranteed a solution for a wide variety of CGE model in a finite number of steps. Nevertheless this partial algorithm has some limitations in that it does not typically converge quickly and found to be computationally inefficient for little complicated models.

In the 1970 two other direct approaches became to be employed to solve nonlinear, empirical, general equilibrium model. The first method was a walrassian process in which sectoral price change iteratively as a function of the sectoral excess demand. The second approach also treats the general equilibrium model as a system of algebraic constraint, but uses the matrix of the first partial derivation, the Jacobian matrix.

The model which used in this paper that is the 1-2-3 CGE model is different from the standard model with all goods tradable and all tradable perfect substitution with domestic goods Taylor (1975). Empirical model that reflect these assumptions embody "the law of one price," which states that domestic relative prices of tradables are set by world prices. Such models tend to yield extreme specialization in production and unrealistic swings in domestic relative prices in response to changes in trade policy or world prices. Empirical evidence indicates that changes in the prices of imports and exports are only partially transmitted to the prices of domestic goods. In addition, such models cannot exhibit two-way trade in any sector, which is often observed at fine levels of disaggregation.

Recognizing these problems, Salter (1959) and Swan (1960) specified a two-sector model distinguishing "tradables" (including both imports and exports) and "nontradables." Their approach represented an advance and the papers started an active theoretical literature. However, they had little impact on empirical work. Even in an input-output table with over five hundred sectors, there are very few sectors which are purely non-traded; i.e., with no exports or imports. So defined, non-traded goods are a very small share of GDP; and, in models with ten to thirty sectors, there would be at most only one or two non-traded sectors. Furthermore, the link between domestic and world prices in the Salter-Swan model does not depend on the trade share, only on whether or not the sector is tradable. If a good is tradable, regardless of how small is the trade share, the domestic price will be set by the world price.

De Melo and Robinson (1985) show, in a partial equilibrium framework, that the link between domestic and world prices, assuming imperfect substitutability at the sectoral level, depends critically on the trade shares, for both exports and imports, as well as on elasticity values. For given substitution and transformation elasticities, the domestic price is more closely linked to the world price in a given sector the greater are export and import shares. In multisector models, the effect of this specification is a realistic insulation of the domestic price system from changes in world prices. The links are there, but they are not nearly as strong as in the standard neoclassical trade model. Also, the model

naturally accommodates two-way trade, since exports, imports, and domestic goods in the same sector are all distinct.

De Melo and Robinson (1989) analyze the properties of this model in some detail and argue that it is a good stylization of most recent singlecountry, trade-focused, computable general equilibrium (CGE) models. Product differentiation on both the import and export sides is very appealing for applied models, especially at the levels of aggregation typically used. The specification is a faithful extension of the Salter-Swan model and gives rise to normally shaped offer curves.

Devarajan and Go (1993) present a dynamic version of the 1-2-3 framework in which producer and consumer decisions are both intra- and intertemporally consistent. All these extensions require that the model be solved numerically. We turn therefore to the numerical implementation of the 1-2-3 model, extending the basic 1-2-3 model to include the government sector in order to look at policy instruments such as taxes.

CHAPTER THREE

3. MODEL SPECIFICATIONS

This chapter has three sections. In the first section is devoted to the description of analytical framework of the simple computable general equilibrium model used in the study. The second section specification of the system of equations is calibration of the model.

3.1 Analytical Framework of the Model

The framework of a CGE model is made up of an analytically consistent mathematical model of the whole economy. The theoretical base rests on the initial work of Walras (1874) and the existence proof of Arrow and Debreu (1954), elaborated on in Arrow and Hahn (1971). The model structure incorporates explicitly stated equations or “functional forms” that describe the behaviour of all parts of the economy, and the interdependencies and feedback effects between the different sectors. Drawn from established economic theory, these functional forms represent the key characteristics of the economy. Typically they allow for substitution between inputs in production and outputs in consumption, the elasticity being either “hard-wired” in the model or a choice variable for the modeller. The exact choice of model structure is driven by the precise purpose of the model. This will determine issues such as the level of sectoral aggregation, the precise functional form specification and the treatment of the external sector (i.e. how the model accounts for trade and transfers between economies).

