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**Alternative Policy Strategy to ADLI for Ethiopia: A
Dynamic CGE Framework Analysis**

Lulit Mitik

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Initial Title

**Alternative Policy Strategy to ADLI for Ethiopia: A Dynamic
CGE Framework Analysis**

Revised Title

**Public Spending, ADLI, and Alternative Scenarios for Ethiopia:
A Dynamic CGE Framework Analysis**

REVISED RESEARCH PROPOSAL

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Prepared by
Lead researcher
Lulit Mitik
&
Team members
Solomon Lemma
Befekadu Behute

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Abstract

Ethiopia's government has been following agricultural development led industrialization policy strategy (ADLI) since 1993. So far, this strategy has not brought about the anticipated food security and sustainable economic growth. The main government tools to address the ADLI strategy is allocating targeted public resource for agriculture sector that constitute 42 percent of GDP. The spending to agriculture is in terms of agricultural extension programs and rural infrastructure developments.

In light of this, the objective of this study is to assess the outcomes associated with two types of development approaches over the period of 2010 to 2015 using a dynamic Computable General Equilibrium (CGE) model. One is a targeted sector development approach, and the other is a more broad based development approach. Under the first approach public spending is separately targeted to agriculture sector development and the choice is intended to represent ADLI. Under the second approach a more broad based development strategy is adopted where the same public spending is distributed among the other sectors (agriculture, industry and service) and takes place simultaneously, which is referred as sectorally balanced strategy. The analysis will be carried out under two cases: one where public resources are reallocated within the ADLI framework and the second scenario assumes public resource are equally distributed among the sectors.

In the analysis process we would use a standard CGE model. The CGE model is neo-classical in spirit, with agents responding to price changes. The CGE model used in this analysis relies on EDRI's social accounting matrix (SAM) of Ethiopia, based on 2005/2006 data. The SAM has more disaggregated accounts that will enrich the level of analysis. Our SAM has a wider range of activities, commodities and household categories. Public investment accounts are disaggregated by sector which will allow us to undertake the simulation scenarios.

1. Research Questions and Objectives

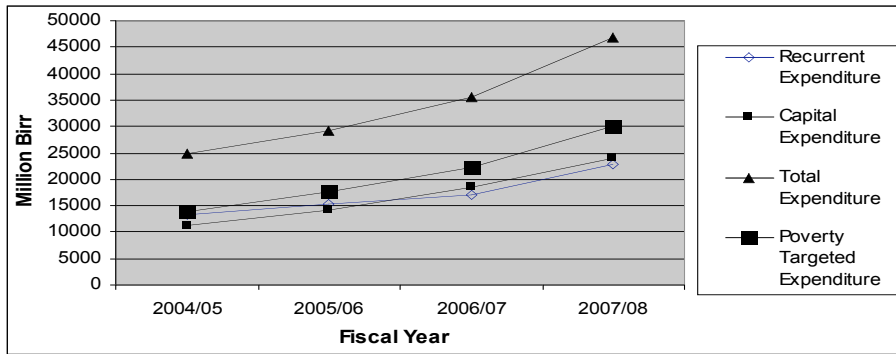
Early development specialists have varied stand towards taking agriculture as a driver of an economy. A wide spread of writers agree that agriculture's share declines as structural transformation happens. The Transformation transfers capital and labor from agriculture to fuel growth in industry and services sectors of developing economies (Chenery and Syrquin 1975; Johnston and Mellor 1961). On the other hand, Hirschman (1958) with his pro-industrial stand argues that agriculture has feeble production linkages with the rest of the economy, hence has fewer stimuli effect to overall growth. Lewis (1954) is also pro first industrialization. The current Ethiopian government policy strategy is in line with the former.

Ethiopia's government goal is to alleviate poverty via fast economic growth. Agricultural development led industrialization (ADLI) put forward in 1993, is the government's chosen growth strategy to realize its goal. The objective of ADLI is to strengthen the linkages between agriculture and industry by increasing the productivity of small scale farmers, expanding large scale private commercial farms, and by reconstructing the manufacturing sector in such a way that it can use the country's human and natural resources.

Agricultural Development led industrialization strategy of Ethiopia states that the growth in agriculture will induce overall economic growth, through structural transformation, by stimulating demand and supply. On the demand side, expansion in agricultural activities will increase demand for industrial products (both agricultural inputs and consumer goods) produced by domestic industries. On the supply side, the agriculture sector can supply food to domestic market, raw materials to industries and export products (Diao et al, 2007). In the ADLI framework the "key assertion is that the primary driver of demand for industrial output will be domestic, rather than foreign demand, based on first initiating growth in agriculture." (Dercon and Zeitlin 2009). This reflects the view that the process of industrialization should build on domestic inputs.

This strategy involves high public investment concentration towards the agriculture and continual increase in public spending too (Figure 1). The trend for public spending in Ethiopia also agrees with this. Public spending has been increasing over time and it has reached Eth. Birr 46.9 Billion in Fiscal year 2007/08. Poverty targeted expenditure, namely education, health, agriculture and rural development and roads, constitute 46.6 % of the recurrent expenditure in 2007/08 showing an increase of 36.3 % compared to the previous fiscal year; and 80.5 % of the capital expenditure, witnessing a 33.3 % increase compared to fiscal year 2006/07 (MoFED, 2009).

