The Impact of WTO Accession on Poverty and Inequality in Ethiopia: An Investigation of a Dynamic CGE Micro-Simulation Analysis

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Abstract

Can increased integration to the global economy help Ethiopia, to substantially reduce poverty? What is the likely impact of WTO accession on income distribution and inequality in poor developing countries? To investigate these objectives, we will adopt a sequential dynamic microsimulation Computable General Equilibrium (CGE) model which incorporates 38,524 households derived from the 2004/2005 Ethiopian Households Income, Consumption and Expenditure Survey (HICES). Thus, the paper aims to establish the likely impact of WTO accession on income, poverty and inequality at household level opposing representative households approach. The findings of this research may have relevance to the Government’s decision with respect to accession to WTO. Moreover, the research may help policy makers to react proactively to the possible impact of dismantling import tariffs in Ethiopian economy, especially in relation to achieving Millennium Development Goals (MDGs) and reassessing and reformulating the country’s Sustainable Development and Poverty Reduction Strategy Paper.
1. **Main Research Questions and Core Research Objectives**

Can increased integration to the global economy help poor countries in Africa to substantially reduce poverty and meet the Millennium Development Goals (MDGs)? This question assumes interesting dimensions when formulated in the context of Ethiopia, one of the poorest countries in the world but the second largest in Africa. For years, Ethiopia has been negotiating accession to WTO as a part of its integration into the world economy. However, it has not been an easy task for Ethiopia to negotiate accession and reach a decision. In fact, many have debated on the opportunities and challenges Ethiopia may face by acceding to WTO. The main opportunities for Ethiopia would presumably be an increase in the volume and processing level of its exports, provided that the international standard of quality is achieved. Some of the main challenges Ethiopia would most likely face in accessing WTO are related with diversifying agricultural exports and supply constraints. First, serious problem might arise from non-tariff barriers for Ethiopian exporters (sanitary and phyto-sanitary requirements in QUAD markets for these products are costly to meet when technically possible). Recently, Xiaoyang et al. (2006) reported that standards and technical regulations in developed countries do affect firm’s propensity to export in developing countries. Secondly, easing Ethiopia’s supply constraints is a

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big task to exploit market access in the world market (promotion of investments in road infrastructure, agricultural extension and privatization are most important). Finally, agricultural yields should also be increased to diversify agricultural exports.

There are very few studies that aimed to evaluate the likely impact of WTO accession on Ethiopian economy (Cordella and Esemealem, 2005; Philip and Tadele, 2005; Stasinopoulos and Wendwesson, 2005; Dorel and Mengesha, 2005). However, none of them have addressed the likely impact of WTO accession on poverty. Therefore, it is important to ask and investigate some questions such as: Is the accession of WTO membership pro-poor? Will the accession differentially impact various categories of the poor?

This paper aims to establish the possible impact of WTO accession on income, poverty and inequality in Ethiopia. Recursive dynamic Computable General Equilibrium (CGE) microsimulation model, calibrated to 2004/2005 Social Accounting Matrix (SAM) will be built to capture this impact. Special emphasis will be given to the agriculture sector and commodities essentially due to the following reasons: (a) the livelihood of the poor in Ethiopia is largely dependent on the agricultural sector, (b) Agricultural product is special interest of the poor and (c) virtually, all exportable commodities originate from this sector.
2. Knowledge Gaps and Scientific Contribution of the Research

Since 1992, Ethiopia 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 and quantitative 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. 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 poverty and income distribution in Ethiopia. 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 partners 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 (assumed) increase of foreign investment and the stimulation 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.

Lofgren and Diaz-Bonilla (2005) conducted a research on the impact of alternative MDG strategies that differ in terms of foreign aid requirements on growth, poverty reduction and human development using MAMS model, an economy wide simulation model that the World Bank has developed to analyze MDG strategies in different countries. All the scenarios they design suggested that a considerable expansion in government consumption and investment is required to meet the different MDGs. Finally, to our knowledge there is no work yet that analyzed poverty and tariff dismantling policy at household level using a CGE model in Ethiopia.