Furthermore, the analytical framework of the 1-2-3 model that is extended version with government and investment is presented in Devarajan, Lewis and Robinson (1990), Devarajan, Lewis and Robinson (1993), Devarajan et al (1997) and Devarajan and Go (2000). This model refers to one country with two producing sectors and three goods. The two commodities that the country produces are the first one is an export good, E which is sold to foreigners and is not demanded domestically. And second a domestic good, D, which is only sold domestically. The third good is an import, M, which is not produced domestically. The country is small in world markets, facing fixed world price for export and import (Devarajan *et.al.*, 1994). Some of its basic characteristics and assumptions of the model are the following:

- The model has four actors: a producer, a household, the government and the rest of the world.
- It is a static model for a given growth rate of the economy with no intertemporal elements.
- The model identifies an equilibrium relationship between the real exchange rate and the balance of trade, which is fixed exogenously.
- The model contains no monetary elements and any solution to the system depends only on relative prices (it is a “real” model).
- The model takes the two factors of production (capital and labor) as constant, and it doesn’t consider any imported or domestic intermediate goods.

- The domestic and export goods are imperfect substitutes.
- The output of the domestic good is an imperfect substitute for imports in consumption.
- World prices of exports and imports are fixed exogenously (small country assumption equivalent to price takers).
- Aggregate production is fixed, which is equivalent to assuming full employment of all primary factor inputs.
- The model takes the two factors of production (capital and labor) as constant, and it doesn't consider any imported or domestic intermediate goods.
- The domestic and export goods are imperfect substitutes.
- The output of the domestic good is an imperfect substitute for imports in consumption.
- World prices of exports and imports are fixed exogenously (small country assumption equivalent to price takers).
- Aggregate production is fixed, which is equivalent to assuming full employment of all primary factor inputs.

3.2 Specification of the Equations

The specification of the equation system in this model is described as follows and it is presented in Appendix A.

Equations (1) define the domestic production possibility frontier, which give the maximum achievable combination of exported goods E and sold

domestically D that the country can supply. The function is assumed to be concave and will be specified as a constant elasticity of transformation (CET) function with transformation elasticity Ω . The constant X defines aggregated production and fixed. Since there are no intermediate inputs, X also corresponds to the real GDP. The assumption that X is fixed is equivalent to assumption of full employment of the primary factor inputs.

Equation (4) gives the efficient ratio of export to domestic output (E/D) as a function of relative price.

Equation (13) defines the price of composite commodity and is the cost function dual to the first order condition equation (4). the composite good price p^x corresponds to the GDP deflator.

Equation (2) defines a composite commodity made up of sold domestically D and imported goods M which is consumed by the single consumer. Consumers maximize utility, which is equivalent to maximizing Q (supply of composite good) in this model.

Equation (5) gives the desired ration of M to D as a function of relative price.

Equation (14) defines the price of the composite commodity. It is the cost function dual to the first order condition underlying equation (5). The price p^q corresponds to an aggregate consumer price or cost of living index.

Equation (3) defines household demand for the composite good. Equation (3) stand for the more complex system of expenditure equation found in multisector model and reflects an important property of all expenditure

systems: The value of the goods demanded must equal to aggregate expenditure.

Equation (7) determines household income.

As it is described in appendix A the price equations define relationships among the seven prices. There are fixed world price for export E and import M ; The price of the domestic good D ; and the price for the two composite commodities X and Q .

Equations (16), (17), (18), (19), and (20) define the market clearing equilibrium conditions. Supply must equal demand for D and Q , saving must equal investment and the balance of trade constraint must be satisfied. In this setup four tax instruments are included: an import tariff t^m , an export subsidy t^e , an indirect tax on domestic sales t^s , and a direct tax rate t^y . The single household save a fixed fraction of its income. Public saving (budget deficit or surplus) is the balance of tax revenue plus foreign grants and government expenditure (all exogenous) such as government consumption and transfers to household.

The current account balance, taken to represent foreign saving, is the residual of import less exports at world price, adjusted for grants and remittance from abroad. Foreign saving is fixed so that the model has twenty equations and nineteen endogenous variables. By the Walras law¹, however one of the equations, say the saving investment identity is implied by the other and may be dropped.