Figure 1: Trend of public spending

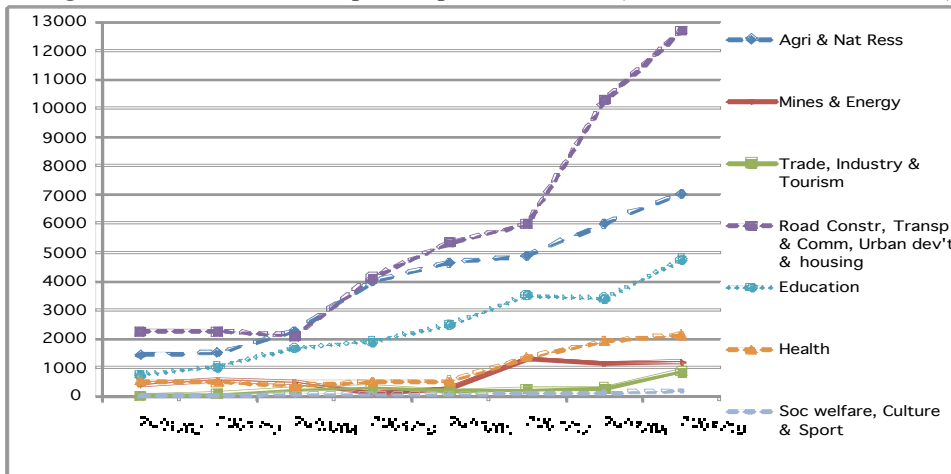


Source: MOFED Annual Progress Report 2007/08

The trend in public investment on poverty-oriented sectors has shown considerable growth over the past five years. Investment in agriculture and food security and education sector took the lion's share (Figure 2). For the last four years, poverty-oriented public spending has amounted more than 60 % of public spending.

When considering all sectors (economic and social), the Fiscal Year 2006/07 marks a boom in capital expenditure in the services sector, mainly road construction, transport and communication, urban development and housing (Figure 2). Sectoral shares of total (current plus capital expenditure) are provided in the Annex II.

Figure 2: Sectoral Public Capital Expenditure trend (2001/02-2008/09, Million Birr)



Source: MOFED, Authors' calculations

The Ethiopian economy has been growing rapidly in recent years. The fiscal year ending June 2008 marked the fifth consecutive year of double digit GDP growth rate. Real GDP has grown by 11.9% in 2003/04, 10.5% in 2004/05, 9.6% in 2005/06, 11.4% in 2006/07, and 11.6% in 2007/08. The agricultural sector contributes up to 44.6 % of GDP and 82 % of export (MoFED and NBE). In addition to the agricultural sector, the service sector has been increasingly contributing to the GDP reaching 43.4 %, followed by the industry sector which constitutes 13.1 % of total GDP during the 2007/08 fiscal year (MoFED). With the construction, real estate, retail and wholesale trade, transportation and financial services being the major drivers, the service sector is becoming a significant source of the growth and has benefited from increased public investment (Figure 2). Government investment that has peaked during the period in nominal terms is one major contributor to service sector growth.

Currently, there is a debate on whether Ethiopia should continue on its current Agricultural development led industrialization strategy; or if it should make adjustments to its growth strategy. Whether the government continues with the ADLI strategy or adopts another policy approach, both will have implications on the concentration and allocation of the limited public resources.

On the one hand, Mellor and Dorosh (2009) argue that “A high rate of agricultural growth has far-reaching positive implications for economic development of low-income countries in terms of increasing employment and accelerating poverty reduction. High agricultural growth also helps avoid the creation of mega-cities with large slum populations. In order to achieve this rapid agricultural growth with positive economy-wide linkages, however, it is necessary to engage “middle farmers”, large enough to adopt new technologies and produce significant marketed surpluses, but small and numerous enough to have spending patterns that drive a vibrant rural non-farm sector. Finally, public and private investments in road, electricity and telecommunications are also needed to reduce marketing costs and enable growth in rural market towns and secondary cities.” Their argument noted that for agriculture to be driver of the economy farmers required to be “middle farmers”, unlike Ethiopia’s concentration of small scale farmers with less new technology adoptive capacity. They have also noted that Agricultural led industrialization requires high levels of government spending. In line with their argument, Ethiopia’s government has been allocating high proportion of public resources towards agriculture through its pro-poor spending strategy.

On the other hand, Dercon and Zeitlin (2009) noted that with modest consumption linkages agricultural innovation will not suffice to drive growth in industry. “More positively, the increasing frequency of trade ‘in tasks’ suggests that it may not be necessary for Ethiopian agriculture to be oriented toward the supply of raw materials for industry, nor for all

industrial energies to focus on the processing of domestic raw materials. However, the most effective policies to stimulate growth may be those that strengthen domestic and international linkages,” Dercon and Zeitlin (2009).

In light of this, the paper attempts to scrutinize alternative policy strategies considering the limited public investment capacity in Ethiopia using a dynamic CGE framework analysis. Given the limited resources of the government studying the relative importance of various public investments options that have the potential to enhance economic growth and poverty reduction is paramount. The proposed research has two objectives. First, it aims at testing alternative public investment strategies within the general ADLI policy framework. Second, it aims at analysing other alternative distribution schemes of public resource across targeted critical sectors.

2. Scientific contribution of the research

The scientific contribution of this research proposal is both technically and related to the issues addressed. The technical contribution comes from special features of the SAM and CGE model.

The model will establish linkages between the different production sectors. The ADLI policy is composed of sub-components aimed at improving agricultural productivity and promoting food security. These subcomponents are:

- Agricultural extension and research;
- Design and operationalization of growth corridors;
- Agricultural export promotion;
- Food security programme;
- Productive safety net programme; and
- Voluntary resettlement programme.

Rural development is one of the determinants of the success of the ADLI policy strategy. Accordingly, the government has been and is undertaking important road construction and rehabilitation programs as well as other infrastructure projects such as electrification, expansion of irrigation, and water harvesting structures. This investment is aimed at addressing various constraints to the development of the agricultural sector including market access and commercialisation, and vulnerability to climate conditions.

The government has also taken measures towards enabling and increasing access to credit for farmers so as to facilitate purchase of farm inputs and diversification of activities. This is essentially implemented through microfinance schemes.

Moreover, under the agricultural extension programme, the government is increasing the number and education level of Development Agents (DAs) through the provision of extensive technical vocational education and training (TVET) in agriculture and through the establishment of Farmer Training Centers (FTCs). This is expected to result in the transfer of improved agricultural technologies and to give adequate services at closer reach. Extension and training programs are designed to enhance farmers' capacity to use water resources efficiently and to help build community level institutional structures necessary for effective irrigation and water management.

