

## Impacts of Trade Liberalization on Growth and Poverty in Ethiopia: Dynamic Computable General Equilibrium Simulation Model

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### Abstract

*To investigate the impacts of trade liberalization in Ethiopia, the paper uses a dynamic Computable General Equilibrium model that allows for quantification of income and welfare effects stemming from tariff reduction. The 1990/2000 Social Accounting Matrix (SAM) is fitted into the model and we simulated alternative policies scenarios depicting full and indiscriminating liberalization, gradual and rationalized liberalization and instantaneous tariff liberalization. The main finding of these scenarios is a decline in poverty among all households in the long run. In the short run, poverty remains significantly unaffected for most of the simulations' scenarios. The simulations' results show that static version of the model underestimates trade liberalization's impacts on production, and welfare, since it excludes the accumulation effects. However, from the alternative simulations' scenarios, instantaneous type of liberalization seems performing well in its capacity to increase real GDP, welfare, real output, and real export in the long run. This liberalization also records substantial decline in poverty level in the long run.*

**Keywords:** Dynamic CGE Model, Trade Liberalization, Poverty, Growth

**JEL Classification:** F, F1, F10 and F13

### 1. Introduction

The links between trade reform and poverty are diverse and complex. In developing countries, the poor households whose income falling below the poverty line share common broad features: they are generally concentrated in rural (subsistence) agricultural and in urban informal sectors ;they have limited assets, the most abundant of which is low skilled labor and food is by far the most important item of their expenditure . Both the direct and indirect effects of trade liberalization on the poor are then connected with the impact on poverty profile.

Trade reform works directly through the transmission of price signals. If it increases the price of something that poor household sells ( unskilled labor) or if it forces down the price of something the poor household consumes (goods, services), then it will increase the real income of the poor household and push more poor from below to above poverty line. Economic growth is the indirect channel through which free trade could contribute to poverty alleviation. Indeed, trade liberalization was an integral part of the structural adjustment program that has been adopted by Ethiopia in 1992. According to World Bank (1991), trade liberalization encompasses structural reforms that denote both import tariff and export tax. Such reforms aim to improve resource allocation in the long run. As part of trade liberalization program, the new government has embarked on comprehensive trade reform programs which were aimed at dismantling qualitative and quantitative restrictions and gradually reducing the level and dispersion of tariff rates. Since 1992, a more than hundred percent of devaluation of the Ethiopian birr was an important step in this reform process.

Besides the market oriented reform - initiatives also have taken to facilitate private sector participation in export trade and perhaps the two major reforms implemented to achieve this objective were the dismantling of government monopoly in coffee trade and abolishing the mandatory approval requirement for export contracts by National Bank of Ethiopia (NBE). Another measure to support exports has been the introduction of foreign exchange retention scheme allowing exporters to retain parts of their foreign exchange earning /proceeds. At present, exporters are allowed to retain 10% of export proceeds without a time limit. Other measures to assist exporters include a bonded manufacturing warehouse scheme and an import duty rebate scheme aimed at providing exporters of manufactured imported inputs at world prices.

The government also reforms the import and export process from two steps (obtain registration of certificate and apply to business license) into a single step. The government tries to encourage exports through export credit guarantee scheme, export promotion agency and demand driven support system. However, the legal and regulatory environment for trade and investment hinder the country's attempt toward free market regime. Weak legal and regulatory environment results in high transaction costs. It reduces both investment return and gains from trade. High transaction cost reduces the Ethiopian products competitiveness in international markets. Nevertheless, there are still hot debates about the benefits of trade liberalization.

Trade liberalization can stimulate economic growth of African economies ( Sahn et al.,1996; Gisselquist and Marie,2000) while others maintained that trade liberalization may not provide positive contributions to long run growth of African economies (DeMaio et al.1999; Badiane,1999; Minot, 1998; Rattso and Torvik, 1998). Winters (2000) argued that trade liberalization is an ally against poverty since it tends to increase average incomes, and providing more resource to tackle poverty.

According to the Global economic prospects (2002), in developing countries, trade liberalization policies are hard to formulate and implement because the magnitude and distributional impacts tend to be very large. Since tax instruments are usually lacking and administrative capacity tend to be very limited, redistribution of the total gain would be cumbersome. Under partial equilibrium, many researchers (e.g. Wacziarg and Welch, 2008; Dollar and Kraay, 2003; Greenaway et al., 2002; Rodrik et al., 2004) found that persistent liberalization had momentous and strong impact on growth. However, the major problem in these studies is that there is no undisputed means of measuring trade liberalization. Trade openness was used as measure of liberalization but it is endogenous and cannot capture trade policy instruments. Average tariff underestimates trade restrictiveness as argued by Kee et al. (2009). The Sachs and Warner index(1995) heavily relies on black markets premium. Researchers that used general equilibrium analysis were Ayele(2002) for Ethiopia; Francisco and Jorge (2003) for Brazil and Ravallion(1997) for Bangladesh. However, empirical results were mixed. Latin American countries and others have experienced an increase in wage dispersion while East Asian countries have observed improvement in income inequality after their trade reforms (Wood, 1999).