¹ Walarss law says that id there are N equations and if the $N-1$ equations are in equilibrium then the N^{th} Equation also in equilibrium

CHAPTER FOUR

4. ANALYSIS AND RUSALTS

The experiment system was shocked with three different scenarios that is reduction in the tariff 25%, 50% and total elimination of the tariff rate. Before the application of the tariff shock in the model the value for the benchmark that is the base year value is exactly equal with the value of the experimental that is the simulation result after the tariff reduction. And the recent age change of these two different value are zero (see table 3)². This enables us to show what happened after the tariff shock is applied in the model.

Table 3. Simulation result of the model before tariff reduction

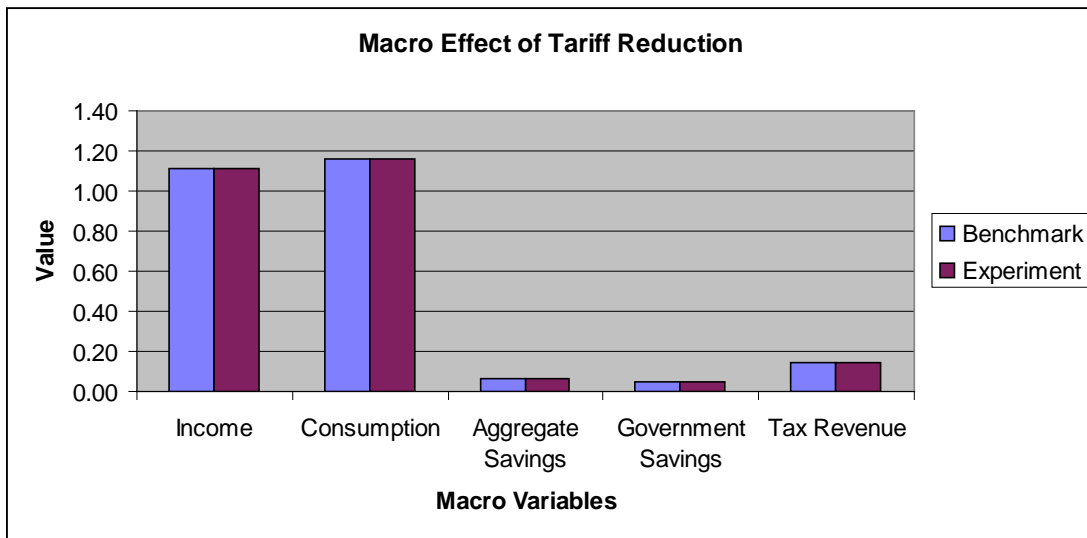
Macro variables	Benchmark	Experiment	% change
Income	1.11	1.11	0
Consumption	1.16	1.16	0
Aggregate Savings	0.07	0.07	0
Government Savings	0.05	0.05	0
Tax Revenue	0.14	0.14	0

Source: Simulation result of the model.

The figures also show that the value of before and after the shock have the same length that is exactly the same.

² Percentage change between the benchmark value and the experimental value is give by
 $\text{Experimental value} / \text{benchmark value} * 100 - 1$

Figure1. Before the simulation result



The simulation results after imposing the tariff rate are presented as follows for the three different scenarios.

Scenario one

In the first simulation a reduction of the 25 % of the tariff rate shock was run to test the revenue or fiscal implication of the alternative tariff regime in Ethiopia. In this revised tariff rate the result of the government revenue and other variables are shown in the table 4. Under the reduction of a 25% of the tariff rate, Ethiopia government total tax decrease by 10%. In addition to the decline of the total tax revenue, government saving and aggregate saving of the country also decline by 25 % and 18 % respectively as the consequence of reducing the tariff rate by 25%.