As reflected in the above paragraphs, the ADLI strategy focuses on the agricultural sector by investing directly in the sector as well as indirectly in other sectors (e.g. roads, irrigation, education, finance) believed to impact on the productivity and expansion of the agricultural sector. This implies strong inter-sectoral linkages. Given this fact, the model will be designed in such a way that it can explicitly incorporate these inter-sectoral linkages. This is an important aspect as the reallocation of public resources, which is the simulation proposed through different sets of scenarios, will not only affect the sector concerned but may have important implications in other production sectors. Establishing the inter-sectoral interconnections and interdependences in addition to the links made through the provision of intermediate inputs as modeled in a standard CGE model will be an interesting scientific contribution of the proposed research.

The model will explicitly introduce the transmission channel of public investment to production (for example, the government of Ethiopia is facilitating access to fertilizer or improved seeds).

Evidence shows that most of the agricultural labour in Ethiopia is performed by women. Therefore, the ADLI policy has significant implication on this dimension. To this end, the model will also incorporate gender aspects when measuring the impact of public resources reallocation. This is further elaborated in the methodology section.

The SAM considers rural households' income comes only from factor income. In this regard, the team will attempt to restructure the SAM to include income from the sales of crops as an additional source of income to rural households engaged in agricultural production. This will strengthen the model's explanatory power and will reflect better the Ethiopian situation. As evidence shows, one of the major sources of cash income for rural households engaged in

agriculture is the sales of crops. In order to accomplish this, the team will undertake a thorough review of literature.

Special features of the SAM are outlined as follows:

- The model will be calibrated to a SAM based on latest data (2005/06). Previous studies were based on a SAM based on data either from 1999/2000 or 2000/2001 and didn't depict the new structure of the country's economy.
- The SAM has more disaggregated accounts that will enrich the level of analysis. Our SAM has a wider range of activities, commodities and household categories.
- The SAM also allows addressing regional specificities based on agro-ecological regions of the country.

Issue wise the study will fill in the knowledge gaps as detailed below:

- Most of the studies that used CGE models framework for Ethiopia mainly focused on trade liberalization and poverty (Dejene et al 2007 and Ayele 2004), but didn't cover issues of public spending.
- Diao et al, 2007 tried to scrutinize the linkage between the agriculture sectors with the rest of the economy in a multi market model. Their input output model addresses the commodity utilized in the process of production and the corresponding output, and hence doesn't address general equilibrium effects. The paper also doesn't consider public spending aspects.
- Lofgren et al, 2005 has also attempted simulate alternative MDG strategy scenarios that differ in terms of foreign aid requirements and their emphasis on growth, poverty reduction and human development. The analysis is based on the Maquette for MDG Simulations (MAMS) model that the World Bank has developed to analyze MDG strategies in different countries. First their analysis tries to apply generally applicable model to specific country, where in the process disregards specific country issues. Secondly, their analysis is focused on only MDG components of public spending (mainly gained from external sources) and did not take in to account investments to agriculture sector explicitly.
- Robinson et.al, 2008 developed a static single country CGE model of Ethiopia to provide general equilibrium effective rate of protection (GE-ERP) measure of price incentive bias prevalent to the Ethiopian economy. The simulation they have undertaken is either individual elimination of import tariffs, export taxes, consumption taxes or the combination of those. The experiments show that there are moderate signs of indirect tax policy induced traded agricultural sector bias in Ethiopia. Their study does not consider the issue of public resources allocation in the simulation. Moreover, their model is static and as it is based on 2000/01 SAM, it does not describe the current economic structure of the Ethiopian economy.

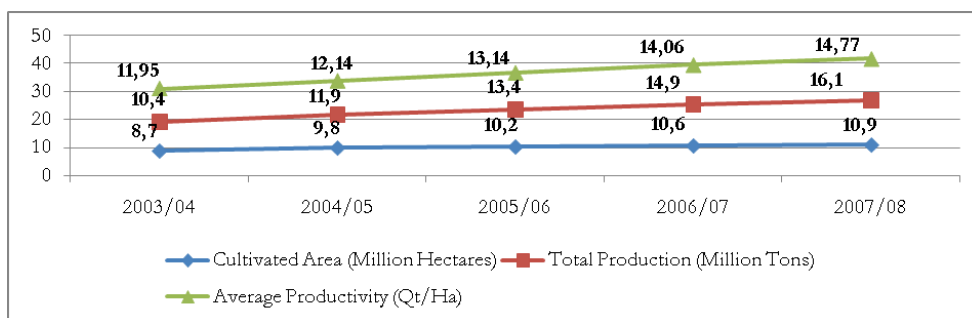
3. Policy relevance

Despite unprecedented economic growth reported over the past consecutive five years, Ethiopia remains one of the most food insecure countries in the world (WDI, 2009). Despite the implementation of ADLI for the last 17 years, the rate of return of the agricultural sector remains relatively low (Figure 3). Moreover, the anticipated production and consumption linkage of the agricultural sector with the rest of the economy remains weak (Diao et al, 2007). In addition, the neglected industrial sector remained stagnant and is characterised by outdated production techniques.

One of the core objectives of ADLI is to stimulate the industrial sector through increased demand from the agricultural sector for industrial products; used either as inputs for agricultural production or consumer goods. However, evidence shows that agricultural inputs, including fertilizer and pesticides as well as agricultural equipments, are mainly imported. On the supply side, ADLI assumes that the agricultural sector will provide raw materials to the industrial sector. Yet, most domestic industries depend on imported agricultural raw materials. For instance, most beer producing industries use imported barley; food processing industries (flour millers, pasta, biscuits) still depend on imported wheat. Although the agricultural sector has show considerable growth relatively to previous years where other policies prevailed, it is still vulnerable to external shocks due to import-dependence.

From the food security perspective, regardless of substantial allocation of public resources to the agricultural sector, the country remains highly food insecure. Although significant progress has been made to expand and intensify agriculture, agricultural productivity has not significantly improved as a result of ADLI and production is still heavily dependent on weather conditions and subsistence mode of production (Figure 3).