However, the main limitation of these studies is that they ignore the dynamic effect of capital accumulation in trade-poverty linkage. Since the consequences of most policy reforms are dynamic in nature, application of dynamic CGE is very scarce in developing countries. The first motivation for this study comes from the ongoing debate with regard to the impacts of economic reform on long term growth and poverty in Africa. Secondly, there is no research work that analyzed the impact of trade liberalization on poverty in Ethiopia using Dynamic Computable General Equilibrium (DCGE) model. The paper finds that trade liberalization boosts economic growth and reduces poverty in the long run while it has small effects in the short run. The paper is structured as follows. Section one provides model specification and data. Section two presents empirical result and discusses the results. Section three concludes.

## **2. Specification of Computable General Equilibrium model**

This section provides detailed specifications of the applied CGE model, reporting on all variables and parameters and equations used. The quantity equations which describe production and value added generation are presented. This is followed by the block of income and expenditure equations that describe the distribution of factor incomes and the associated budget constraint. Foreign trade, saving – investment, price block and system constraints and macro closures will also be shown. For sake of brevity, the time dimension for each equation is omitted but will be introduced only when necessary.

### **Production Block**

On the production side, multistage production function is adopted. In the first stage, sectoral output is a Leontief function of value added and intermediate consumption. Value added is in turn represented by a Constant Elasticity of Substitution(CES) function of labour and capital in non agricultural sectors (industry and services), and CES function of land and composite factor in agriculture. The composite factor is also represented by a CES function of primary factors: agricultural capital and labour. The labour market is assumed to be fully mobile between activities. Capital stock, on the other hand, is sector specific and is fixed in the short run.

The production function can be written as:

$$QA_a = f(LD_a, KD_a, LAN, QINTA_a) \dots \dots \dots (1)$$

Where  $QA_a$  is output of production in activity  $a$ .  $LD_a$  and  $KD_a$  are labour demand and stock of capital demand in each activity respectively.  $LAN$  is demand for land in agricultural sector. In this model, three activities have been identified. These include agriculture, industry and service. Value added in agriculture is produced using three factors of production, namely labour, capital and land. Value added in industry and service sector constituted labour and capital. For each activity, the quantity of value added is a CES function of disaggregated factor quantities.

A profit maximizing firm under perfect competition demand factors at a point where marginal cost of each factor is equal to the marginal revenue product (net of intermediate input costs) of the factors. Having taken the first order condition given the constraints, the demand for labour will be:

$$LD_a = \left[ \left( \frac{\alpha_a}{1 - \alpha_a} \right) \cdot \left( \frac{RK_a}{RL_a} \right) \right]^{\frac{1}{(1 + \rho_a^{KL})}} \cdot KD_a \dots\dots\dots(2)$$

Where,  $RK_a$  = return to capital in sector  $a$  ;  $RL_a$  = return to labour (wage rate) in sector  $a$

$\rho_a^{KL}$  = a transformation of elasticity of factor substitution

$\alpha_a$  = efficiency parameter in the CES value – added function

For each activity, the demand for disaggregated intermediate inputs is determined via a standard Leontief function as aggregate intermediate input times fixed intermediate input coefficients.

**Income and saving Block**

The income equation block specifies the factor payments of the economy and their distribution to households and other institutions as well as tax payments, savings, remittances, and other foreign payments. Thus, the income  $YH_h$  for household group  $h$  and income  $YX_x$  for firm group  $x$  can be written respectively as:

$$YH_h = \lambda_h \cdot RL \cdot \sum_a LD_a + TGH_h + TROWH_h \cdot EXR + DIV_h + \sum_h THH_{hh} \dots\dots\dots(3)$$

$$YM_x = \lambda_x^k \cdot RK \cdot \sum_a KD_a + \lambda_x^l \cdot LR \cdot LAN \dots\dots\dots(4)$$

Where,  $YH_h$  is income of household  $h$  ;  $DIV_h$  is dividend from firm  $x$  to household  $h$ ;  $TGH_h$  is transfers from Government to household;  $TROWH_h$  is transfers from rest of the world to household  $h$  ;  $THH_{hh}$  is an intra-household transfer;  $YX_x$  is income of firm  $x$ . Households are assumed to save a fixed proportion of their disposable incomes. Household’s savings shall be translated directly into demand for investment goods. The government obtains its revenue from a wide range of taxes and transfers coming from the rest of the world. Its expenditure is allocated between the consumption of goods and services (including public wage) and transfers. The government income ( $YG$ ) can be written as:

$$YG = \sum_h ty_h \cdot YH_h + EXR \cdot TROWG + \sum_x try_x \cdot YM_x + \sum_{cm} TIM_{cm} + \sum_{ce} TEX_{ce} \dots\dots\dots(5)$$