3. Policy Relevance

There is an ongoing debate on the role of liberalization negotiations on international trade (the reduction of customs tariffs and non tariff barriers) in alleviating poverty in Ethiopia. It is very important, therefore, to assess the likely impact of WTO accession on poverty given Ethiopia’s commitment to achieve the Millennium Development Goals (MDGs). One of the numerical and time-bound key targets for the MDGs is that head count poverty ratios should be halved by the year 2015. However, it is not very clear whether joining WTO will help the current effort of the government and
international community to reduce poverty which aims to achieve pro-poor growth –
growth that is inclusive of the poor.

This study attempts to evaluate the impact of tariff dismantling scenarios at household
and sectoral level. Moreover, attempt will be made to evaluate the costs and benefits
resulting from the suppression of duties on the government budget by elaborating
different policy scenarios. We believe that, the findings of this research may have
relevance in providing information to the government in the process of acceding
WTO. Finally, the research may help policy makers to react proactively for the
possible impact of dismantling import tariffs in Ethiopian economy, especially in
relation to achieving MDGs and reassessing and reformulating Poverty Reduction
Strategy.

4. Methodology

CGE model is a customary tool to assess the impact of exogenous shocks and change
in policy (trade liberalization, structural adjustment policies, energy and
environmental policies) on endogenous variables (for instance, on growth and income
distribution through its effect on factor wage and employment). Representative
household and microsimulation approaches are commonly used to analyze issues of
income distribution, poverty and inequality. The difficulty with the first approach is
the assumption of exogenous within-group income heterogeneity. Microsimulation approach, however, dispensed this assumption. The micro-simulation model is also very important for vigorous analysis of poverty (See for instance, Decaluwe et. al., 1999). The CGE model in this study roughly starts from the standard neoclassical specification in Dervis et al. (1982) and makes use of the 2004/05 Ethiopian SAM. In what follows, we will discuss the SAM and the model structure.

**Social Accounting Matrix (SAM)**

For quantitative study, getting recent data is a key modeling issue. Good CGE model analysis does matter and can influence policy choice, however to be effective economists must provide policy analysis that are timely (Devarajan and Robinson 2002). Thus, bearing in mind substantial structural changes that occurred since 1999/2000 (for instance, VAT introduced in Ethiopia since 2002, it generated a revenue to government an amount equivalent to the duty tax), the need arises to construct a new SAM for Ethiopia. To fill this gap, International Food Policy Research Institute (IFPRI-Addis Ababa) constructed 2001/2002 SAM for Ethiopia. The 2001/2002 IFPRI-SAM for Ethiopia consists of 20 activity accounts (seven agricultural activities, seven industrial activities, and six services). It also incorporates 25 commodity accounts comprising 15 agricultural, 5 industrial and 5 service products.
Factors of production are classified into five accounts: Family labour, Wage labour, Capital – infrastructural, Capital – other, and Land. Institutions are disaggregated into 13 accounts: three household categories (Farm households, Wage earners, Entrepreneurs), four enterprises (Peasant household farms, Private commercial farms, Private non-agricultural enterprises, Public enterprises), five government accounts (Government recurrent, Government Investment on Infrastructure, Government Investment on Education and Health, Government Investment - Other), capital-other and rest of the world. In this paper, we will update 2001/2002 SAM to use for the microsimulation exercises. More specifically, the 2001/2002 SAM will be updated to 2004/2005 SAM for Ethiopia using cross entropy method following Robinson et al (2000). The computations can be done with a matrix-balancing computer algorithm (GAMS).

The SAM used in this study has 20 production sectors and activities. The classification of activities reflects a combination of difference in type, location, scale, and ownership structure of production. Seven of these sectors are agriculture based, 6 are manufacturing, 1 is mining and construction sector and 6 are services (See Table 1). The SAM includes ten factors of production: Urban Male Unskilled, Urban Male Skilled, Urban Female Unskilled, Urban Female Skilled, Rural Male Unskilled, Rural Male Skilled, Rural Female Unskilled, Rural Female Skilled, Capital, and Land). The households will be derived from the 2004/2005 Household Consumption, Income,
The income and expenditure data for the survey will be extracted and reconciled to the SAM sectors, institutions and factors of production.

