The impact of trade liberalization on poverty reduction in Bangladesh: A computable general equilibrium (CGE) analysis

Ziaur Rahman

Assistant Commissioner; Office of the Divisional Commissioner, Rangpur, Bangladesh

Abstract

This paper examines the impact of trade liberalization on poverty reduction in Bangladesh by using Computable General Equilibrium (CGE) analysis. By using CGE analysis we see that WTO and SAFTA have a positive impact of increasing in household welfare in Bangladesh through increasing in household consumption in Bangladesh. The major findings of two simulation results show that under the complete abolition the tariff rate, the exports of all sectors increase significantly. Output of mineral sector, social service sectors decreases; however, consumption increases for all sectors and import increase in all sectors except financial and service sectors. The simulation result suggests that the liberalization of trade policy can be applicable in the case of Bangladesh because liberal trade policy helps to reduce the poverty in Bangladesh and improve social welfare by increase in consumption.

Keywords: Computable general equilibrium (CGE) model, trade liberalization, poverty reduction, Bangladesh

Introduction

In economic literature, trade stimulates economic growth and reduces poverty, because trade acts as a channel through which surplus of domestic production can exchange the products of foreign countries. Trade enhances the allocation of domestic resources derived from the apparent comparative advantages of member countries and fosters economic growth of the economy. In economic theory, trade liberalization is the outcome of productivity gains through increased in competition, efficiency, innovation and attainment of latest technology. The impact of trade liberalization on growth is keenly debated issue in the field of modern economics. Most of the economic literature considers that trade liberalization leads to improvement in social welfare through spreading out the allocation of domestic resources. The policy of trade can works through price changes because price changes leads to substitution effect of production and consumption of goods and services. The level and composition of exports and imports (trade balance) can influence through changes in prices. Trade liberalization leads to more effective and efficient reallocation of resources through changes in relative prices. In general, liberalization of trade enhances the economic scope through expansion of market share and transfer of knowledge (technical knowhow). The sources of economic growth are efficiency gains from specialization and economies of scale (reduction of cost of production) which is the ultimate outcome of trade. Winters (2000) was developed the theoretical outline of trade reforms linkage with poverty reduction. Winters (2002) has explained how trade liberalization affects poverty reduction throughout various channels such as economic growth, price changes, market and government. Baldwin (2003) mentioned that lower trade restrictions countries achieve faster economic growth than those countries with higher restrictive trade policies.

Corresponding author's
Email address: *ziaem09@yahoo.com*

Salim (2010) mentioned that only trade liberalization does not provide the improvement of household welfare, other policy reforms needed for reduction of poverty. Dollar and Kraay (2002) conducted a study to find out the linkage between trade liberalization and poverty reduction. They found that trade liberalization and poverty reduction has a positive association through growth. From the above analysis we see that trade openness is good for economic growth and poverty reduction even in longer term.

Literature review

The impact of trade liberalization on growth and poverty reduction remains a keenly debatable issue among the economist and researchers. Empirical evidence states the mixed findings regarding the linkage between trade liberalization and economic growth. Some studies (for example: Dollar, 1992; Edwards, 1993; Sachs and Warner, 1995) found the positive association between trade liberalization and economic growth. Some researchers (For example, Adleman and Morris, 1997; Kawai, 1994) found negative association between trade liberalization and economic growth. Evidently, economic growth and poverty reduction is negatively related. Golden role for economic theory is that if economic growth increase in 1%, then poverty reduces by 2% points.