Where,  $TROWG$  is the rest of world transfers to government. Import and export tariffs equations represented by  $TIM_{cm}$  and  $TEX_{ce}$  respectively shall take the following form:

$$TIM_{cm} = txm_{cm} \cdot EXR \cdot PWM_{cm} \cdot QM_{cm} \dots\dots\dots(6)$$

$$TEX_{c\theta} = tex_{c\theta} \cdot EXRPWE_{c\theta} \cdot QE_{CE} \dots\dots\dots(7)$$

Government saves the remaining part of the income after deduction of transfers (to households and the rest of the world) and expenditure (government consumption and government investment). Domestic savings depend on firm and household-specific marginal propensities to save. Total investment shall be equal to total savings which is defined as the sum over households and enterprises savings, and foreign savings in local currency. Thus, the saving investment balance is:

$$\sum_x SX_x + \sum_h SH_h + SG + EXR \cdot BC = \sum_c PQ_c \cdot QINV_c + WALRAS \dots\dots\dots(8)$$

Where,  $QINV_c$  is the quantity of investment on commodity  $c$ . The variable WALRAS is added in the above equation to satisfy that the numbers of equations are equal to the number of variables. Finally, the demand block equations contain households' group demand, total demand by commodity, total intermediate demand and the total government demand.

**Foreign trade; Price Block and Sequential Dynamics**

Given the fact that there are differences in the quality of goods produced for exports and for domestic consumption, following Dervis et al (1982), a constant elasticity of transformation (CET) function between domestically consumed good,  $QD_{ce}$  and exported goods  $QE_{ce}$  is adopted.

$$QX_c = f^{CET}(QE_{ce}, QD_{ce}) = \sigma_{ce}^t \left[ \delta_{ce}^t \cdot QE_{ce}^{\rho_{ce}^t} + (1 - \delta_{ce}^t) \cdot QD_{ce}^{\rho_{ce}^t} \right]^{\frac{1}{\rho_{ce}^t}} \dots\dots\dots(9)$$

$QX_c$  is aggregate marketed production.  $\sigma_{ce}^t$  and  $\delta_{ce}^t$  are the shift and share parameter respectively and  $\rho_{ce}^t$  is the exponent parameter in the CET function. Maximizing revenue from a given output, subject to equation (9) yields the export supply function as:

$$QE_{ce} = QD_{ce} \left[ \frac{PE_{ce}}{PDD_{ce}} \cdot \frac{1 - \delta_{ce}^t}{\delta_{ce}^t} \right]^{\frac{1}{\rho_{ce}^t - 1}} \dots\dots\dots(10)$$

This specification of export supply works under the small country assumption in which the national export volume has no influence on world market prices. In addition, there is imperfect substitutability between domestic and imported goods ( Devarajan et al, 1995; Armington, 1969). The import domestic demand ratio:

$$\frac{QM_{cm}}{QD_{cm}} = \left[ \frac{PDD_{cm}}{PM_{cm}} \cdot \frac{\delta_{cm}^q}{(1 - \delta_{cm}^q)} \right]^{\frac{1}{\rho_{cm}^q + 1}} \dots\dots\dots(11)$$

Where,  $PDD_{cm}$  and  $PM_{cm}$  are the prices of domestic output and import respectively.  $PDD_{cm}$  is endogenously determined in the model. The balance of payments equation requires total payment for imports to be equal to total receipt for exports plus foreign savings and borrowing.

$$\beta C = \frac{1}{EXR} \left( \sum_h THROW_h + TGROW \right) + \sum_{cm} PWM_{cm} \cdot QM_{cm} - \sum_h TROWH_h - TROWG - \sum_{ce} PWE_{ce} \cdot QE_{ce} \dots\dots(12)$$

Where,  $\beta C$  is current account balance and  $EXR$ , is exchange rate.  $THROW_h$  and  $TGROW$  are transfers from households and governments to rest of world respectively. The current account balance, which is expressed in foreign currency, imposes equality between the country's spending and its earning of foreign exchange. For the basic model version, foreign savings is fixed; the real exchange ( $EXR$ ) serves the role of equilibrating variable to the current account balance.

