Trade Liberalisation and Poverty in Bangladesh: A General Equilibrium Approach

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Abstract: This paper uses a computable general equilibrium (CGE) model to investigate the impact on poverty of trade liberalisation in Bangladesh. The simulation results show that the complete removal of tariffs favours export oriented sectors in the economy. With trade liberalisation, rural and urban areas experience an overall reduction in poverty in the short run. However, a marginal increase in the poverty gap and poverty severity for urban areas is projected, implying that the poor become poorer in urban areas. Moreover, poverty incidences vary among various socio-economic groups. In the short run, poverty incidence increases for rural landless and urban illiterate and low-educated household groups. In contrast, the long run results highlight that trade liberalisation reduces absolute poverty for all groups both in rural and urban areas.

Keywords: Trade Liberalisation, Poverty, Bangladesh, Computable General Equilibrium (CGE) model.

Introduction

Over the past 20 years, the liberalisation of domestic markets and integration into the global economy has become an important development strategy for developing countries. During this period, a growing number of developing countries have adopted outward oriented liberalisation measures in the hope that trade liberalisation will lead to a greater allocative efficiency which in turn will lead to the acceleration of growth and increase in productivity. It has also long been recognized that by influencing the allocation of resources and switching the production from non-traditional and inefficient import substitutes to efficient exportable trade liberalisation increases the demand for unskilled labour in which the country has a comparative advantage. These changes in turn induce differential impact on household's income, consumption and poverty level.

Like many other developing countries, Bangladesh has gone through a variety of structural adjustment processes since its political independence in 1971. Immediately after independence Bangladesh adopted a protectionist inward–oriented policy regime with rigid trade and exchange controls. In the 1980's and 1990's, the country experienced a radical shift to a more liberal policy regime under the Structural Adjustment Programs (SAP) suggested by the World Bank and the International Monetary Fund (IMF).

Trade reforms, which were initiated in the 1980's were aimed at, mainly, the privatization of state owned enterprises, a withdrawal of quantitative import restrictions, financial restrictions and some downward adjustment of tariffs and quantitative restrictions (QR's). However, a major progress in trade policy reform occurred in the 1990's with a substantial scaling down and rationalization of tariffs, removal of trade–related QR's and elimination of import licensing, unification of exchange rates and the move to a more flexible exchange rate system Ahmed and Sattar (2004). Trade liberalsation policies also have been accompanied by some monetary and fiscal management. As a result, Bangladesh has become increasingly open to international market forces. The openness, measured by trade (Exports and Imports) to GDP ratio, increased from 18.01 per cent in the 1980's to 22.92 percent in 1990's and 30.41 per cent during the period 2000-05(IFS).

The economic performance of the post liberalisation reforms were quite impressive with a high growth rate of GDP, high investment and savings rates and exports all showing notable improvement in overall performance. However, despite the success, concerns are growing about the distributional consequences, especially the poverty incidences. With the acceleration in the growth of per capita income in the 1990's, even though considerable progress was made in poverty reduction, it still remains at an unacceptably high level. In south Asia, Bangladesh still has the highest incidence of poverty, about 36 per cent of the population live below US$1 per day and about 82.8 per cent live under US$2 per day (in 2000) WDI (2002). With this background, several important policy questions arise regarding the poverty and welfare impacts of trade liberalisation: What will be the impact of reducing nominal trade protection on the allocation of resources? What is the poverty impact of trade policy on different household groups? Is the benefit of trade liberalisation of trade reform distributed evenly to all classes in the society?

In the context of Bangladesh, there are very few studies that have aimed to evaluate the likely impact of trade liberalisation of the Bangladesh economy such as Hoque (2006), Hossain (2003), Noman (2002), Ahmed (2001), World Bank (1999), Ahammad (1995). However, most of these studies concentrate on a macroeconomic perspective rather than distributional aspects, especially on a poverty perspective. Moreover, some recent studies regarding the welfare and poverty impacts showed conflicting results. For example, Mujeri and Khondker (2002) found that globalization efforts in Bangladesh are generally pro-poor; however, the gains accrue more to the relatively well-off households while the extremely poor households benefit less. In contrast, Annabi et al.(2005), Khondker and Raihan (2004) stated that trade liberalisation produces welfare loss and poverty deterioration. These contradictory results therefore call for a re-examination of the issue. The major objective of this study is, therefore, to address the above mentioned questions with respect to tariff liberalisation in Bangladesh on poverty and welfare of different household groups.

The rest of the paper is organized as follows: Section 2 reviews the economy of Bangladesh with reference to trade policies, structure of trade and poverty level. Section

3 presents the methodology, the model and discusses the database used in the model. Section 4 discusses the simulations and results obtained. Some concluding remarks are presented in section 5.