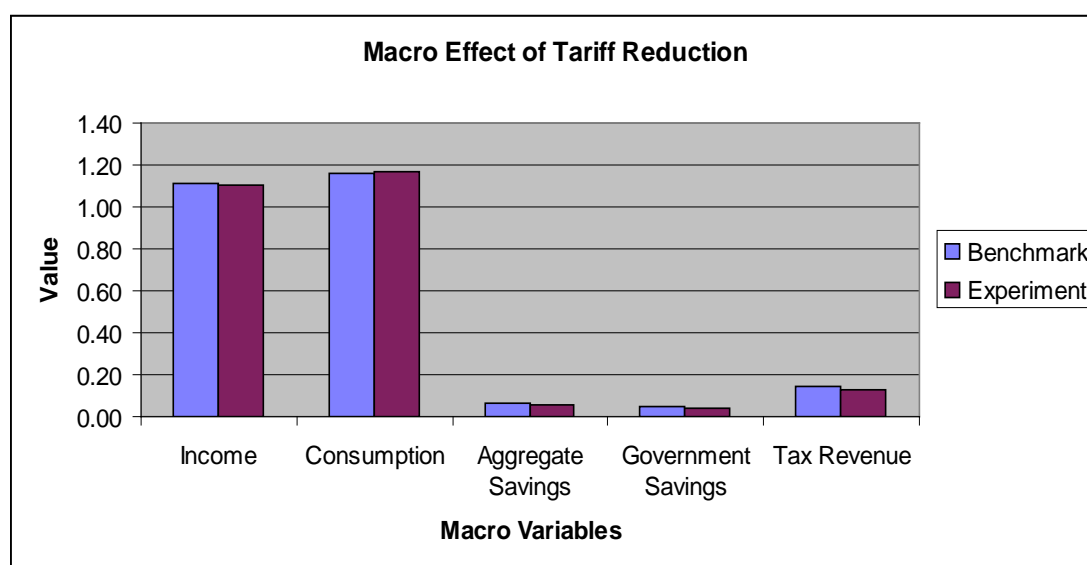
Table 4. Simulation result of the model in Scenario one

Macro variables	Benchmark	Experiment	% change
Income	1.11	1.10	-1
Consumption	1.16	1.17	1
Aggregate Savings	0.07	0.05	-18
Government Savings	0.05	0.04	-25
Tax Revenue	0.14	0.13	-10

Source: simulation result of the model.

The figure below also show the level of the benchmark and the experiment out put of the model. The bar graph below show that the benchmark value of income aggregate saving, government saving and tax revenue are high than the experimental value. But the value of the benchmark of Consumption is low than the experimental value that is to indicate an improvement of the consumption level due to the reduction of the tariff.

Figure.2. the simulation result of the model when tariff reduce by 50%



Scenario two

The result of the analysis of the second scenario suggested that is the reduction of the tariff rate by 50% in Ethiopia, leads to the reduction of the tax revenue, government saving, aggregate saving. However, the reduction of the tariff rate affect the income level of the country positively as it is indicated in the table 5.

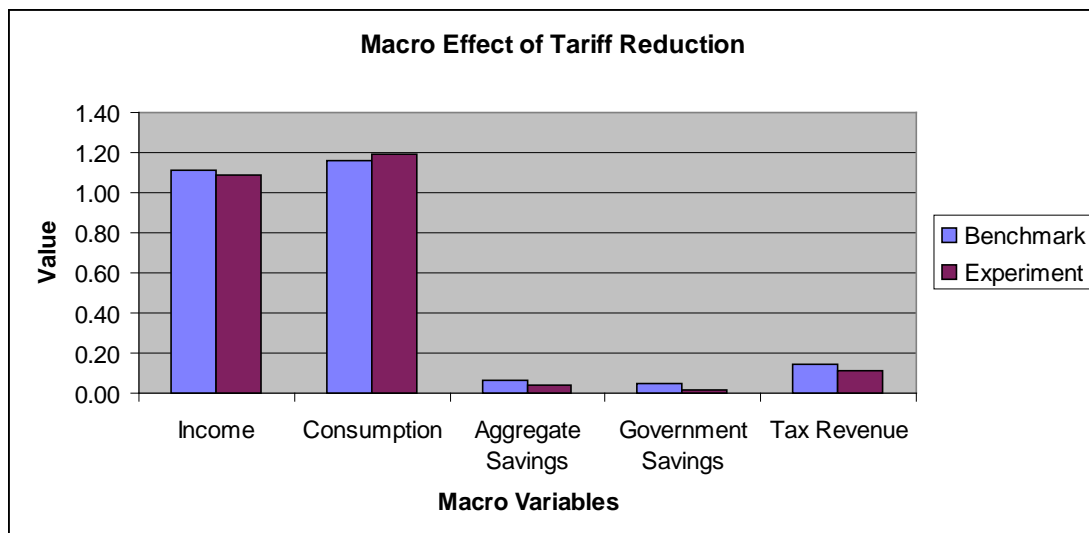
Table 5. Simulation result of the model in second scenario

Macro variables	Benchmark	Experiment	% change
Income	1.11	1.09	-2
Consumption	1.16	1.19	3
Aggregate Savings	0.07	0.04	-44
Government Savings	0.05	0.02	-62
Tax Revenue	0.14	0.11	-25

Source: simulation result of the model.