The price system of the model is rich. For instance, the domestic price of imports is exogenously determined and is linked in world prices in dollars as:

$$PM_{cm} = PWM_{cm} \cdot EXR (1 + txm_{cm}) \dots\dots\dots(13)$$

Where,  $PWM_{cm}$  C.I.F. import price in foreign currency units.  $txm_{cm}$ , is import tariff rate. In addition, the consumer price index is defined as the geometric average of consumer prices using consumption share weights. Following, Annabi et al. (2004), in every period, the capital stock is updated with a capital accumulation equation in sequential dynamic model (involving the rate of depreciation ( $\delta$ ) and investment (  $Qind_{a,t}$  )).

$$KD_{a,t+1} = (1 - \delta) KD_{a,t} + Qind_{a,t} \dots\dots\dots(14)$$

New investment will be distributed between different sectors through an investment demand function which takes the form as:

$$\frac{QInd_{a,t}}{KD_{a,t}} = y_{1a} \left( \frac{RK_{a,t}}{U_t} \right)^2 + y_{2a} \left( \frac{RK_{a,t}}{U_t} \right) \dots\dots\dots(15)$$

Where  $U_t$  is the user cost. Finally, the equivalent variation for the household groups could also be written as:

$$EV_{h,t} = Pr od \left[ C, \left( \frac{PQO_c}{PQ_{c,t}} \right)^{\beta_{c,h}} \cdot EH_{h,t} \right] - EH0_h \dots\dots\dots(16)$$

Where,  $EV_{h,t}$  is the equivalent variation for household  $h$  at time  $t$  and  $EH0_h$  is initial consumption expenditure for household  $h$ ;  $PQO_c$  is the initial composite price of commodity  $c$ .

**2.1 Data**

The 1999/2000 Social Accounting Matrix (SAM) used in this study is a secondary data prepared by the World Bank for Ethiopia. The paper uses 17,336 households obtained from the Central Statistical Authority’s consumption and expenditure survey. SAM records the transactions taking place in an economy during a specified period of time and integrates national income, input-output, flow-of funds, and foreign trade statistic into a comprehensive and consistent data set. Our SAM is a 40x40 matrix and contains 12 production activities and 4 factors of production, 10 institutions, eight commodities, transaction cost, and public investment, saving - investment and three tax accounts and rest of world account. To apply a CGE model, the 12 activities are aggregated into 3 broad activities groups such as industrial, agricultural and services activities. In addition, some institution accounts such as food for work project, food aid program accounts are aggregated into government account. Finally, the public investment is added into saving - investment account. Hence, the disaggregated SAM consists of only 26 accounts. Commodities types identified in the SAM include food crops, traditional agricultural exportables, non-traditional agricultural exportable, other agricultural products, agro manufacturing and industrial products; public goods and other services. Factors typically include labour, capital and land while enterprises consist of private, public and peasant households.

**3. Simulation Results and Discussions**

In static CGE model, counterfactual analysis is made with respect to the base run that is represented by an initial SAM. However, in dynamic models the economy can grow even without a policy shock and the analysis should be done with respect to the growth path in the absence of any shock. In all simulation scenarios the percentage variation between the Base as Usual (BaU) path and the after simulation path for each variable could be presented just to examine whether trade liberalizations enhance capital accumulation effect in the long run. To analyze poverty, Foster, Greer, and Thorbecke (FGT) classes of poverty measures have been used. In addition, in order to capture whether the change in poverty would be a result of growth or redistribution effect, we use the approach developed by Datt and Ravallion (1992). According to these authors changes in poverty measures can be decomposed in to growth and distribution components.

**Poverty and distributional effects of unilateral trade liberalization**

In this section, a complete unilateral trade liberalization policy on industrial and services commodities has been made. For comparison, the 2000 poverty level and the simulation poverty level (from the experiment) and trend values (base line) would be presented. The paper presents the baseline values (trend values) and values from the experiment (simulation values) from 2001 till 2019 and the series of the two values can be compared to analyze the gain from trade liberalization.

**Table 1: Poverty status of households from 1999/2000 household survey (%)**

Household group	Poverty incidence	Poverty gap	Poverty severity	Proportion	Absolute contribution	Relative contribution	gini
Farm households	56.60	18.13	7.80	41.16	23.30	50.50	33.50
Wage-earners	36.56	10.83	4.45	33.80	12.36	26.81	39.50
Entrepreneurs	41.73	11.93	4.72	25.03	10.45	22.65	36.70
Absolute contrib.	46.10	14.10	5.90				

From the above table, we can see that the highest poverty indices are found in the farm-households group (56.6%). This indicates that poverty is a rural phenomenon as most of them live in rural area of the country. The relative contribution of these households to total poverty is amounted to 23.3 percent. The wage -earners have the lowest poverty indices among the three households groups mentioned above. As shown in table.1, 46.1 percent of the population is under poverty line. According to MOFED (1999/2000), the poverty line is stood at birr 1075.00 per adult equivalent. This is considered as an absolute poverty line. The poverty gap ratio is a good indicator of poverty since it measures the extent to which the income of the poor is fall-apart away from the poverty line. It gives more weight to the poorest of the poor households. The above table indicates that poverty gaps are also highest among farm-households followed by the entrepreneurs. This means that for each unit of birr under the poverty line, on the average, the poor farm household need to have 0.183 birr per a birr poverty line and per population to come out from poverty. The lesser the poverty gap, the lesser the amount of money required to completely remove poverty. As shown above, both the poverty gap ratio and poverty severity would be lower for the wage-earners.