2 Changes in Trade Policy and Economic Structure in Bangladesh

Bangladesh maintained a restrictive trade regime from its independence in 1971. The highly protectionist trade policy regime was regulated through quantitative controls on imports and exceptionally higher tariff rates. Import bans, quotas and other restrictions were imposed to protect the domestic industries. Import substitution strategies were followed through various quantitative restrictions on import and import licensing. In addition, strict exchange control measures were undertaken.

A major change of policy directions occurred in the early 1980s with the adoption of market oriented liberalisation policy reforms under the guidelines of the IMF and the World Bank. Trade reforms launched in the 1980s were aimed mainly at the privatization of state-owned enterprises, the withdrawal of quantitative import restrictions, financial liberalization, and some downward adjustment of tariffs and QRs. However, trade reforms initiated in the 1990s were aimed at moving towards an open economy by making the currency convertible on the current account, involving foreign investors in key sectors, reducing import duties generally to much lower levels, and removing nearly all controls on the movements of foreign private capital. The specific measures of trade liberalisation that Bangladesh adopted were as follows:

- The unweighted average protection rate declined from 36.0 per cent in 1993/94 to 12.51 per cent in fiscal year 2005/06. In contrast, the weighted average rate of protection, which was 24.1 per cent in 1993/94, was reduced to 8.09 per cent in fiscal year 2005/06 GOB (2006).

- A reduction in the number of commodities under the four-digit subject to quantitative restrictions from 550 in 1987 to 63 under the import Policy Order of 2003-06.

- The maximum tariff rate was lowered from 350 per cent in fiscal year 1991 to 37.5 per cent in 2000. During the same period, the Most Favoured-Nation (MFN) tariff fell from an average of 58 per cent to 22 per cent, which again reduced to 15.5 per cent in 2005/06.

- The number of tariff bands reduced to 5 in 2004/05 (0 per cent, 7.5 per cent, 15 per cent, 22.5 per cent and 30 per cent) from 15 in 1992/93.

- On the export side, the emphasis was on diversifying the export base, improving the quality of exports and to stimulating higher value-added exports to machinery and intermediate inputs. In line with the above objectives an incentive package including fiscal and financial facilities was instituted. They included income tax rebates, rebates on insurance premiums, duty drawbacks, lower interest rates on bank loans, tax holidays, a cash compensation scheme, an export credit guarantee scheme, export credit support, a special bonded warehouse scheme, a back-to-back letter of credit system, an export development fund and the establishment of export processing zones.

- Adoption of a unified exchange rate system in 1992 instead of multiple exchange system[3]. Since then, to maintain flexibility in the exchange rate, a policy of creeping devaluation was also followed. A bold exchange liberalization step took place in 2003 by the introduction of a fully market-based exchange rate.

As a result of the trade policy reforms, Bangladesh's economy has become increasingly open to international market forces. Openness measures such as the

[3] Bangladesh had practiced a multiple exchange rate regime involving the official pegged rate and a secondary foreign exchange rate associated with the introduction of the wage earner's scheme.

import orientation ratio, export orientation ratio and trade-GDP ratio all show an upward trend during the period 1973-2005 (Figure 1).

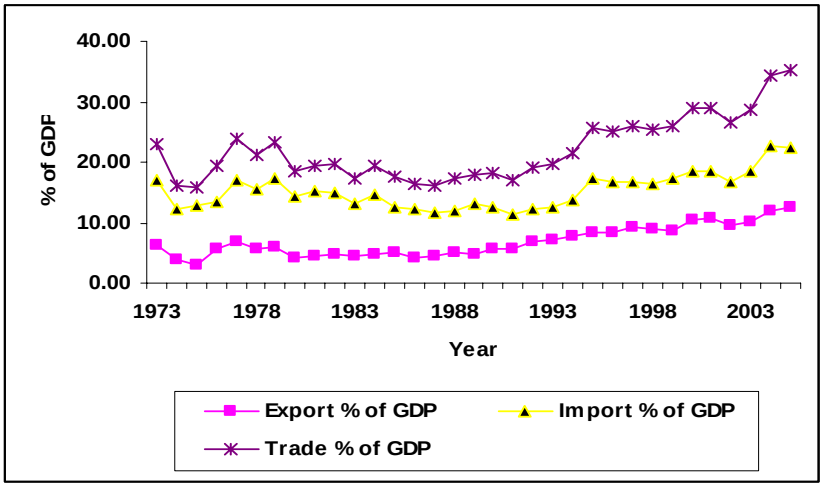

Figure 1: Import orientation, Export Orientation and Trade–GDP ratio in Bangladesh, 1973-2003

Figure 1 shows starting from 6 per cent of GDP in 1973, the ratio of exports of goods and services rose to about 12 per cent in 2005; the ratio of imports of goods and services rose from 17 per cent to 22 per cent; and the rates of trade (exports +imports) to GDP increased from 23 per cent to 35 per cent. Furthermore, all the above measures show larger increases over the extensive trade liberalisation period (1992-onward) than in the initial phases of trade reforms (1976-1991).