**Table 1: Sectors included in the Model**

<table>
<thead>
<tr>
<th>GAMS Code</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>ACFH</td>
<td>Subsistence Crop Farming - Highland</td>
</tr>
<tr>
<td>AFL</td>
<td>Subsistence Crop Farming - Lowland</td>
</tr>
<tr>
<td>ALFH</td>
<td>Subsistence Livestock Farming - Highland</td>
</tr>
<tr>
<td>ALFL</td>
<td>Subsistence Livestock Farming - Lowland</td>
</tr>
<tr>
<td>ACFPU</td>
<td>Commercial farming - public</td>
</tr>
<tr>
<td>ACFPR</td>
<td>Commercial farming - private</td>
</tr>
<tr>
<td>AFF</td>
<td>Forestry and Fishing</td>
</tr>
<tr>
<td>ALFOOD</td>
<td>Large/medium food, beverages, and tobacco manufacturing</td>
</tr>
<tr>
<td>ASFOOD</td>
<td>Small-scale and cottage/handicraft food, beverages, and tobacco manufacturing/processing</td>
</tr>
<tr>
<td>ALTEX</td>
<td>Large/medium textile and leather manufacturing</td>
</tr>
<tr>
<td>ASTEXT</td>
<td>Small-scale and cottage/handicraft textile and leather manufacturing/processing</td>
</tr>
<tr>
<td>ALOTH</td>
<td>Large/medium other manufacturing</td>
</tr>
<tr>
<td>ASOTH</td>
<td>Small-scale and cottage/handicraft other manufacturing/processing</td>
</tr>
<tr>
<td>AMICO</td>
<td>Mining and Construction</td>
</tr>
<tr>
<td>AUTILI</td>
<td>Utilities</td>
</tr>
<tr>
<td>ATTCO</td>
<td>Trade, transport, and communications</td>
</tr>
<tr>
<td>ATHRE</td>
<td>Tourism, hotels, and restaurants</td>
</tr>
<tr>
<td>AHEDU</td>
<td>Health and education</td>
</tr>
<tr>
<td>APADM</td>
<td>Public administration</td>
</tr>
<tr>
<td>AOSER</td>
<td>Other services</td>
</tr>
</tbody>
</table>
Model structure

In recent years, studies on trade liberalization, poverty and income distribution using CGE models became an area of great interest. To analyze issues of poverty and inequality, basically there are two approaches: representative household approach and micro simulation approach (see for example Bourgugnon et. al., 2003 and Davies, 2003). The traditional representative household approach has a weakness, i.e., it fails to capture adequately the within-group inequality. To overcome this weakness, it has now become a common practice to use microsimulation-CGE approach.

The CGE model, calibrated to 2004/2005 SAM for Ethiopia, follows the standard neoclassical specification. The calibration will be governed by the benchmark data set, comprising the base year SAM and other parameter values not included in the SAM. The principal sets of parameters in this category are the trade substitution (Armington) elasticities which have to be determined exogenously. Production sectors in the model will utilize a nested production technology. Primary factors of production will be combined according to a Constant Elasticity of Substitution (CES) functions to constitute value added, which in turn combines with intermediate consumptions through Leontief functions.
Since the economy has no impact on international markets, the world prices of import and export are assumed to be exogenous to the model. The current account balance (assumed always in equilibrium, with foreign savings equal to the current account deficit) and the nominal exchange rate (acts as the numeraire) are also exogenous to the model. The local price is made up of the producer price plus indirect tax. The import price and the domestic price then form the composite price for the composite commodity. The local import price is the world price adjusted by the exchange rate and import taxes. The experiment of removing taxes will thus have an impact on the composite price. Output price affects the export price and itself affected by input price.

At the same time, it is assumed that the economy is investment-driven: the quantity of investment will be fixed and that the government has a fixed budget for a pre-defined consumption plan. In addition, a compensatory tax by means of a direct tax is instituted to maintain the fiscal balance at the same level as the benchmark simulation. Domestic savings, on the other hand, adjust through changes in institutional income. For example household income changes endogenously due to changes in factor income and government income depends endogenously on direct and indirect tax receipts. Investment must equal the sum of domestic and foreign savings, and there are no constraints on borrowing from abroad. Domestically-produced and imported commodities will be combined to produce composite goods in
accordance with the Armington hypothesis; this is equivalent to assuming a degree of 
imperfect substitution between domestically-produced and imported goods. 
Moreover, consumption demand is specified as a Linear Expenditure System (LES) 
from maximizing a Stone Geary utility function.