After implementing shock on CGE model, the change in income of the representative households was used to analyze poverty effects of tariff liberalization. Its effect on poverty level is said to be positive only if the values of poverty indicators are lower as compared to both the trend scenario and base line poverty. Table 2 shows the evolution of poverty on Base as Usual (BaU). If there is no external shock; the long run national poverty headcount ratio will be 18.35 percentage points. In other words, the long run national headcount poverty ratio declines by 27.8 percent as compared to the base poverty level. Since capital accumulation starts after first year, the short run results of trend scenario and the base run values are same for all variables.

**Table 2: BaU Scenario of Poverty and inequality**

	Farm households		Wage earners		Entrepreneurs		All	
	2000	2019	2000	2019	2000	2019	2000	2019
Headcount ratio	56.60	23.39	36.56	15.40	41.73	14.03	46.10	18.35
Poverty gap	18.53	5.50	10.83	3.59	11.93	2.93	14.10	4.20
Poverty severity	7.80	1.90	4.45	1.30	4.72	0.92	5.90	1.43
Gini	-	-	-	-	-	-	37.78	37.52

The first simulation consists of a complete reduction in tariff on both imported items of industrial and service sectors commodities .This reduces poverty in the long run but it has no significant effect on the short run.

### **Simulation 2: Full and Indiscriminating Liberalization.**

In this simulation, we remove all tariffs on imports. This type of liberalization is indiscriminating as we have not made any distinction among industrial, service and agricultural imported commodities in terms of tariff protection. As table 3 illustrates, the national headcount ratio by 2019 will be only 16.9% while the poverty gap is estimated to 3.8%. As compared to the base, the long run national headcount ratio is reduced by 29.7 %. Similarly, the poverty gap ratio is also reduced by 10.5 %.

In the long run, the net national headcount ratio declines by 1.42 percent as compared to the trend.

This means tariff liberalization would enhance capital accumulation effects and thereby increase the income of the households by more than the increase in income if the economy is operating without any shock. This increase in national income may also be associated with absence of inefficiency in resource allocation created by the tariff itself. However, tariff reduction would not have significant impact on poverty level in the short run. The study found that trade liberalization would not increases both inter - group inequality and national level of inequality in the long run and short run.

**Table 3: Poverty indices in full and indiscriminating liberalization**

	Farm households		Wage earners		Entrepreneurs		All	
	2001	2019	2001	2019	2001	2019	2001	2019
Headcount ratio	56.61	22.21	37.89	14.74	41.98	11.2	46.62	16.93
Poverty gap	18.13	5.12	11.38	3.41	12.06	2.2	14.33	3.81
Poverty severity	7.79	1.76	4.76	1.18	4.78	0.66	6.01	1.29
Gini	-	-	-	-	-	-	37.66	37.6

### Simulation 3: Instantaneous Liberalization

In this simulation, complete tariff reduction has been made on industrial and service sectors accompanied by a 90 percent reduction in tariff for agricultural sectors and results are presented in table 4. In this scenario, the entrepreneurs would enjoy higher benefit in the long run (year 2019). The head count ratio declines from 14 percent in the trend scenario to 8 percent for entrepreneurs. However, the wage earners do not get much benefit in the long run. The reason may be associated with the fact that the wage earners heavily depend on industrial and service sectors for their employment. With trade liberalization, some of these incompetent sectors are unable to cope up with the reduction in import price. In general, the long run impact of tariff liberalization on the national headcount ratio is a decline of 2.8 percent as compared to the headcount ratio in the trend

**Table 4: Poverty indices in Instantaneous liberalization**

	Farm households		Wage earners		Entrepreneurs		All	
	2001	2019	2001	2019	2001	2019	2001	2019
Headcount ratio	56.60	21.78	34.85	13.46	41.49	8.156	45.47	15.55
Poverty gap	18.10	5.02	10.11	3.10	11.83	1.44	13.85	3.48
Poverty severity	7.79	1.72	4.13	1.05	4.67	0.41	5.77	1.17
Gini	-	-	-	-	-	-	37.94	37.94

Similarly, the poverty gap ratio and poverty severity also showed a net decline of 0.5 and 0.26 percent respectively as compared to the trend scenario. This shows that tariff liberalization would enhance the accumulation effects in the very long run. But, its short run effect is negligible.

### Simulation 4: Gradual liberalization

Under this scenario, tariffs on all imported goods are reduced by 20 percent each year over the next 19 years. In this simulation, the national headcount ratio and poverty gap and poverty severity in the short run would remain the same as the base level poverty. However, in the long run, tariff liberalization would reduce the poverty headcount ratio, poverty gap, and severity from 18.4, 4.2, and 1.4 percent in the trend to 16.8, 3.8 and 1.3 percent respectively in the current scenario.