According to Winters (2000), trade liberalization and poverty reduction has a linkage. The way which liberalization of trade affects the poverty reduction is shown in figure 1.
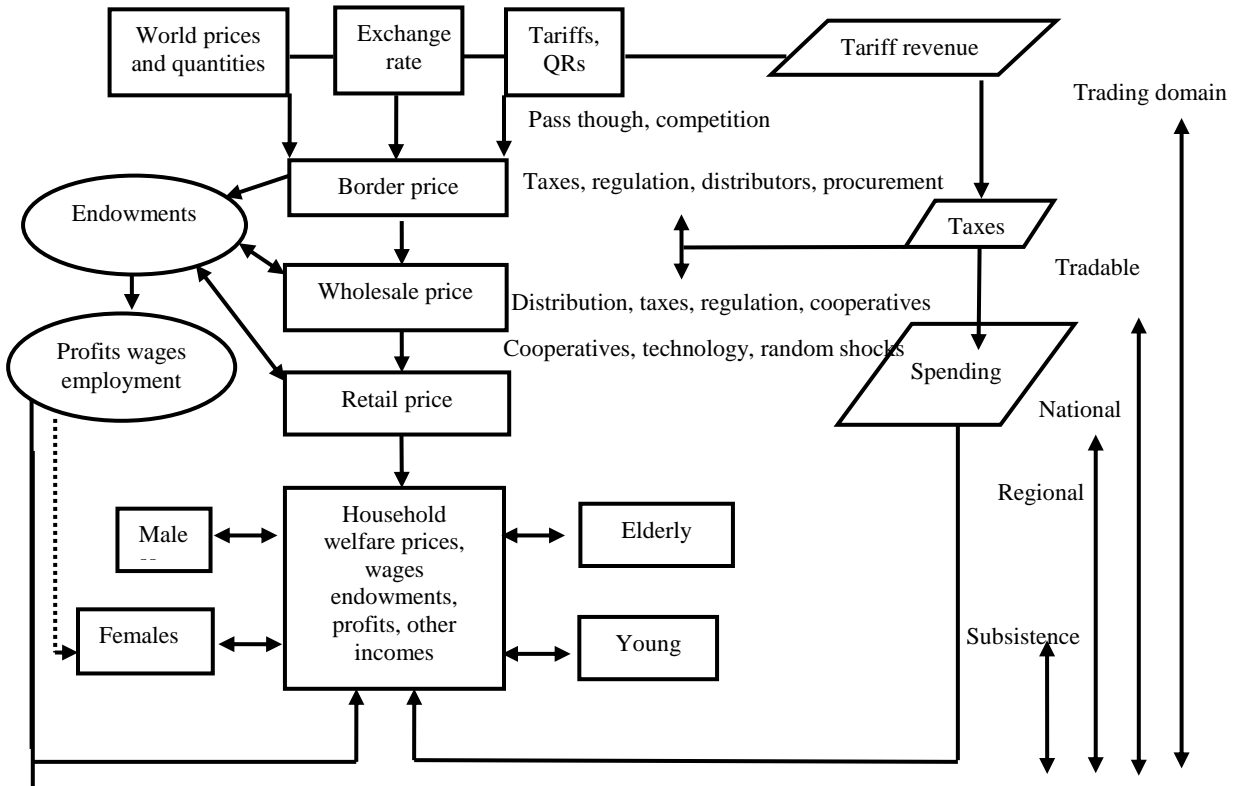

Figure 1: Alan winters analytical framework for linking trade liberalization and poverty
Note: Winters (2000)

From figure 1 we see that Winters finds six possible links between trade to poverty. The links are as follows: change in price effect on the poor people; changes in government income and expenditure; changes in risk and vulnerability; links through factor markets; effects on economic growth and adjustment procedure of the systems. It is often argued that the positive impacts of trade liberalization

on poverty reduction can be dampened partly through tight policies, huge transaction costs, absent markets and immobility of factors of production. Basically, in developing countries domestic capacity constraints is the main factor to prevent the poor from reap the advantages of opportunities created by trade liberalization and access to the market.

The basic analytical framework shows that there has a linkage among the three components i.e. international trade (exports and imports), development of productive capacities; and poverty and wellbeing. The relationship between trade, development of productive capacities, employment and poverty and wellbeing are shown in figure 2:

Direct links between trade and poverty
Development links between trade and poverty
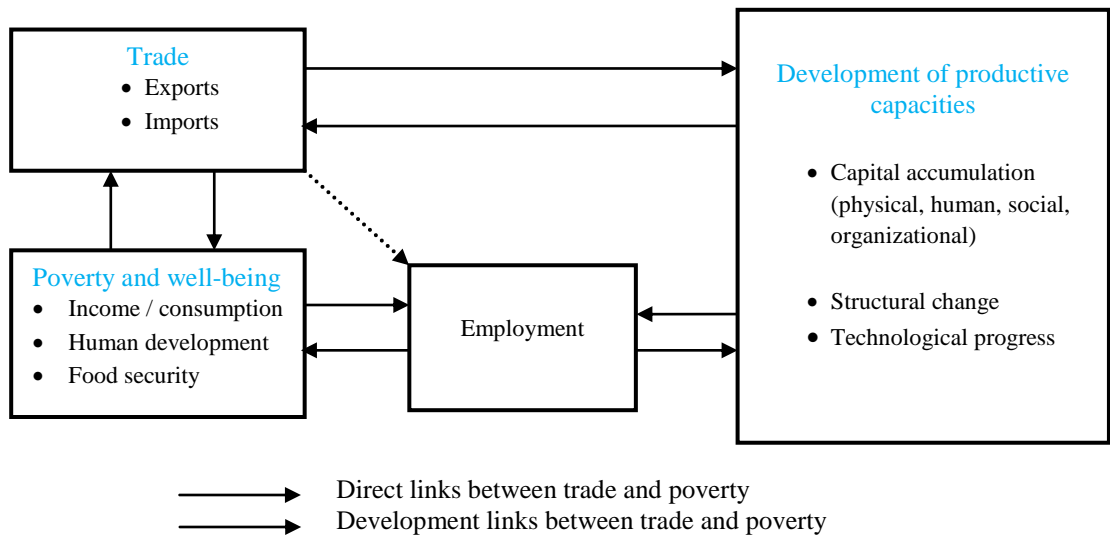
Figure 2: The relationship between trade, the development of productive capacities, employment and poverty
Note: The least developed countries report 2004

From figure 2 we see that trade has a both direct and indirect impact on poverty reduction. The indirect linkage between trade and poverty associated with development linkage where trade leads to poverty reduction through employment generation.