The factors of production will be modeled as a CES function between capital and 
labour (Male and female, as well as skilled and unskilled labors assumed imperfect 
substitutes in the production activities). The study will assume that Land is mobile 
between the crop sectors and male and female. Moreover, since all factors in the 
model will be assumed to be sectorally mobile, the model will solve for long-run 
equilibria. Various simulation exercises will be conducted in consultation with 
experts in the Ministry of Trade and Industry (MTI), including a total removal of 
import tariffs.

The common critic on conventional CGEs, as we noted before, in assessing impact of 
a given policy on poverty is that the model can only simulate the impact of a shock on 
the representative households in each group since the SAM does not contain 
information on intra-socioeconomic household group income distribution. The 
advantage of microsimulation is to further investigate into the impact of the policy on 
poverty and inequality by introducing household income explicitly into the model.
By doing this, we introduce heterogeneity and dispense with the assumption of the representative households. In recursive dynamic CGE model, a two-stage dynamic formulation is used to handle the dynamic linkages: a within-period static CGE model and a between-period model. In this paper, the within-period static model is solved for 2004/2005 (the base year for the database) and annually for 2005/2006 through 2007/2008, and then every two years thereafter until the year 2024/2025.

A lognormal distribution will be used to analyze poverty impact of policies following Demery and Demery (1991). On the other hand, Ducaluwe et al (1999) have suggested that the Beta distribution may have preferred properties. They examined the advantage and disadvantage of using each approach. One major disadvantage of the lognormal distribution is its poor description at the upper tail while a prime advantage of using this distribution is its relationship to the normal distribution, and therefore, its simplicity for statistical analysis. Accordingly, lognormal distributions will be used to evaluate the poverty incidence within each group in a general equilibrium framework.

To compare the poverty levels obtained in the post-simulation case with those prevailing in the pre-simulation case, Foster, Greer and Thorbecke’ (FGT) measures will be used. The FGT $P_\alpha$ class of additively decomposable poverty measures allows us to measure the proportion of poor in the population (the headcount ratio, $\alpha=0$), the
depth of poverty ($\alpha=1$), and the severity of poverty ($\alpha=2$). The poverty line will be
determined endogenously within the CGE model. Finally, in our model, Gini-
coefficient and Atkinson index of inequality will be used to measure whether the
inequality will fall or rise after the reform.

5. Data Requirements And Sources

Central Statistics Authority (CSA) has carried out a number of socio-economic
surveys in 2004, such as the 2004 household survey and the 2004 Welfare Monitoring
Survey. Moreover, to update the 2001/2002 Ethiopian SAM external trade data,
government accounts, agricultural production surveys, industrial data surveys, annual
production surveys, other administrative surveys and various international
organization databases (World Bank, United Nations, African Development Bank)
will be used. The Main sources of data are: Central Statistics Authority (CSA),
National Bank of Ethiopia (NBE), Ministry of Finance and Economic Development
(MoFED), Customs Authority and various international organizations. As many
developing country, in Ethiopia, we have poor data base, serious problem of data
reliability and insufficient and fragmented data sources.
6. Dissemination Strategy

A methodological seminar will be held to refine the proposal methodology. A compendium of statistical data will be prepared and submitted to the Ethiopian Research Institute (EDRI) and Ministry of Trade and Industry (MTI) immediately after the data entry is completed. This would contain preliminary findings and allow the institutions concerned to follow the progress of the study. A workshop will be held to discuss preliminary report followed by a national conference in collaboration with Ministry of Trade and Industry (MTI) to disseminate the research findings. The final version will be published and distributed to relevant public and non-governmental organizations, universities and colleges and research institutes. The report will also be published in the website of EDRI. An article will be submitted for publication in a reputable international journal for a wider audience.
7. References


Dorel , Valérie and Mengesha Tadesse 2005, “Qualitative Impact Study on Service”. In Derk Bienen, eds., Impact Assessment of WTO Accession: Technical Assistance to Support Ethiopia in its Accession to the WTO, Draft


Davies , James B. 2003, “Microsimulation, CGE and Macro Modelling for Transation and Developing Economies” mimeo, University of Western Ontario.