From the bar graph it is also possible to observe the effect of the tariff reduction on the different macro economic variables.

Figure.3. the simulation result of the model second scenario



Scenario three

The third scenario of this paper that is analyse the effect total elimination of tariff rate on the tax revenue and other macro economic variables. The simulation result of the simple CDE model when the shock is total elimination of tariff rate, is will affect negatively the tax revenue, government saving and aggregate saving. The simulation result show that, a 51%, 127% and 90% decrease of tax revenue, government saving and aggregate saving respectively due to a total elimination of tariff rate.

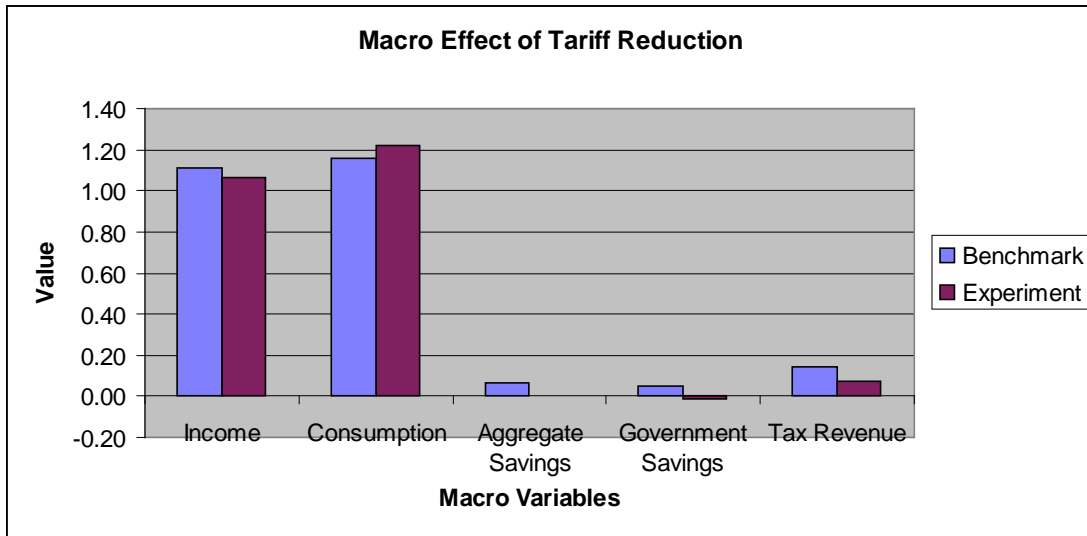
Table 6.Simulation result of the model in third scenario

Macro variables	Benchmark	Experiment	% change
Income	1.11	1.06	-5
Consumption	1.16	1.22	5
Aggregate Savings	0.07	0.01	-90
Government Savings	0.05	-0.01	-127
Tax Revenue	0.14	0.07	-51

Source: Simulation result of the model

The graphical analysis of the third scenario also shows the effect of the total elimination tariff rate on the various macro economic variables comparing the benchmark value and the experimental value of the model.

Figure.3. the simulation result of the model third scenario



Tariffs are a significant source of public revenue in many developing countries. Therefore, the potential revenue loss of tariff reduction in any attempted trade liberalization has to be offset by other revenue source so as to prevent the total tax revenue for the country stable

The simulation result of the simple CGE model that is the reduction of the tariff rate in the three different scenarios effect the total revenue negatively. Hence, the empirical simulation result of the tax coordination between the trade tax revenue and other domestic tax revealed that 14 %, 43%, and 71% increase in domestic tax to compensate the revenue loss due to the reduction of the tariff rate in the three scenarios respectively (see table 7).