The economic performance of the post liberalisation era of Bangladesh has been improving gradually. The growth of GDP, which averaged 3.7 per cent annually during the 1980s, has increased to 5.06 per cent by the second half of the 1990s and increased marginally during the period 2000-05. At the same time, per capita income also grew faster than the growth of overall GDP from 1.3 per cent per annum in the 1980s to 3.26 per cent during the period 2000-05 (IFS, various issues). Growth performance during the post liberalisation period was accompanied by structural change. The relative contribution of agriculture to GDP decreased while the contributions of industry and services increased (Figure 2)

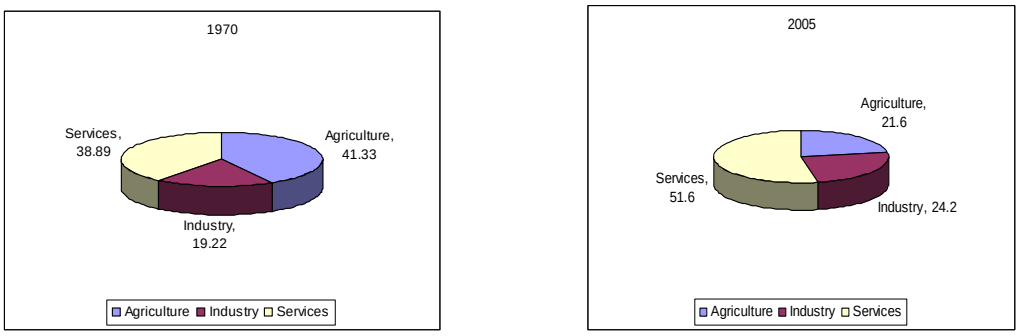

Figure 2: The Sectoral value added during the period 1970 and 2005

Figure 2 shows agriculture, which constituted 41.33 per cent of real GDP in 1970, declined to about 22 per cent in 2005, whereas the contribution of the service sector increased to about 52 per cent in 2005 compared to about 39 per cent in 1970. The industry sector also shows significant changes by 2005 compared to 1970. Thus over the long term there was a shift of the sectoral composition of GDP away from agriculture towards industry and services.

2.2 Poverty situation in Bangladesh:

In Bangladesh, there are numerous studies concerning the incidence of poverty for example, Hossain and Sen (1992), Khundker et al.(1994), Khan (1990), Wodon (1999), Mujeri and Khondker (2002), World Bank (1998), Osmani et al.(2003) and Sen, Mujeri K.M.M., and Sahabuddin (2004). Even though all of these studies used the data provided by the Household Income and Expenditure surveys (HIES) conducted by the Bangladesh Bureau of Statistics (BBS) , there is much controversy about the extent of poverty, particularly in the 1970s and 1980s (Ravallion and Sen,(1996). Methodological differences and the differences in underlying assumptions may have contributed to these observed differences. Most of these studies used the food energy intake (FEI) method in calculating poverty incidences[4]. According to Ravallion and Sen (1996), the main ingredients of poverty measures, calorie requirements and allowances for non-food goods, and the set of prices used for costing the minimum calorie bundle in setting the

[4] By this method, poverty lines are set by computing the level of consumption or income at which households are expected to satisfy the normative nutritional requirements (Wodon (1997) .

food poverty line in Cost of Basic Needs (CBN)[5] constitutes a major source of discrepancy among various estimates. Despite these variations, some trend can be observed from Table 1. Table 1 shows that the national incidence of poverty declined between 1983/84 and 2005, as measured both by lower and upper poverty lines[6]. In 1983/84, 58.50 per cent of Bangladesh's population was poor compared to 40 per cent in 2005 while 40.91 per cent of the population was extremely poor in 1983/84 compared to 25.1 per cent in 2005. By considering 1983-1992 approximately as the pre-reform period and 1992-2005 correspondently as the post-reform period, Table 1 also shows that there was a faster poverty reduction in the post reform period than in the pre-reform period. Using the upper poverty line, the national poverty incidence increased by 0.06 per cent annually for 1983-1992 because increasing poverty in rural areas outweighed falling poverty in urban areas. In the period 1992-2005, the national poverty incidence declined at an annual rate of 2.29 per cent (Table 1). Another notable feature is that the rate of decline in poverty incidence from 1983 to 2005 was larger in urban areas than in rural areas. As a result, in terms of the lower poverty line, the ratio of the rural family index to the urban family index was considerably higher at the end of the period than it had been at the beginning. The same is true for upper poverty line (Table 1).