Chitiga *et al.* (2005) conducted a study on trade liberalization on agriculture export and agriculture labor in micro-simulation analysis in Zimbabwe by using CGE model. They found that liberalization of trade policy has a significant positive impact on poverty reduction in Zimbabwe. Castilho *et al.* (2012) conducted a study to investigate the consequence of trade liberalization and international trade on household income distribution in Brazil. They found that liberalized trade policy increases magnitude of poverty and inequality in urban area but it reduces the poverty and inequality in rural area. Acharya and Cohen (2008) used CGE analysis to state the outcome of trade liberalization on households' welfare in Nepal. They found that higher growth is generated by the joint effect of import and export liberalization but distributional pattern are not pro-poor. Cockburn (2002) used CGE analysis to examine the consequences of trade liberalization on poverty reduction in Nepal. The findings of Cockburn (2002) study is that trade liberalization increases poverty and inequality in urban area in Nepal but decreases poverty and inequality in rural area in Nepal. Trade is important factor to stimulate economic growth. Dollar (1992) examined sources of growth in 95 developing countries in 1976-1985. He found that there is strong positive correlation between per capita GDP growth and a measure of outward orientation in developing countries. By using cross country regressions data, Frankel and Romer (1999) found that

trade has a significant and robust positive effect on income distribution. Wacziarg (1998) examined the links between trade policy and economic growth by using the panel data of 57 countries from 1979 to 1989. He found that trade openness has a significant positive impact on economic growth. The above evidences show that trade liberalization is good for growth and it reduces poverty even in the longer term.

Trade liberalization in Bangladesh
Bangladesh is a developing country. As a developing country, Bangladesh has carried out liberalized trade policy. After independence in 1971, Bangladesh has followed highly restricted trade policy. The highly restricted trade policy was characterized by high tariffs and non-tariff barriers to trade and an overvalued exchange rate system. This restricted trade policy was supported by the import-substitution industrialization strategy of the government. The objective of this policy was improving the balance of payment (BOP) position of the country and protection of domestic market for manufacturing industries. The trade policy has a major shift in the mid-1980s, when moderate liberalization trade policy was initiated. However, in the early 1990s, large scale trade liberalization policy was implemented in Bangladesh. The trade liberalization policy in 1990 created large scale opportunity for the Bangladesh economy. This liberalization trade policy enhances economic growth and foster overall economic development through trade. Because, trade openness has a positive effect on economic growth, exports, imports, foreign direct investment and remittance inflow. Since then, successive governments have reaffirmed their commitment to the development of a more liberal trade policy in Bangladesh. Basically, the trade liberalization process in Bangladesh started since the 1980. The trade liberalization policy has been associated with the enhancement of export and import and investment inflows. However, liberalized trade policy in Bangladesh has based on the following three things i.e liberalization of imports through removal of quantitative restrictions (QRs); reductions in nominal and effective tariffs rates; and adoption of moderately flexible exchange rate policy.

Bangladesh trade policy has been redesigned several time periods. It has moved from an import substitution trade policy towards a more liberalized trade and market oriented policy. Bangladesh has entered into several regional free trade agreements that leads to liberalization of exports and imports. Bangladesh also enters into free trade area by signing bilateral Free Trade Areas (FTAs) with a number of countries. Recently, regional economic integration has increased in South Asian countries. Although, Bangladesh has entered into different free trade area, it has maintained significant levels of protection in certain sectors and is still considered as one of the most protected economies in the world. Economic point of view trade liberalization will allocate resources to those areas where Bangladesh has comparative advantage. Trade liberalization policy leads to more efficient allocation of resources and promote growth. In case of Bangladesh, several studies have conducted to show the link between liberalization of trade policy and poverty reduction in Bangladesh.

Nahar and Siriwardana (2009) conducted a study to identify the impact of trade liberalization policy on poverty reduction in Bangladesh. They found that trade liberalization policy reduces overall poverty in the short run in Bangladesh. Salim (2010) conducted a study to identify the welfare and poverty impacts of trade liberalization in Bangladesh by using a dynamic CGE micro simulation model. He found that trade liberalization policy has a positive impact on poverty reduction in Bangladesh. Although, several studies conducted in the field of trade liberalization and poverty reduction in Bangladesh. But very few studies conducted in the field of trade liberalization and its impact on poverty reduction in Bangladesh by using CGE analysis. Therefore, the objective of this study is to examine the impact of trade liberalization on poverty reduction in Bangladesh by using CGE model. However, our research question, is there any impact of trade liberalization policy on poverty reduction in Bangladesh?