Figure 1: Performance of Ethiopian Agriculture (2003/04 – 2007/08)



Source: CSA

In contrast, the services sector has emerged as the dominant (43.7% of GDP in 2008/09) source of economic growth in Ethiopia despite the fact that the sector has been benefiting from a smaller portion of public resources until a boom in 2005/06 (Figure 2). With increased levels of public investment, the sector may have a potential for generating more rapid and sustainable growth.

In light of this, testing empirically the outcomes and sustainability of ADLI policy strategy has strong policy relevance considering its goals of attaining food security, sustainable economic growth and poverty reduction.

In addition, the proposed policy scenarios, which try to reallocate public spending in alternative manners across target sectors, will inform policy makers on the efficient use of the limited public resources. It would also be a response to the debate outlined in the previous section.

4. Methodology

a. Conceptual framework of the study

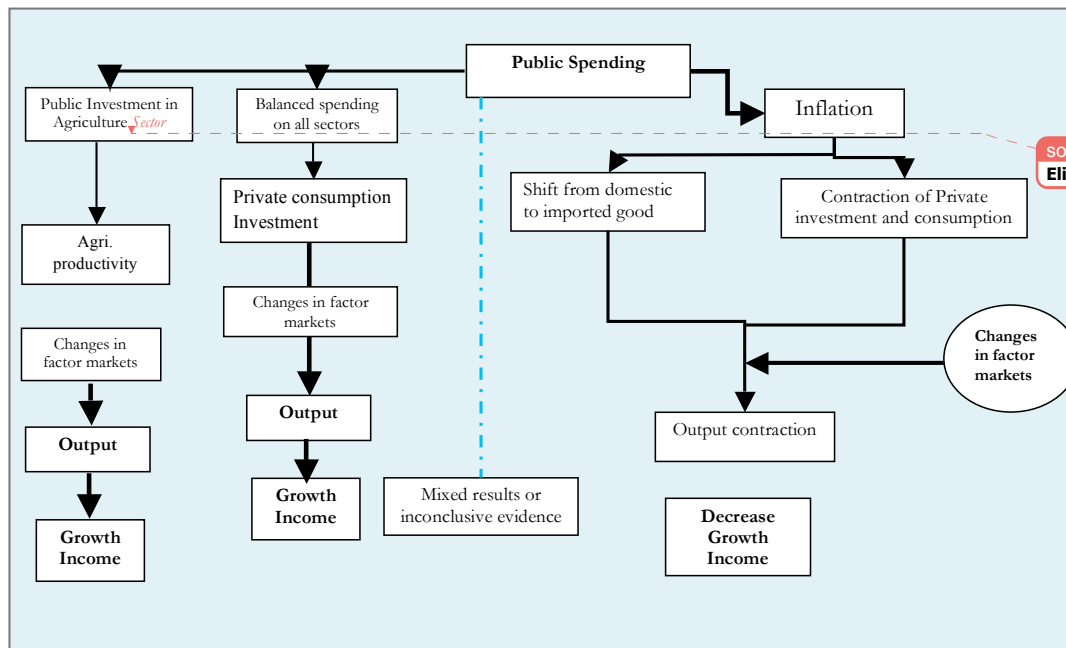
Based on the review of literature, we will adopt a conceptual framework that links public investment with agricultural productivity and sectoral growth. Public investment on rural education, extension programs, public health, irrigation schemes, rural electrification, agricultural research and development, and rural roads have positive correlation with agricultural productivity Aschaur (1989) and Bramlich (1994). In particular, the extension program package of the government that involves efficient utilization of fertilizer, improved seeds, developing irrigation scheme and farmers' capacity development combined would enhance agricultural productivity.

Likewise improved health status, access to inputs due to rural road development, enhanced farmer skill emanates from rural capacity building and education would have similar impact on agricultural productivity.

First, Increase in output, through increased aggregate demand for public goods and services could contribute in increasing growth. This growth could be achieved through increase in returns to production, investment and private capital formation. Once the output stimulated by increased aggregate domestic demand, all household involved in production line will be impacted positively. The second path proposes that public spending could lead to decline in growth if public spending is financed through domestic sources such as tax which have disincentive for the private sector to invest and bids up inflation which causes a shift from domestic consumption to imported goods.

Drawing on insights from the more recent literature and on the specific condition of developing countries (such as Ethiopia), it is possible to propose that public spending has significant impacts on growth and inequality in economies characterized by weak initial conditions and structural rigidities or it can be argued that it may have differential impacts on different categories of households (e.g. net buyers and net sellers), or on specific sectors within an industry (or agriculture). We take this as a third “path” as indicated in box 1 by the dotted line.

Box 1: A Synopsis of Public Spending on Growth: A Conceptual Framework



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 Eliminato: Secto

Source: Constructed by authors.

b. The Model

The computable general equilibrium model used in this study will follow the sectoral and socioeconomic structure of the SAM described above. The CGE model is neo-classical in spirit, with agents responding to price changes. The model is Walrasian, determining only relative prices. Product prices, factor prices and the equilibrium exchange rate are defined relative to the consumer price index, which serves as the price numeraire. The country is “small” in the sense that it takes world prices as given. Following a general description of the standard features of the model, this section gives a more detailed explanation of some salient characteristics of the model: namely, labour migration behaviour and the agricultural policy component. The model will also incorporate explicit inter-sectoral linkages as described in the simulations section.