Table 7. Coordination of the import tax and domestic tax

Different scenario of tariff reduction	Tax	base year	current year	change in %
25% reduction of tariff rate	Tax Revenue (taxR)	0.21	0.21	0.00
	Indirect Taxes (tsC)	0.07	0.08	0.14
	Import Tariffs (tms)	0.14	0.11	-0.25
50% reduction of tariff rate	Tax Revenue (taxR)	0.21	0.21	0.00
	Indirect Taxes (tsC)	0.07	0.10	0.43
	Import Tariffs (tms)	0.14	0.07	-0.50
Total elimination of tariff rate	Tax Revenue (taxR)	0.21	0.21	0.00
	Indirect Taxes (tsC)	0.07	0.12	0.71
	Import Tariffs (tms)	0.14	0.00	-1.00

Source: the simulation result of the model for tax coordination

CHAPTER FIVE

5. CONCLUSION AND RECOMMENDATION

Trade tax constitutes an important source of government tax revenue for most developing countries. For Ethiopia the trade tax revenue is about 56.4 percent of the tax revenue and 34.8 percent of the total tax revenue. In many cases, a tariff reform can considerably decrease government tax revenue and pose a serious fiscal challenge especially for the least developing countries like Ethiopia. The fiscal impact of tariff reduction depends directly on the size of the tariff cut. The responsiveness of imports to the tax change is relative important of import tariff as a source of government revenue, and indirectly on what happen to the other tax bases. In theory, many studies conveniently offset the revenue loss of the government by a hypothetical lump sum transfer of the adjustment cost from developed countries. However, in practice the transfer of the lump sum adjustment costs from the developed countries do not exist from all countries and even there it is not enough to cover the loss. Lately, the importance of the revenue implication of trade liberalization has been widely acknowledged among economists, especially in international organization such as the World Bank and IMF. Recent policy recommendations that have evolved from their research on the interaction of trade liberalization and domestic tax system that for developing countries with binding government budget constraint, it is a priority to

implement comprehensive reform package of the domestic tax system to accompany trade liberalization (Ebrill *et.al.* 1999).

This paper analyses the impact of trade liberalization policies of structural adjustment reforms, tariff rate reduction on government tax revenue and government saving using a simple 1-2-3 CGE model for Ethiopia. Furthermore, the investigation continues to assess the impact of tariff reduction on aggregate saving consumption and income of the country. The simulation exercise is undertaken to describe the impact of tariff reduction in three different scenarios that is 25%, 50% and total elimination of the tariff rate. Simulation results of the 1-2-3 CGE model simply show the direction of change in the various variables as a result of the tariff reduction.

The empirical result of investigation of the model indicates that the government tax revenue, government saving and income decline in the three different scenarios when the reduction tariff shock is applied to the model. But the magnitudes of the decline of each differ among the variables and among the scenarios. However, the consumption level improved when the tariff shock is applied.

Furthermore, the result of the tax coordination of the tariff reduction from domestic indirect tax is also examined in the paper. To keep the government tax revenue unaffected increase the domestic tax by 14%, 43% and 71% while the tariff rate that is trade tax reduced by 25%, 50% and total elimination of the tariff rate respectively.

The recommendation draws from this paper are the following:

- In line with the accession to the WTO the country needs comprehensive and comparative analysis regarding the relationship between trade liberalization and government revenue in the short run and in the long run and how it is possible to compensate the revenue loss of most developing countries like Ethiopia.
- Enhance the coordination of the international tax and the domestic tax to replace the trade tax revenue loss from the domestic tax revenue as it is the country liberalizes the economy.
- More emphasis is needed to deal with the supply side constraint issue and administration reform to increase the tax base of the country.
- Equip the ministry of Trade and Industry and the ministry of revenue with skilled man power to discharge the responsibility of trade policy formulation, analysis, and monitoring and evaluation more effectively.
- Exhaustively use of the on going international initiatives or trade related technical assistance and capacity building to improve the method of tax collection in the country.

These results encourage further research with different policy tools and different advance model specifications. Introduction of distortionary income taxation, tax on private domestic consumption, value added tax or other non tax barriers distortions, such as quotas, subsidy, domestic support, including the trade facilitation like reduction of the cost of tax

administration in the model, along with making the model dynamic, would provide new result, which could help shape policy recommendations for developing countries in general and for Ethiopia specifically.