To examine the impact of trade liberalization on poverty reduction in Bangladesh by using CGE model, we use SAM (Social Accounting Matrix) data in 2007 in Bangladesh obtained from GTAB 2008 data base. First, we consider base line scenario where we show the household consumption as a percentage of output, export as a percentage of output and import as a percentage of output. Then, we show the

impact of abolition of import tariff and application of flat tariff rate 10% in poverty reduction in Bangladesh. This section is followed by section 2, which explains our CGE model and simulation scenario. The sectoral impact of simulation results explains in section 3. Section 4 explains the robustness of the simulation result. Section 5 depicts the conclusion of simulation results and policy implications.

CGE model set up and simulation scenario

CGE model
The detailed accounts of the circular flows of receipts and outlays in an economy are captured by the Computable General Equilibrium (CGE) models. CGE model satisfies the general equilibrium conditions in the markets simultaneously. Given the framework, CGE models are helpful to examine the links among the different agents of the economy. The CGE model consists of 279 single equations and equal number of endogenous single variable that includes prices, production sectors, production factors and the utility function. The CGE model is used to evaluate the impact of economic shocks that echo among the sector of the economy and representing cumulative shocks from corner to corner of the country. Basically, CGE model is calibrated to a Social Accounting Matrix (SAM) obtained from GTAP 8 (Global Trade Analysis Project) data base after integrating 57 sectors into 05 sectors.

This model consists of 05 goods sectors and 04 factors of production with the assumption that all factors of production such as land, unskilled labor, skilled labor and capital are completely used by only 05 sectors. Hicksian Equivalent Variation (EV) is computed which measures the changes in the utility level in monetary term of the total Households Income and Expenditure Survey, 2010 (HIES). All other 146 member countries of WTO are considered as rest of the world and assuming that import tariff rate of these countries are set according to WTO norms and other guidelines.

The following systems of simultaneous equations of different blocks for the standard CGE model (Hosoe *et al.*, 2010) were solved using GAMS and optimal as well as equilibrium solutions were analyzed.

Domestic production block

$$Y_j = b_j \prod_h F_{h,j}^{\beta h,j} \quad \forall j \qquad \text{---------------- (1)}$$

$$F_{h,j} = \frac{\beta h,j \; P j^y}{P_h^f} \; Yj \quad \forall h, j \qquad \text{-------------- (2)}$$

$$X_{i,j} = ax_{i,j \, Zj} \quad \forall i, j \qquad \text{---------------- (3)}$$

$$Y_j = ay_i Z_j \quad \forall j \qquad \text{---------------- (4)}$$

$$p_j^z = ay_j p_j^y + \sum_i ax_{i,j} \; p_i^q \quad \forall j \qquad \text{-------(5)}$$

Government block

$$T^d = \tau^d + \sum_h P_h^{\;f} FF_h \qquad \text{------------------------------- (6)}$$

$$T_j^z = \tau_j^z p_j^z Z_j \quad \forall j \qquad \text{-------------------------------(7)}$$

$$T_i^m = \tau_i^m p_i^m M_i \quad \forall i \qquad \text{--- (8)}$$

$$X_i^g = \frac{\mu i}{P_i^q} (T^d + \sum_j T_j^z + \sum_j T_j^m - S^g) \qquad \forall j \text{ --------(9)}$$

Investment and saving block

$$X_i^v = \frac{\lambda i}{P_i^q} (S^p + S^g + \in S^f \ \forall i \ \text{_____ (10)}$$

$$S^p = ss^p (\sum_h P_h^f FF_h) \qquad \text{-------------------- (11)}$$

$$S^g = ss^g (T^d + \sum_j T_j^z + \sum_j T_j^m) \text{---------------------(12)}$$

Household block

$$X_i^p = \frac{\propto i}{P_i^q}(\sum_h P_h^f FF_h) - S^p - T^d) \quad \forall i \ \text{_____ (13)}$$

Export and import prices and balance of payments (BOP) block

$$P_i^e = \in P_i^{We} \quad \forall i \qquad \text{_____ (14)}$$

$$P_i^m = \in P_i^{Wm} \quad \forall i \qquad \text{_____ (15)}$$

$$\sum_j P_i^{We} E_i + S^f = \sum_j P_i^{Wm} M_i \qquad \text{-------------------(16)}$$

Armington composite (Substitution between imports and domestic goods) block

$$Q_i = \gamma_i \ (\delta mi \, M_i^{\eta i} + \delta di \, D_i^{\eta i})^{\frac{1}{\eta i}} \quad \forall i \ \text{_____(17)}$$

$$M_i = \left[\frac{\gamma_i^{\eta i} \delta mi \, p_i^q}{(1+\tau_i^m) \, p_i^m}\right]^{\frac{1}{1-\eta i}} Q_i \qquad \forall i \qquad \text{_____ (18)}$$

$$Di = \left[\frac{\gamma_i^{\eta i} \delta di \, p_i^q}{p_i^d}\right]^{\frac{1}{1-\eta i}} Q_i \qquad \forall i \qquad \text{_____ (19)}$$