Based on the SAM, the production technologies across all sectors are calibrated to their current situation, including each sector’s use of primary inputs, such as land, labour and capital, and intermediate inputs. To capture existing differences in labour markets, the model classifies employed labour into different sub-categories, including skilled and unskilled workers based on occupational categories. Information on employment and wages by sector

and region is taken from the 2005/06 household income and expenditure survey (HIES 2005). Most workers in the model can migrate between regions and sectors. These workers are disaggregated according to occupational categories (i.e., administrators; professional; skilled; and unskilled). Agricultural family labour is region-specific but mobile across agricultural subsectors. Both agricultural and non-agricultural capital investments move freely across regions and within the broad non-agriculture sector. The Ethiopian agricultural labor supply is essentially composed of unpaid family labor as most of the agricultural output is produced by small holder farmers. Information from 2004/05 National Labor Force Survey showed that from the total employed population, only 8% were paid workers while the remaining 92% were unpaid family workers and self-employed. Therefore, the supply of labor in the agricultural sector is less responsive to changes in wages in other economic sectors.

The accumulation of capital is through investment financed by domestic savings and foreign inflows. Increased capital is allocated across sectors and regions according to their relative profitability. Once invested, capital becomes sector-specific and can only be adjusted through exogenously-determined depreciation and the attraction of new investments. Incomes from employment accrue to households according to employment and wage data from the household survey. This detailed specification of production and factor markets in the model allows it to capture the changing scale and technology of production across sectors and sub-national regions, and therefore, how changes in the economic structure of growth influences its distribution of incomes.

An important factor determining the contribution of public investment to overall economic growth is its linkages with productivity. The model captures production linkages by explicitly defining a set of nested constant elasticity of substitution (CES) production functions allowing producers to generate demand for both factors and intermediates. Productivity elasticity which help to develop the desired scenario will be calculated from government program that depict how much change in investment brought change in agricultural productivity.

Disaggregation of public expenditure - Public expenditure (G) will be disaggregated between current (CG) expenditure and capital expenditure (IG). Public expenditure will be sector specific.

$$G = CG + IG$$

$$IG = IG_a + IG_i + IG_s + IG_{\dots}$$

Each component will have a fixed share of total capital investment

$$IG_h = \mu_h * IG \text{ with } h = a+i+s+\dots$$

$$\text{Sum of } \mu_h = 1 \text{ and } 0 \leq \mu_h \leq 1$$

These will be the policy parameters envisaged to capture the reallocation of public investment across different production sectors.

In addition, the team will use econometric techniques to estimate the model responsiveness of the different sectors to changes in public investment. The elasticity of productivity in different sectors with regard to changes in public investment will be estimated.

Public expenditure in the form of capital expenditure will be introduced in the production function based on the view that capital expenditure in the economy improves the productivity of other factors of production used to generate output. The production technique will have a nested structure where domestic output is a combination of the different factors of production. Public capital expenditure will be combined with private capital using a CES function. Overall capital will be combined with labor using the same functional form. Land will be an additional factor of production in the agricultural sector.

Gender specifications - CGE modeling is widely used to evaluate the impact of public investment policies. However, few studies adopt a gender-aware approach. In our model, composite labor will be disaggregated by gender and by skill level. The labor market will be segmented into male labor and female labor treated as separate factors of production. This is intended to reflect gender bias in terms of wages and employment opportunities in the Ethiopian labor market, but also, occupational differences. Some sectors are male-intensive and others female-intensive, therefore, a reallocation of public investment will affect women and men differently depending on the factors mentioned above. The proposed equations are available in the Annexe.

Other features of the model - The CGE model also captures forward and backward production linkages between sectors. Import competition and export opportunities are modeled by allowing producers and consumers to shift between domestic and foreign markets depending on changes in the relative prices of imports, exports and domestic goods. More specifically, the decision of producers to supply domestic or foreign markets is governed by a constant elasticity of transformation (CET) function, while substitution possibilities exist between imports and domestically supplied goods under a CES Armington specification. In this way the model captures how import-competition and the changing export opportunities of agriculture and industry can strengthen or weaken the linkages between growth and income.

Incomes from production, trade and employment accrue to different households according to employment and wage data from the household survey. As with production, households are defined at the regional level, and within each region, by rural and urban areas and poor/non-poor categories. Income and expenditure patterns vary considerably across these household

groups. These differences are important for distributional change, since incomes generated by agricultural growth accrue to different households depending on their location and factor endowments. Each representative household in the model is an aggregation of a group of households in the household survey. Households in the model receive income through the employment of their factors in both agricultural and non-agricultural production, and then pay taxes, save and make transfers to other households. The disposable income of a representative household is allocated to commodity consumption derived from a Stone-Geary utility function.

The model makes a number of assumptions about how the economy maintains macroeconomic balance. These ‘closure rules’ concern the foreign or current account, the government or public sector account, and the savings-investment account. For the current account, a flexible exchange rate maintains a fixed level of foreign savings. This assumption implies that the country cannot simply increase foreign debt but has to generate export earnings in order to pay for imported goods and services. While this assumption realistically limits the degree of import competition in the domestic market, it also underlines the importance of the agricultural and industrial export sectors. For the government account, tax rates and real consumption expenditure are exogenously determined, leaving the fiscal deficit to adjust to ensure that public expenditures equal receipts. For the savings-investment account, real investment adjusts to changes in savings (i.e., savings-driven investment). These two assumptions allow the models to capture the effects of growth on the level of public investment and the crowding-out effect from changes in government revenues.

c. Simulations

The study will test two sets of simulations. First, it will explore scenarios that will consider simulations within the ADLI framework maintaining the current sectoral public spending. As proven by our discussions with Officials from the MOFED, the aim of the government is to maintain the ADLI policy strategy and targets through an upgrade of its different components. Hence, the BAU scenario will reflect the functioning of the ADLI policy within its current applications.

The simulations in this first set of scenarios will measure outcomes of an alternative or upgraded form of the ADLI policy. For example, one scenario can consist in an alternative reallocation of public investment, initially allocated for the agricultural sector, between different subsectors or subcomponents of the sector (see section 2).

The ADLI strategy promotes the use of labor-intensive methods to increase output and productivity. This is implemented through applying chemical inputs, diversifying production,

and utilizing improved agricultural technologies among others. An additional scenario could involve a relatively more capital-intensive method.