### Simulation 5: Gradual and rationalized liberalization

In this type of liberalization, agriculture is allowed to reduce its tariff rate for the first 10 years by 20 percent. After 10 years, there would be a complete liberalization in the sector. Similarly, since the industrial sector is initially more protected (average tariff rate is as high as 25 %,) we assume a 50 percent reduction in tariff rate for the first 10 years and then after a complete liberalization for the remaining years. Moreover, the service sector is allowed to reduce its tariff rate by 50 percent instantaneously. A joint effect of such liberalization indicates that the three national poverty indicators almost remain unchanged in the short run.

**Table 5: Poverty Indices in Gradual and Rationalized Liberalization**

	Farm Household		Wage Earner		Entrepreneurs		All	
	2001	2019	2001	2019	2001	2019	2001	2019
Headcount Ratio	56.60	22.03	36.08	13.68	43.27	11.15	46.3	16.48
Poverty Gap	18.13	5.07	10.62	3.15	12.40	2.18	14.17	3.70
Poverty severity	7.79	1.74	4.38	1.08	4.98	0.65	5.93	1.24
Gini	-	-	-	-	-	-	37.8	37.68

But, in the long run, the national headcount ratio declines from 18.4 percent in the trend to 16.5 percent in the simulation. Similarly, the long run poverty gap and squared poverty gaps are decreasing as compared to the trend. In all households, poverty indicators fall down with substantial decline in poverty among entrepreneurs.

### FGT decomposition into Growth and Redistribution

From the above alternative scenarios, 90% tariff reduction in agricultural sector and complete liberalization of industrial and service sectors substantially reduce poverty in the long run. Thus, it is better analyzing the impacts of this liberalization as to whether it enhances growth or redistribution effects in the long run. This analysis should be made with respect to variations in poverty indices of the trend scenario and results are indicated in table 6.

**Table 6: Decomposition of the BaU and Simulation paths of Poverty Changes**

	Growth components (Datt and Ravallion)	Growth component (Shapley)	Distribution component (Datt and Ravallion)	Distribution component (Shapley)	Residual (Datt and Ravallion)	Differences
<b>(a) BaU</b>						
head count ratio	-27.34	-27.42	-0.25	-0.33	-0.16	-27.75
Poverty gap	-9.81	-9.76	-0.19	-0.17	0.10	-9.90
Poverty severity	-4.43	-4.40	-0.10	-0.07	0.07	-4.47
<b>(b) Simulation</b>						
head count ratio	-31.04	-30.86	0.14	0.317	0.357	-30.55
Poverty gap	-10.77	-10.79	0.18	0.16	0.04	-10.63
Poverty severity	-4.81	-4.84	0.141	0.104	0.072	-4.74

In the trend scenario, the poverty headcount ratio falls from 46.1 in the base to 18.35% in 2019, a net reduction of 27.7 percent. Complete trade liberalization in the industry and service sectors and a 90% reduction in tariff in agricultural sector reinforce poverty reduction. The national headcount ratio declines from 46.1% in the base to 15.5% in the long run with a net reduction of 30.55%. All this reduction is attributable by growth component. Indeed, growth would have reduced the headcount ratio by 31.04 percentage point had it not been for a deterioration in income distribution that actually increased the headcount ratio by 0.14 percentage point. Trade liberalization strengthens the pro-poor growth effect and at same time the anti-poor increases in inequality. Similar trends are also observed for the two other FGT indices. Regardless of the choice of the poverty lines, the growth component always reduces poverty and distribution become neutral. Finally, the study endogenizes the poverty line. In the short run, there are no significant changes in poverty indices. However, trade liberalization results in a substantial poverty reduction generated from both income and price effect in the long run. The study also computed growth elasticity of poverty. As income of households increase by one percent, the national headcount ratio declines by 1.4 percent.

### Welfare effects

Regarding the impacts on household welfare, results are reported for instantaneous liberalization. Since factor remuneration is the main source of income for households, an increase in income is observed over the long run. However, the short run factor remuneration for all households almost remains unchanged. As shown in table 7, consumer price index (1.15 percent) increases more than income (0.58 percent) leading to a decline in real consumption and welfare for all households in the short run. Real consumption and equivalent variation slightly decrease by 0.68 and 0.57 percent respectively in the short run. However, entrepreneurs are more affected than farm households and wage-earners. This result may be explained by the net buyer status of entrepreneurs. In the long run, the combined income and price effect leads to positive variation in real consumption and welfare. The equivalent variation increases by 11.7%, 12.9% and 25% percent for farm households, wage earners and entrepreneurs respectively. The relatively higher gain in terms of real consumption and equivalent variation for the entrepreneurs may be explained by an increase in labour and capital income in the long run owing to trade liberalization. At national level, real consumption and welfare increase substantially by 19.5 and 14 percent respectively.