Transformation between exports and domestic goods block

$$Z_i = \theta_i \ (\xi ei \, E_i^{\phi i} + \xi di \, D_i^{\phi i})^{\frac{1}{\phi i}} \quad \forall i \ \text{_____ (20)}$$

$$E_i = \left[\frac{\theta_i^{\phi i} \xi ei \, (1+\tau_i^z p_i^z)}{p_i^e}\right]^{\frac{1}{1-\phi i}} Z_i \qquad \forall i \ \text{_____ (21)}$$

$$D_i = \left[\frac{\theta_i^{\phi i} \xi di \, (1+\tau_i^z p_i^z)}{p_i^d}\right]^{\frac{1}{1-\phi i}} Z_i \qquad \forall i \ \text{_____ (22)}$$

Market clearing conditions

$$Q_i = X_i^p + X_i^g + X_i^v + \sum_j X_{i,j} \quad \forall i \quad \text{------------------------------ (23)}$$

$$\sum_j F_{h,j} = FF_h \quad \forall h \quad \text{------------------------------ (24)}$$

The endogenous variables in this model are: $Y_j, F_{h,j}, X_{i,j} Z_j, X_i^p, X_i^g, X_i^v, E_i, M_i, Q_i, D_i, P_h^f, P_j^y P_j^Z, P_i^q, P_i^e, P_i^m, P_i^d, \varepsilon, S^p, S^g, T^d, T_j^z$ and T_i^m

The exogenous variables are: $FF_h, S^f, P_i^{We}, P_i^{Wm}, \tau^d, \tau_j^z, \tau_i^m$
Where
Y_j= Composite factor produced.
$F_{h,j}$ = The h-th factor used by the j-th firm,
$X_{i,j}$ = Intermediate input of the i-th good used by j-th firm,
Z_j = Gross domestic output of the i-th good used by the j-th firm,
X_i^p = Household consumption of the i-th good,
X_i^g = Government consumption of the i-th good,
X_i^v = demand for the i-th investment good,
E_i = Exports of the i-th good,
M_i = Imports of the i-th good,
Q_i = The i-th Armington composite good,
D_i = The i-th domestic good,
P_h^f = Price of the h-th factor,
P_j^y = Price of the j-th composite factor
P_j^Z = Price of the j-th gross domestic output.
P_i^q = Price of the i-th composite good.
P_i^e = Export price in terms of domestic currency,
P_i^m = Import price in terms of domestic currency,
P_i^d = Price of the i-th domestic good,
ε = Foreign exchange rate (domestic currency/ foreign currency)
S^p = Household saving,
S^g = Government saving
T^d = Direct tax,
T_j^z = Production tax on the j-th good,
T_i^m = Import tariff on the i-th good,
FF_h = Endowments of the h-th factor for the household,
S^f = Foreign saving,
P_i^{We} = Export price in terms of foreign currency,
P_i^{Wm} = Import price in terms of domestic currency,
τ^d = Direct tax rate,
τ_j^z = Production tax rate on the j-th good,
τ_i^m = Import tariff rate on the i-th good,
$\propto_I$ = Share parameter of the utility function,
$\beta_{h,j}$ = Share coefficient in the composite factor production function,
b_j = scaling coefficient in the composite in the composite factor production function,
$ax_{i,j}$ = input requirement coefficient of the i-th intermediate input for a unit output of the j-th good,
a_{yj} = input requirement coefficient fo the j-th composite good for a unit output of the j-th good,
λi = Expenditure share of the i-th good in total investment ($\sum \lambda i = 1$),
μi = Share of i-th good in government expenditure ($\sum \mu i = 1$),
γi = Scaling coefficient in the Armington composite good production function,

σi = Elasticity of substitution in the Armington composite good production function,
ηi = Parameter defined by the elasticity of substitution, $(\eta i = (\sigma i - 1)/ \sigma i), (\eta i \geq 1)$,
θi = Scaling coefficient of the i-th transformation,
$\xi ei, \xi di$ = Share coefficient of the i-th good transformation, $(\xi ei + \xi di) = 1$,
ψi = Elasticity of transformation of the i-th good transformation,
ϕi = Parameter defined by the elasticity of transformation $(\phi i = (\psi i + 1)/ \psi i, \psi i \geq 1$,

Baseline scenario
The base line scenario deals with the initial position by considering the SAM data obtained from GTAB 8 data base.