Overall, the first set of scenarios will explore alternative public investment strategies within the general ADLI policy framework. It will consist in intra-sectoral reallocation schemes.

The second set of scenarios will consist in an inter-sectoral reallocation of public investment. As elaborated in the introduction of this proposal, the services sector has emerged as a prominent source of economic growth in Ethiopia. The service sector has been increasingly contributing to the GDP reaching 43.4 percent of total GDP during the 2007/08 Ethiopian fiscal year while the agricultural sector represented 44.6 % (MoFED). The alternative scenarios will attempt an experiment with government spending distributed differently across targeted sectors.

Moreover, in this set of scenario, we will reallocate public resources towards export oriented sectors. The rationale behind this scenario is based on the current macroeconomic situation that the country experienced. Evidence has shown that Ethiopia faces a recurrent shortage of foreign currency reserves, caused by considerable deficit in the Current Account and Balance of Payments accounts and has significantly affected its capacity to import inputs (fertilizer, raw materials) critical for economic growth. The prevalence of the global financial and economic crisis has worsened the situation. To this end, reallocating resources towards export oriented sectors is expected to improve main macroeconomic indicators.

5. Data Requirements and Sources

The CGE model used in this analysis will be calibrated on a social accounting matrix (SAM) of Ethiopia, based on 2005/2006 data. The EDRI regional SAM is disaggregated in three agro-ecological regions that include moisture sufficient, drought prone and pastoralist area. The moisture sufficient agro-ecological region is further disaggregated into highland cereal-growing area, lowland cereal-growing area and enset-based area. Each agro-ecological region is further splited into five agro-ecological zones based on per capita expenditure. The EDRI 2005 SAM distinguishes 45 activities, 89 commodities, 5 primary factors, 2 household groups, 17 tax accounts as well as aggregate accounts for trade margins, transport margins, government, investment, and the rest of the world.

The second set of data employed in the analysis will be Household Income Expenditure Survey (HIES 2005) and Welfare Monitoring Survey (2004) collected by Central Statistics Authority. The third set is time-series data on public spending on agriculture and other sectors which is archived by Ministry of Finance and Economy Development (MOFED).

6. Consultation and Dissemination Strategy

There was a training workshop organized jointly by EDRI and ESSP aimed at introducing the newly constructed EDRI-SAM and to provide CGE model training by Paul Dorosh¹ and James Throly. During this workshop, the team took the opportunity to introduce this research proposal and undertook discussions on simulation variables, macro closures of the model, and possible implications of the output. The workshop was attended by many participants from different institution including Ministry of Finance and Economic Development (MoFED), Ethiopian Development Research Institute (EDRI), Addis Ababa University (AAU), Ethiopia Strategic Support Program (ESSP), and Ethiopia Economic Association (EEA). This will allow policy makers and other concerned bodies to follow the progress of the study.

As part of a dissemination strategy, the team has held a meeting with experts from the Ministry of Finance and Economic Development (MoFED). During this meeting, the team presented the proposal and received comments from government counterparts regarding the objective of the study, the envisaged methodology, and the policy implications. Particularly, the experts from MOFED gave invaluable insights on how the project can be an input to the new Ethiopian Poverty Reduction Strategy Program (PRSP) and the consideration of the findings in future policy formulation.

The second phase of the Ethiopian PRSP, the Plan for Accelerated and Sustained Development to End Poverty (PASDEP) has been the country's guiding strategy policy framework for the past years. It was designed for a five-year period of implementation and is going to be phased-out in the current Ethiopian fiscal year (2009/2010) ending July 2010. Currently, the third phase of the PRSP is under elaboration by the Ethiopian government. Our discussion held with experts from the MOFED has helped to identify how the study can contribute to this strategy document. During the discussion, it was noted that the findings from the study will be an asset regarding the allocation of public resources to the different economic sectors.

In the course of the research, the team has agreed to work in consultation with policy makers within the MoFED and possibly with other concerned ministries. The team has also proposed to organize a workshop to present preliminary findings to policy makers and academicians to get their feedback and comments which will be incorporated in the final paper.

The proposed dissemination strategy is to present the paper during the eighth International Conference on the Ethiopian Economy, which is organized by the Ethiopian Economic

¹ Senior Research and ESSP program leader at IFPRI

Association. At this conference, Policy makers, academicians and practitioners are presumed to participate. Accordingly, we anticipate that findings of our study will be disseminated and benefit from constructive comments and feedbacks from different participants which will strengthen the paper. For wider audience, we also plan to publish the final paper on one of the peer-reviewed international journals. In consultation with EDRI, it is expected that the findings of the research will be published as an EDRI-ESSP discussion paper.

7. List of team members

The team leader **Lulit Mitik** holds a PhD in Economics specializing in developing countries particularly in the assessment of fiscal and trade policies. She has extensive experience in macro-economic modelling, more specifically Gender Specific Computable General Equilibrium models. In her capacity as a Program Manager at Center for Development Consulting located in Addis Ababa, Ethiopia, she has worked on various development projects in Ethiopia including the Assessment of the Impact of the Global Financial and Economic Crisis in Ethiopia on the real sector and the resulting secondary effects on financial services for the USAID ; the evaluation of the Economic and Human Dimensions of the Financial and Economic Crisis in Ethiopia for the UNDP, the overall implementation of various components of the Protection of Basic Services Project in Ethiopia for the World Bank, the design of components of a Joint Programme for the four Developing Regional States aimed at enhancing public service delivery for the UNDP. In her stay in France, she has developed her expertise in the areas of policy modelling and the evaluation of macro policies, and worked as a consultant and participated in the assessment of Economic Partnership Agreement (EPA) between Central Africa and the European Community. Mrs Mitik has served as a course assistant at the University of Nice-Sophia Antipolis. She has been a visiting researcher and a Post Doctoral Fellow at the Inter-University Center on Risk, Economic Policies and Employment (CIRPEE), Laval University, Québec, Canada, where she learned CGE modeling and produced two research papers in collaboration with Professor Bernard Decaluwé. She is fluent in French, English and Amharic Languages.