**Table 7: Welfare Effects (Percentage change from BaU Path)**

	Farm households		Wage-earners		Entrepreneurs		All	
	2001	2019	2001	2019	2001	2019	2001	2019
Income	0.00	4.01	2.88	6.70	0.32	28.9	0.58	8.40
Real consumption	-0.58	12.80	-0.23	17.20	-2.90	42.30	-0.68	19.50
Welfare(EV)	-0.54	11.70	0.23	12.90	-1.60	25.01	-0.57	14.01

### Sectoral effects of Unilateral trade Liberalization

The main determinants of trade liberalization effects are the values of trade elasticities, the share of imports and exports, the cost of inputs, and the general equilibrium effects of supply and demand. The domestic distortion caused by the tariff might lead to less efficient factor reallocation between sectors.



Changes in import prices affect the composite good price, factor demands and remunerations, and the value-added price. In dynamic model, both the efficiency and the accumulation effects are mainly driven by the disposable saving and profitability of investing. For instantaneous liberalization, sectoral effects are presented in table 8. The shock of tariff elimination leads to first a decrease in domestic price of imports. It is found that the greatest reduction is in industrial sectors, which had high initial tariff rates (25 percent). The average initial tariff rate in this sector is two-fold of the tariff rate in the service sector. The fall in import price in the sector is amounted to 9 percent in the short run. Similarly, the long run import price reduced significantly with 21 percentage point in the same sector. The long run import price has also gone down to 13.8 percent and 12.7 percent respectively in agriculture and service. The fall in domestic prices and initial import penetration ratios will influence the sectoral import demand changes. In the short run, the industrial and service sector registered higher import growth due to the decline in import price. Furthermore, we note a decline in domestic demand in all sectors in the short run. However, pronounced decline in domestic demand (6.8%) is found in industry as it was initially more protected sector. In table 8, SIM represents the simulated outcomes with shocks (change in tariff).

**Table 8: Sectoral effects (percentage change from base)**

	Agriculture			Industry			Service		
	2001 (SIM)	2019 (SIM)	2019 (Trend)	2001 (SIM)	2019 (SIM)	2019 (Trend)	2001 (SIM)	2019 (SIM)	2019 (Trend)
Import price	-0.10	-13.80	1.80	-8.90	-21.40	1.80	1.20	-12.70	1.80
Domestic price	-1.87	-7.90	-4.30	11.60	10.40	4.20	-13.50	14.40	42.20
Composite price	-1.75	-7.90	-4.30	2.76	-3.80	3.30	-14.20	13.45	41.80
FOB export price	14.01	8.60	1.80	14.01	8.60	1.80	14.01	8.60	1.80
Producer price	-1.15	-7.80	-4.20	11.71	10.10	4.20	-13.25	14.25	41.70
Value added price	0.45	0.45	3.81	28.91	59.01	46.90	-25.42	24.81	16.50
return to capital	1.04	47.39	32.30	0.00	47.37	31.50	-3.20	47.81	29.30
Imports	-0.83	69.90	43.61	7.45	37.22	11.90	5.61	11.69	5.80
Domestic goods	-0.93	61.5	48.8	-6.79	8.21	10.10	-0.71	0.64	1.31
Exports	16.31	66.87	53.20	-2.69	-14.40	4.90	4.63	-4.30	-9.01
Production	0.75	61.97	49.30	-6.71	7.71	10.01	0.00	0.00	0.00
Investment	-0.95	29.37	15.90	-3.70	25.75	12.50	-9.60	22.20	8.71
Capital stock (SR=2002)	-0.09	-1.51	0.7	-0.36	-4.10	3.81	-0.97	-7.21	2.71
Labour demand	1.55	73.27	74.20	-0.14	68.54	66.51	-3.19	63.50	62.41
Intermediate demand	0.47	30.78	0.00	-42.51	-100.00	-100.00	42.10	-63.01	-19.50
Private consumption	1.00	75.04	61.20	-1.79	73.55	51.40	-7.85	68.30	46.22

In the long run, comparison should be made with references to trend scenario. Therefore, the agricultural sector is expanding in the long run through higher domestic and import demand. In the long run, the domestic demand for industrial sector decreases while import volume increases. In the short run, the exchange rate is depreciated. As result, exports increase in agriculture and service but industrial sector remain import intensive. The volume of export for agricultural and service sectors increased due to depreciation of exchange rate in the long run.