Simulation designs
For policy analysis purpose, this study only two simulations (simulation one: tariff rate is equal to zero and simulation two: tariff rate is equal to 10%) has formulated to examine the impacts of trade liberalization on poverty reduction in Bangladesh.

Simulation one
In simulation one, the base line values of the tariff rates are set equal to zero to encourage trade volume. The main objective of this policy simulation (tariff abolition) is to expand trade openness. Accordingly, we kept the base values of all other parameters are unchanged.

Simulation two
In the second simulation, the base line values of the tariff rates are set equal to 10 % flat rate of all imported goods. The main objective of this simulation (tariff rate 10%) is to discourage imports and protect domestic infant industry. Accordingly, we kept the base values of all other parameters are unchanged.

Sectoral impacts of policy simulation

The SAM data obtained from GTAB 8 database for Bangladesh. From the SAM table we see that base lines import tariff rate for agriculture is 4.7%, mineral sector is 5.3% and manufacturing sector is 12.3% percent. Table 1 shows the base lines scenario; table 2 shows simulation one scenario and table 3 shows the simulation two scenarios.

Baseline scenario
The base line scenario of household consumption, export and import as a percentage of output is shown in following table1.

Table 1: Baseline scenario of household consumption, export and import share as % of output

Sectors	Consumption as a % of output	Export as a % of output	Import as a % of output
Financial	7.72	0.31	2.02
Agriculture	42.85	1.41	10.72
Mineral	17.73	0.19	40.52
Manufacturing	42.00	24.97	30.53
Service	40.26	3.47	1.77

By observing the table 1 we see that household consumption as % of output is higher in the case of agriculture sector i.e. 42.85% and followed by manufacturing sector is 42.00%, service sector is 40.26%. , mineral sector is 17.73% and financial sector is 7.72% respectively. We see that export as a % of output is higher in the case manufacturing sectors i.e. 24.97% and followed by service sectors is 3.47%, agriculture sector is 1.41%, financial sector is 0.31% and mineral sector is 0.19% respectively.

We also see that import as a % of output is higher in the case mineral sector i.e. 40.52% and followed by manufacturing sectors is 30.53%, agriculture sector is 10.72%, financial sector is 2.02% and service sector is 1.77% respectively.

Simulation one
The simulation one where base lines values of tariff rates are set equal to zero can be shown the following table 2.

Table 2: Simulation results for change % from the baseline values of household consumption, output, export, and import

Sectors	Consumption	Output	Export	Import	Hicksian Equivalent Variation
Financial	0.776	1.194	7.330	-4.627	
Agriculture	1.046	1.460	7.663	4.638	
Mineral	1.510	-0.130	6.509	3.826	1565.067
Manufacturing	6.003	2.873	12.663	10.860	
Service	1.316	-1.719	5.123	-8.576	

From the table 2 we see that the abolition of import tariff rate ($\tau_i^m = 0$) has an adverse effect on output in mineral and service sectors as output is declined by 0.13% and 1.719% respectively. We also see that the abolition of import tariff reduces import in financial sector and service sector 4.627% and 8.576% respectively. Export in all sectors increase due to abolition of tariff rate in the rest of the world. Higher export in manufacturing sectors shows the higher output in this sector. Similarly, higher export in agriculture and financial sectors leads to higher output in both sectors. Tariff abolition leads to increase in consumption in all sectors compare to baselines scenario. The increase in consumption in mineral sectors under decline in output is compensated by the increase in import of mineral sectors. However, increase in export shows that consumers switch their consumption behavior to the foreign goods and decrease in domestic demand is fulfilled by increase in export. The Hicksian Equivalent Variation is 1565.067 (EV is 1565.067) which shows the welfare level of household consumer increase in after completely abolition of import tariff.

Simulation two
The simulation two where base lines values of tariff rates are set equal to flat rate 10% can be shown the following table 3.

Table 3: Simulation results for % change in household consumption, output, export and import from the baseline for import tariff set at 10% in all sectors

Sectors	Consumption	Output	Export	Import	Hicksian Equivalent Variation
Financial	-0.119	0.163	0.393	-17.412	
Agriculture	-0.538	0.306	0.271	-9.094	
Mineral	-0.817	1.297	1.570	-7.417	64.436
Manufacturing	0.719	-1.115	-0.881	2.710	
Service	-0.474	0.135	0.356	-17.439	

From the table 3 we see that, the adoption of flat import tariff rate ($\tau_i^m = .10$) increases output in all sectors except in manufacturing sectors. The adoption of flat import tariff rate ($\tau_i^m = .10$) has adverse effect on output in manufacturing sector as output is declined by 1.115%. We observe that the adoption of flat import tariff rate reduces import in financial sector, agriculture sector, mineral sector and service sectors are i.e. 17.412%, 9.094%, 7.417% and 17.439% respectively. The increase in exports for all

sectors, except manufacturing sector is due to adoption of flat tariff rate in the rest of the world. Consumption in all sectors except manufacturing sector under adoption in flat tariff is decreases compare to the base lines scenario. The increase in consumption in mineral under decline in output is compensated by increase in import in minerals. However, increase in export indicates that consumers switch their consumption behavior to the foreign goods and decrease in domestic demand is fulfilled by increase export. The Hicksian Equivalent Variation is 64.436 (EV is 64.436) which show the welfare level of household consumer decreases after adoption of flat import tariff rate i, e. $\tau_i^m = 10\%$.