Mr. Solomon Lema holds BA in statistics and MSC in economics. He has extensively worked on agricultural and food policy issues in Ethiopia over the three years. Two main themes of his research have been (a) links between food security and functioning of agricultural markets and (b) markets and poverty alleviation programs. He has also experience in research activity that primarily focused on agriculture, rural livelihoods and household food insecurity, and quantitative poverty analysis. In general, his experience extends to areas that include international trade, growth, and poverty. He has also worked in micro-macro modeling particular in General Equilibrium Analysis (CGE) Modeling. Currently, Solomon is working as a researcher at International Food Policy Research Institute (IFPRI), East Africa Regional office, in Market, Trade and Institution Division (MTID).

Mr. Befekadu Behute holds MSc and BA in economics. He has some exposure on macro modeling and has been a member of Macro modeling committee, while he was working at National Bank of Ethiopia. He is expertise in macro and micro issues, including public spending, economic growth and poverty. Currently, he is working as research officer with International Food Policy Research Institute (IFPRI), East Africa Regional office, in Market, Trade and Institution Division (MTID).

8. Expected capacity building

Among the team members, this is the first CGE type research for the youngest researcher (Befekadu) and the third CGE-applying study for the other member (Solomon). This would give them the opportunity to learn rigorously how to use the techniques, from compiling data, modifying model, implementing model, running simulation, interpreting results, correcting errors, and writing the report under the supervision of a senior researcher. These activities are essential for them for future research endeavor.

Team leader: overall responsibility, guidance and supervision over each activity, interfacing with MOFED and other government counterparts, model construction, preparing policy simulations, writing the policy analysis, result interpretation, and other miscellaneous parts of the report.

Solomon Lemma: will be responsible for data compilation, learning model construction, learning to run simulation and interpretation of the results, writing the section on data compilation.

Befekadu Behute: will be responsible for data compilation, model construction, learning to run simulation and interpretation of the results, writing the section on theoretical model structure, learning to write result interpretation.

9. Any ethical, social, gender or environmental issues or risks that should be noted

No noteworthy risk

10. List of past, current or pending projects in related areas involving team members

- Behute, B (2009), “The impact of the global financial crisis: macro and household level analysis in Ethiopia”, funded by WFP

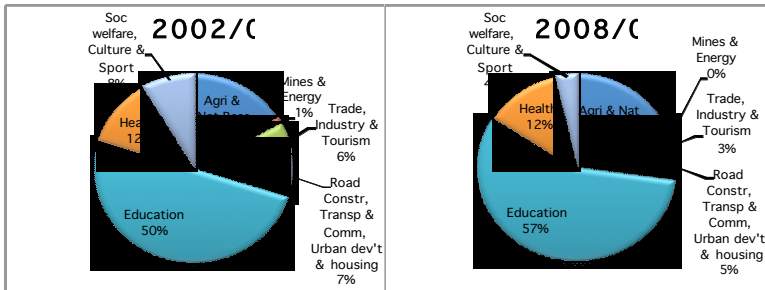
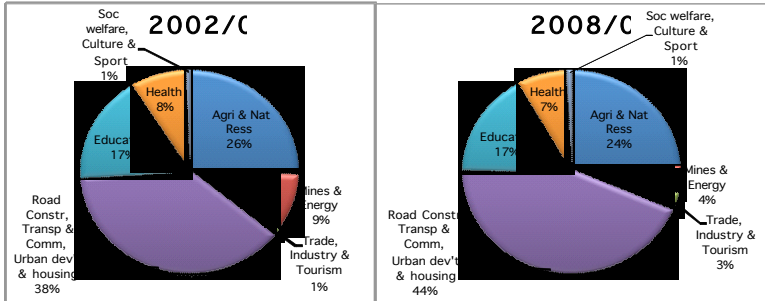
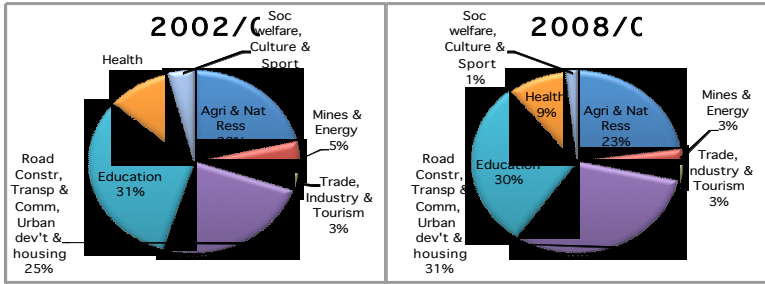
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- Mitik, L. et al (2010), Review of the Ethiopian Financial Sector in the Context of Economic Development, USAID Ethiopia, WTO Accession Plus Project
- Mitik, L. et al (2009), Piloting Social Accountability in Ethiopia: Analytical Report with Case Studies, Protection of Basic Services-Ethiopian Social Accountability Project, GTZ International Services
- Mitik, L. et al (2009), Joint Programme in Afar, Benishagul Gumuz, Gambella and Somali Regional States to Enhance Public Services Delivery and Accelerate Regional Development, UNDP Ethiopia
- Mitik, L. and B. Decaluwé (2008), “The impact of trade on female labor and girls’ education in South Africa: a CGE analysis”, paper prepared for the Fourth International conference hosted by UNICEF and the New School (New York, April 21 to 23, 2008) and the Eleventh Annual GTAP Conference on Global Economic Analysis (Helsinki, June 12 to 14, 2008)
- Mitik, L. (2007), Gender, public policies and women’s work. A computable general equilibrium analysis: the case of South Africa and Ethiopia, PhD dissertation, Université de Nice – Sophia Antipolis