The efficiency (reallocation) and capital accumulation effects will determine the impact on production. Both effects are driven, in large extent by, value added price, factor remunerations and the cost of inputs represented by the composite price. The composite price decrease in agriculture and industry both in the short run and in the long run. The reallocation effects among the sectors are determined by the change in value - added price. The result indicates that resources will move toward agricultural sectors in the short run. For gradual and rationalized liberalization, tariff reduction augments the export and investment capacity of the country with benefits lean toward agricultural and service sectors. The full and discriminating liberalization scenario (removal of tariff in industrial sector) also indicates that industrial sector seems to contract both in the short and long run while agriculture expands its production and export due to depreciation of exchange rate.

### Macro- effects of trade liberalization

Table 9 illustrates both the short run and long run impacts of unilateral trade liberalization on macro variables.

In the short run, the volume of exports shows faster growth than imports in both types of liberalization owing to depreciation of exchange rate. The short run results suggest that instantaneous liberalization is performing better in exports both in real and nominal value while rationalized gradual liberalization recorded better results in GDP at market price, real private consumption. Nevertheless, Instantaneous liberalization recorded the highest performance both in real and nominal value for all macro variables in the long run. GDP at factor cost increases from 49% in the trend to 55.2 % in instantaneous case with a net increases of 6% while real GDP at market prices increases from 44.7% in the trend to 55.2%. This implies that the net impact of this liberalization is an increase of 10.5 % ,8%, 4.5% , 22.1% and 19.5% respectively for real GDP, real export, real output, real import and Real consumption. On the aggregate level, unilateral trade liberalization has positive impacts in the long run for the macro-variables. The decline in the long run capital good price and consumer price index suggest that the welfare, real consumption and investment impacts of instantaneous liberalization are encouraging as compared to the gradual and rationalized liberalization type.

**Table 9: Summary of Results of Macro-Impacts of Simulations (%)**

	Base Year	Trend		Instantaneous Liberalization				Gradual and rationalized liberalization			
	Value in (\$m)	Nominal (LR)	Real (LR)	Nominal (LR)	Real (SR)	Nominal (SR)	Real (LR)	Nominal (LR)	Real (SR)	Nominal (SR)	Real (LR)
GDP(factor cost)	68,156.00	42.70	-	48.40	-	-0.39	-	47.60	-	-0.01	-
GDP(market price)	71,926.00	51.30	44.70	51.20	-2.80	-5.81	55.24	48.71	-0.40	-2.50	42.10
Total Output	88,844.00	29.62	21.90	29.30	-1.40	1.70	26.40	30.61	-0.76	0.58	20.90
Total Exports	8,017.00	20.61	17.70	36.30	8.90	24.50	25.80	36.30	1.81	6.70	23.21
Total Imports	15,970.00	14.20	12.21	31.80	6.81	21.80	34.30	35.88	4.21	9.20	23.80
Private	50,290.00	56.40	54.20	64.01	-0.68	0.54	73.70	61.60	0.32	0.93	56.41
Consumption Government Revenue	11,984.00	-	-	-3.01	-	-36.10	-	-2.00	-	-12.10	-
Investment	22,386.00	16.14	13.01	21.10	-3.80	-1.01	26.00	20.92	-1.40	-1.22	15.20
Poverty level	45.47	-2.82	-	27.80	-	-	-	30.20	-	-	-

#### 4. Conclusion

In this paper, a sequential dynamic model is developed to analyze the potential poverty and inequality effects of unilateral liberalization in Ethiopia. The model uses a 1999/2000 social accounting matrix and a 1999/2000 income and consumption survey of 17336 households. In this research paper, both the short run and long run analysis of the linkages between trade liberalization, growth, income distribution and poverty have been carried out. An instantaneous liberalization consists of a complete removal of tariff in industrial and service sector followed by 90 % tariff reduction in agricultural sector. In this case, the welfare and the real consumption of the households are decreasing in the short run. Real export is growing faster than imports owing to deprecation in exchange rate. Concerning the sectoral effects, agriculture seems expanding as domestic demand for its output increases while industry contracts. The short run impact of instantaneous liberalization on poverty level is positive and results a very small decreases in national poverty.

The long run impacts of instantaneous liberalization on poverty, welfare, and macro variables will be indicated as follows. The main finding of this liberalization is that real GDP at market price, real consumption, and welfare of the households increase by 10.5%, 19.5%, and 14% respectively in the long run. Moreover, both the nominal GDP at market price and GDP at factor cost are substantially increasing in the long run. The decline in consumer price (5.5%) index contributes to an increase in real consumption besides an increase in income of the households. Real export, real total output, investment and volume of import increase remarkably by 8.1, 4.5, 13.1, and 22.1 percentage points respectively in the long run. The increase in real investment may be explained by a decline in price index of investment owing to trade liberalization. At sectoral level, agriculture plays a dominant role in production and export. Finally, the Foster, Greer, and Thorbecke measures of poverty indices are decreasing in the long run. Thus, trade liberalization further reinforces poverty reduction and growth seems pro-poor. In general, trade liberalization enhances the accumulation effects and there by increases both the welfare and real consumption of households.

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