8. Prior Training And Experience In The Issues And Techniques Involved

Dejene Aredo (P.hD), Associate Professor of Economics, Addis Ababa University, and National Coordinator of Ethiopian Technology Policy Studies Association (ETPSA), taught Agricultural Economics for many years. He received intensive training in graduate studies on CGE modeling. In addition, he has a good deal of experience in teaching quantitative agricultural policy analysis in M.A. for graduate students from Anglophone Africa countries, (Africa Economic Research Consortium, AERC). Presently, he is developing teaching materials for agricultural policy analyses for use in African Universities.

Belay Fekadu is a young researcher who showed keen interest on macro modeling starring from his effort to construct SAM for Ethiopia in his M.Sc thesis. He employed Cross entropy SAM estimation techniques in the balancing exercise by using GAMS software. Now, he is a researcher in International Food Policy Research Institute (IFPRI – Addis Ababa) beginning from December 2006, currently working on construction of 2001/2002 SAM for Ethiopia. He is also one of the team members who are assigned to build multi-market and CGE model for Ethiopia. This project will be finalized on July 2006.

Sindu Workneh is a young researcher who worked on poverty measurement and analysis on her Masters thesis. She has presented her thesis paper on a conference in Malawi. Currently, she is working as a research officer in International Food Policy Research Institute (IFPRI) in the area of poverty, food security and agricultural productivity. She has produced four conference papers (as attached on her CV).
9. Expected Capacity Building

Virtually, there is no application of macroeconomic modeling in Ethiopia.\textsuperscript{5} One of the main reasons is the knowledge gap that exists among the researchers. CGE modelling exercise and the software that is used for estimation purpose (GAMS) is less known and not applied by the researchers.

The Ethiopian Technology Policy Studies Association (ETPSA), a chapter of the Nairobi-based African Technology Policy Studies (ATPS) network, is a multidisciplinary network of researchers and policy makers promoting greater participation in science and technology policy research and dialogue in Ethiopia. The team members and the association, through participation in this project, will build the research capacities on the recently evolving techniques and tools on macroeconomic modeling. The association will further commit itself to advocate the use of the CGE model by the researchers and policy makers in the country to a wide range of economic questions in their analysis in collaboration with different international institutes.

Two post-graduate students (effort will be made to select female students working on M.Sc thesis) are expected to be involved in research project (in connection with their M.Sc thesis). They will be involved in all various stages of the study.

The data collection, entry and editing will be done by selected students under the supervision of Belay Fekadu and Sinedu Workhen. Revision of literature and analysis of the preliminary findings will be done by Belay Fekadu under direct supervision of Dr. Dejene Aredo, National Coordinator of ETPSA and Associate Professor of Economics, Addis Ababa University. Lead researcher will prepare the final paper work.

\textsuperscript{5} Ethiopia still has no official macro model to analyze nation wide effect to some proposed or implemented economic policy. Recently, however, we see there is a move towards the construction of macro models in different organizations, like Ministry of Finance and Economic Development (MoFED), Ethiopian Economic Association (EEA), and National Bank of Ethiopia (NBE). There was also some individual effort in the construction of nation wide models (Asmerom et al. 1985; Berhanu 1994; Lemma 1993)
10. Research Ethics

This research basically uses secondary data from various sources. However, the research will strictly follow research ethics identified in Poverty and Economic Policy (PEP) grants manual. As things stand, there is no expected ethical problem.

11. Some Of Current Or Pending Projects In Related Areas

Dejene Aredo (P.hD)
I. “Coffee Price Crises Impact on Poverty among Coffee Farmers”, forthcoming, Results of the Research Undertaken in collaboration with University of Bergamo, Italy.

Belay Fekadu
I. “Structure and Linkages in Ethiopia: A SAM-Based Analysis”, unpublished
II. “Financial SAM for Ethiopia”, forthcoming
III. “2001/02 Social Accounting Matrix for Ethiopia”, forthcoming, Agricultural linkages project, IFPRI
IV. “Inter-sectoral Linkages in the Ethiopian Economy – A Multi-Market Model”, forthcoming, Agricultural linkages project, IFPRI
V. “A CGE model for Ethiopia Economy – Inter-sectoral Linkages and Growth Potentials” forthcoming, Agricultural linkages project, IFPRI

Sindu Workneh