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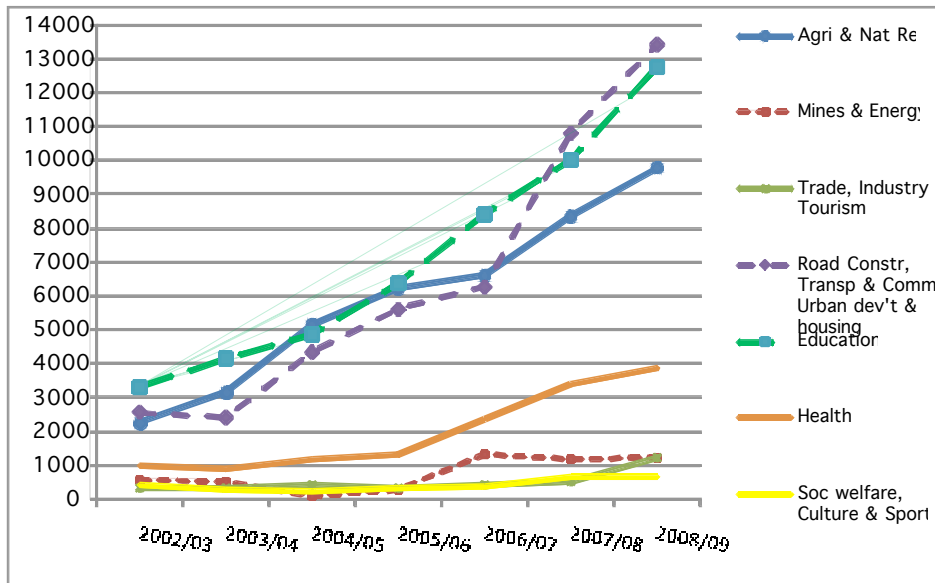
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Annexes

Annex I



Annex II Sectoral share of public spending: Total expenditure trend (2002/03-2008/09, Million Birr)



Annex III Gender dimensions of the model: proposed equations

Labor market structure

$LD_{i,t} = A_{-g_i} \left[\alpha_{-g_i} LDfem_{i,t}^{-\rho_{-g_i}} + (1 - \alpha_{-g_i}) LDmal_{i,t}^{-\rho_{-g_i}} \right]^{\frac{-1}{\rho_{-g_i}}}$		$LDfem_{i,t} = \left(\frac{\alpha_{-g_i}}{1 - \alpha_{-g_i}} \right)^{-g_i} \left(\frac{wmal_{i,t}}{wfem_{i,t}} \right)^{\delta_{-g_i}} LDmal_{i,t}$	
$LDfem_{i,t} = A_{-fq_i} \left[\alpha_{-fq_i} LDfemq_{i,t}^{-\rho_{-fq_i}} + (1 - \alpha_{-fq_i}) LDfemmq_{i,t}^{-\rho_{-fq_i}} \right]^{\frac{-1}{\rho_{-fq_i}}}$		$LDfemq_{i,t} = \left(\frac{\alpha_{-fq_i}}{1 - \alpha_{-fq_i}} \right)^{-fq_i} \left(\frac{wfemmq_{i,t}}{wfemq_{i,t}} \right)^{\delta_{-fq_i}} LDfemmq_{i,t}$	
$LDmal_{i,t} = A_{-mq_i} \left[\alpha_{-mq_i} LDmalq_{i,t}^{-\rho_{-mq_i}} + (1 - \alpha_{-mq_i}) LDmalnq_{i,t}^{-\rho_{-mq_i}} \right]^{\frac{-1}{\rho_{-mq_i}}}$		$LDmalq_{i,t} = \left(\frac{\alpha_{-mq_i}}{1 - \alpha_{-mq_i}} \right)^{-mq_i} \left(\frac{wmalnq_{i,t}}{wmalq_{i,t}} \right)^{\delta_{-mq_i}} LDmalnq_{i,t}$	
$w_{i,t} = \frac{wmal_{i,t} LDmal_{i,t} + wfem_{i,t} LDfem_{i,t}}{LD_{i,t}}$		$wfem_{i,t} = \frac{wfemq_{i,t} LDfemq_{i,t} + wfemmq_{i,t} LDfemmq_{i,t}}{LDfem_{i,t}}$	
		$wmal_{i,t} = \frac{wmalq_{i,t} LDmalq_{i,t} + wmalnq_{i,t} LDmalnq_{i,t}}{LDmal_{i,t}}$	
$LSTfemq = \sum LDfemq_i$		$LSTfemmq = \sum LDfemmq_i$	
		$LSTmalq = \sum LDmalq_i$	
		$LSTmalnq = \sum LDmalnq_i$	

Household Income

$YH_{h,t} = \epsilon_{-wfemq_h} wfemq_{i,t} \sum LDfemq_{i,t} + \epsilon_{-wfemmq_h} wfemmq_{i,t} \sum LDfemmq_{i,t} + \epsilon_{-wmalq_h} wmalq_{i,t} \sum LDmalq_{i,t} + \epsilon_{-wmalnq_h} wmalnq_{i,t} \sum LDmalnq_{i,t}$ <p>+ other</p>

Variable and parameter definition

Wfem	aggregate female wage rate	LDfemq	unskilled female labor demand
Wmal	aggregate male wage rate	LDmalq	skilled male labor demand
wfemq	skilled female wage rate	LDmalnq	unskilled male labor demand
wfemmq	unskilled female wage rate	LSfemq	skilled female labor supply
wmalq	skilled male wage rate	LSfemmq	unskilled female labor supply
wmalnq	unskilled male wage rate	LSmalq	skilled male labor supply
LDfem	female labor demand	LSmalnq	unskilled male labor supply
LDmal	male labor demand	YH	Household income
LDfemq	skilled female labor demand		
λ_{-wmalq}	Share of skilled male labor income received by household	$\lambda_{-wmalnq}$	Share of unskilled male labor income received by household
λ_{-wfemq}	Share of skilled female labor income received by household	$\lambda_{-wfemmq}$	Share of unskilled female labor income received by household
A ₋	Scale parameter (CES function)	α_{-}	Share parameter (CES function)
ρ_{-}	Substitution parameter (CES function)	δ_{-}	Substitution elasticity (CES function)