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Appendix A the 1-2-3 Computable General Equilibrium Model

Real Flows

$$(1) X = G(E, D^S; n)$$

$$(2) Q^S = F(M, D^D; \sigma)$$

$$(3) Q^D = C + Z + G$$

$$(4) E/D^S = g_2(p^e, p^d)$$

$$(5) M/D^D = f_2(P^m, P^t)$$

Prices

$$(10) P^m = (1 + t^m) R \cdot p^{w^m}$$

$$(11) P^e = (1 + t^e) \cdot R \cdot p^{w^e}$$

$$(12) P^t = (1 + t^s) \cdot P^q$$

$$(13) P^x = g_1(P^e, P^d)$$

$$(14) P^q = f_1(P^m, P^t)$$

$$(15) R = 1$$

Nominal Flows

Equilibrium Conditions

$$(6) T = t^m \cdot R \cdot p^{w^m} \cdot M \\ + t^s \cdot p^q \cdot Q^d \cdot t^y \cdot Y \\ - t^e \cdot R \cdot p^{w^e} \cdot E$$

$$(7) Y = p^x \cdot X + tr \cdot p^q + re \cdot R$$

$$(8) S = s \cdot Y + R \cdot B + S^g$$

$$(9) C \cdot p^t = (1 - s - t^y) \cdot Y$$

$$(16) D^D - D^S = 0$$

$$(17) Q^d - Q^s = 0$$

$$(18) p^{w^m} \cdot M - p^{w^e} \cdot E - ft \cdot R = B$$

$$(19) p^t \cdot Z - S = 0$$

$$(20) T - p^q \cdot G - tr \cdot p^q - ft \cdot R - S^g = 0$$

Accounting Identities

$$(21) P^x \cdot X = P^e \cdot E + P^d \cdot D^S$$

$$(22) P^q \cdot Q^S = P^m \cdot M + P^t \cdot D^d$$

Endogenous Variables	Exogenous Variables:
E: Export good	p_w^m : World price of import good
M: Import good	p_w^e : World price of export good
D^s : Supply of domestic good	t^m : Tariff rate
D^d : Demand for domestic good	t^e : Export subsidy rate
Q^s : Supply of composite good	t^s : sales/excise/VAT
Q^D : Demand for composite good	t^y : direct tax rate
P^e : Domestic price of export good	tr : government transfers
P^m : Domestic price of import good	ft : foreign transfers to gov't
P^d : Producer price of domestic good	re : foreign remittances to private sector
P^t : Sales price of composite good	s : Average savings rate
P^x : price of aggregate out	
P^q : Price of composite good	G: Real government demand
R: Exchange rate	B: Balance of trade
T: Tax revenue	Ω : Export transformation elasticity
S_g : Government savings	σ : Import substitution elasticity
Y: Total income	S: Aggregate savings
C: Aggregate consumption	Z : Aggregate real investment

CHAPTER ONE.....	1
1. Introduction.....	1
1.1 Background of the Study.....	1
1.3 Objective of the Study.....	7
General Objective.....	7
Specific objectives.....	7
1.4 Methodology and Data Source.....	8
1.5 Source of Data.....	9
1.6 Significance of the Study.....	9
1.7. Scope of the Study.....	10
1.8 Limitation of the Study.....	11
1.9 Macroeconomic Performance and Policy in Ethiopia since 1992/93	11
1.9.1 An Overview Recent Economic Performance.....	13
9.1.2 Fiscal Performance.....	14
1.10 Organization of the Paper.....	16
2. LITERATURE REVIEW.....	17
2.1 Historical development from GATT to WTO and Some basic rules and disciplines.....	18
2.1.1 Historical development of WTO.....	18
2.1.2 Some of the Basic Rules and Disciplines of GATT/ WTO.....	20
2.2 Impact of trade liberalization on the tax revenue and other macro economic variables.....	25
2.3 Computable General Equilibrium Model.....	37
3. MODEL SPECIFICATIONS.....	41
3.1 Analytical Framework of the Model.....	41
3.2 Specification of the Equations.....	43
CHAPTER FOUR.....	46
4. ANALYSIS AND RUSALTS.....	46
CHAPTER FIVE.....	53
5. CONCLUSION AND RECOMMENDATION.....	53
REFERENCE:.....	57