Welfare effects of policy simulations
For policy analysis purpose, one of the important concepts is efficiency or welfare of the economy. In case of policy analysis, some measures of welfare are applied to compare the shift from one situation to another in terms of welfare. In this study, the Hicksian Equivalent Variations (EV) has been used as a measure of social welfare to examine welfare impacts of the policy simulations in Bangladesh economy. From two simulations, we can be observed that Hicksian Equivalent Variations (EVs) are positive for household consumption level. The positive EV values are the symbol of positive growth of real GDP. The positive growth of real GDP stimulates consumption growth in economy. The Hicksian equivalent variation is higher (EV is 1565.067) in case of simulation one with complete abolition of the import tariff rates than that of simulation two with flat tariff rate i.e tariff rate is 10% (EV is 64.476). This evidence indicates that trade liberalization has a positive impact on poverty reduction in Bangladesh. In case of Bangladesh, poverty are measured by CBN (Cost of Basic Needs) method. According to HIES data 2010, the pattern of reduction of poverty from 2000 to 2010 can be shown the following diagram:
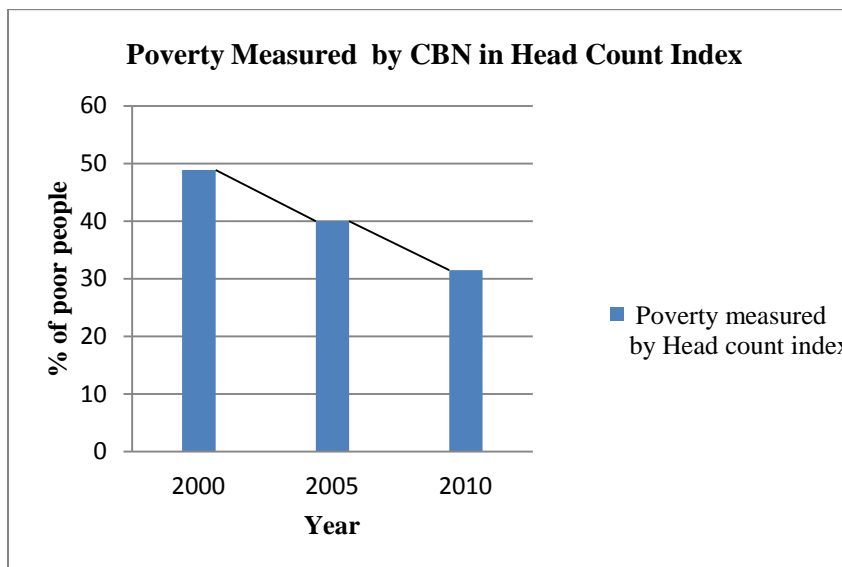

Figure 3: Trend of income poverty measured by CBN in head count index
Note: HIES 2010

From diagram 3 we see that poverty level was around 50% in year 2000, it reduced 40% in 2005 and it became 32% in 2010. This shows that poverty in Bangladesh decrease significantly after the trade liberalization. This figure states that evidently trade liberalization reduces the poverty in Bangladesh.
 Figure 4 shows the Gini-coefficient in case of Bangladeshi economy which measures the inequality in the distribution of income in Bangladesh. Figure 4 shows that Gini-coefficient is decreases from 2005 in 0.467 to 0.458 in 2010 which indicate that not only decrease in poverty but also decrease in inequality in distribution of income in Bangladesh. Therefore, evidently we can see that trade liberalization leads to increase in welfare in Bangladesh by increasing in household consumption measured by Hicksian Equivalent Variation (EV).
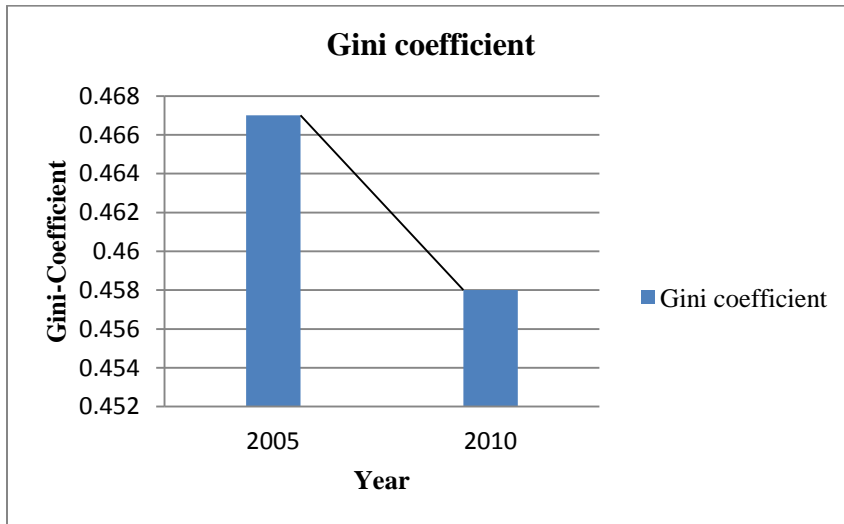
Figure 4: Gini -coefficient in case of income distribution in Bangladesh
Note: HIES(2010)

Robustness of the simulation results

The robustness of simulated results is evaluated under two criteria:

- How sensitive the estimated results are with the change in sectoral elasticity to maintain the sign of simulation results.

- Order of the simulation results such as sectoral output, consumption, import and export respectively in all three cases.

Table 4 shows the sectoral output, consumption, import and export change under base line case where abolition of total tariff (i, e.tariff rate is 0 and elasticity is 2), low elasticity cases (20% decrease i, e. 1.6) and high elasticity cases (20% increase i, e. 2.4). The simulation results are robust to changes in elasticity except for cases mineral output because our model satisfy the above two criteria. However, if we use different simulation in case of mineral output, then it will be robust under the elasticity of 3.54.

Major findings

The results of CGE model shows that the abolition of the import tariff would lead to an increase in consumption of all sectors. Output increases all sectors except mineral and service sectors. Export increase in all sectors significantly, import increase in agriculture sector, mineral sectors and manufacturing but decrease in financial sectors and service sectors. The consumer welfare increases because Hicksian Equivalent Variation (EV) increases when trade liberalized. However, in the case of lower elasticity and higher elasticity case, the change in order and sign move the same direction which indicates that our model is robust and the policy suggestions should be applicable in developing countries like Bangladesh.

Table 4: Sensitivity analysis of simulation results

Sectors	Baseline case change in %				Lower elasticity case change in %				Higher Elasticity case change in %			
	Consumption	Output	Export	Import	Consumption	Output	Export	Import	Consumption	Output	Export	import
Financial	0.776	1.194	7.330	-4.627	0.770	1.207	6.219	-3.599	0.782	1.182	8.423	-5.618
Agriculture	1.046	1.460	7.663	4.638	1.010	1.537	6.560	3.987	1.081	1.382	8.769	5.299
Mineral	1.510	-0.130	6.509	3.826	1.488	0.060	5.477	3.091	1.529	-0.326	7.517	4.587
Manufacturing	6.003	2.873	12.663	10.860	5.941	2.941	10.803	9.194	6.063	2.806	14.547	12.537
Service	1.316	-1.719	5.123	-8.576	1.310	-1.774	3.786	-7.415	1.321	-1.664	6.450	-9.698

Conclusion and policy implication

In the present study, two simulations have been conducted to examine the impacts of trade liberalization on poverty reduction in Bangladesh. In simulation one the tariff rate has been set equal to zero to encourage trade expansion and foster the growth. This simulation also show how trade liberalization impact on poverty reduction in Bangladesh. The base values of all other parameters are remains same. In simulation two, the tariff rate has been set equal to flat rate 10% to protect the domestic industry and stimulate the export led industry. The objective of this simulation is also observing the impact of household welfare in the case of restricted trade. The base values of all other parameters have been remained same. After conducting the CGE model, the simulations results shows that after the agreement of WTO and SAFTA with the reduction of import tariff rate, the household consumption in Bangladesh has increased significantly. The increase in household consumption evidently shows that the household welfare increase. We can see that the abolition of import tariff increase in consumption of all sectors. We can also see that output increase in all sectors except mineral and service sectors. The increase in output and consumption shows that household welfare increase. The increase in output and consumption leads to decrease in poverty. Finally, export increases in all sectors significantly.

In order to check the robustness of our CGE model, we consider three cases such as tariff abolition with elasticity equal to two, tariff abolition with lower elasticity i.e. elasticity equal to 1.6 and tariff abolition with higher elasticity i.e. elasticity is equal to 2.4. By examine the sensitivity result; we see that our model is robust because it satisfies the two criteria of justification of robustness of CGE model. Since our model result is robust, the policy implication is that government can use trade liberalization policy to increase in welfare of the society. Liberal trade policy promotes the economic growth through reduction on poverty. However, in our model we fail to consider the simulation scenario including export subsidy and quantitative restrictions such as quota. Even in the model, we do not consider the distributional impact of household welfare. Therefore, in order to show the simulation impacts in household welfare level, the micro simulation is needed. Hence, further work must be needed to improve the model and the result of our CGE model.

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