Table 1: Head-count indices of poverty in Bangladesh during 1983/84-2005

Year	% of population under lower poverty line			% of population under upper poverty line		
	Rural	Urban	National	Rural	Urban	National

[5] With the CBN method, any household with per capita expenditure below a given poverty line is considered as poor. The poverty lines are set by computing the cost of a food basket enabling households to meet the requirement and adding to this cost an allowance for non-food consumption. See Ravallion (1996) Ravallion and Bidani (1994) and Ravallion and Sen (1996) for details.

[6] The 'low poverty line' is based on the cost of acquiring a fixed food bundle that yields 2,122 kcal.(per person per day) plus a non-food component based on the actual non-food expenditure of households whose total expenditure is equal to the food poverty line. On the other hand, 'high poverty line' has the same food component but a different non-food component whose total food expenditure is equal to the food poverty line.

1983/84	42.62	28.03	40.91	59.61	50.15	58.50
1985/86	36.01	19.90	33.77	53.14	42.92	51.73
1988/89	44.30	21.99	41.32	59.18	43.88	57.13
1991/92	45.95	23.29	42.69	61.19	44.87	58.84
1995/96	39.76	14.32	35.55	56.65	35.04	53.08
2000	37.90*	19.90*	34.3*	52.30*	35.2*	48.9*
2005	28.6*	14.60*	25.1*	43.8*	28.4*	40.0*

Source: World Bank (1998)

Note: '*' estimates are taken from the Preliminary Report on Household Income and Expenditure Survey-2005.

Further, in terms of the incidence of poverty by main sources of income, it is noticed that in 2004 poverty incidence was the highest for the households whose main source of income was daily wage from agriculture, non agricultural and non-agricultural self employed. In terms of poverty incidence by land ownership, it is observed that poverty is negatively correlated to land ownership (GOB 2004). In addition, in Bangladesh, inequality worsened during the period of policy reform implementation and the situation was more severe in urban areas than in rural areas (Table 2). The Gini index of income in both rural and urban areas remained largely unchanged till 1992. The rural Gini index for income however, rose sharply to nearly 0.43 per cent in 2005 (from 0.36 per cent in 1991). In urban areas, inequality in income increased sharply to nearly 0.50 per cent in 2005 from 0.38 per cent in 1991 (Table 2).

Table 2: Gini Index for Bangladesh, 1973-2005

Year	Gini index (%)		
	Rural	Urban	National
1973	0.36	0.38	0.36
1983	0.35	0.41	0.36
1991	0.36	0.40	0.39
1995	0.38	0.44	0.43
2005	0.43	0.50	0.47

Source: Khan and Hossain (1989) Report of the Household Income and Expenditure Survey, 2000 and Preliminary Report on Household Income and Expenditure Survey, 2005.

3 Methodology:

The Computable General Equilibrium (CGE) models have been widely used as a tool for simulating the impacts of exogenous shocks or policy changes on household's poverty

and income distribution. In the CGE modeling context there are many approaches that calculate income distribution and poverty variations. Among them, the traditional and most frequently used method is the representative household (RH) approach where poverty analysis is performed with income variations with an endogenous poverty line (Decaluwe et al. 1999). The other approach is the micro simulation (MS) approach where one incorporates household data into the CGE model and simulates the model with all the individual households (Cogneau and Robilliard 2000). Application of this approach was carried out by Orcutt (1957), Meagher (1993), Tongeren (1994), Cogneau and Robilliard (2000) and Cockburn (2001). In the representative household (RH) approach, modelers need to specify a specific distribution of income within each category where it is assumed that the income distribution follows a given functional form. This approach is known as a *parametric* approach and some of the applications of this model are Dervis, Melo De., and Robinson (1982), de Janvry, Sadoulet, and Fargeix (1991), Chia, Wahba, and Whalley (1994) and Decaluwe et al.(1999).

In our study, the measurement of poverty profiles follows the representative household approach and the procedures followed by Decaluwe et al.(1999). According to Decaluwe et al. (1999), a unique and constant basic needs based poverty line will be determined endogenously in the model where the poverty line is obtained by multiplying the basic need commodity basket by their respective prices. Under different simulations even though the commodity basket remains invariant, the commodity prices change, as a result nominal values of the poverty line also change. Then, changes in the poverty incidences are calculated by considering the changes in the poverty line and change in the nominal income. However, our poverty analysis differs slightly from Decaluwe et al (1999) in some respects. As an example, unlike Decaluwe et al.(1999), in this study we used a non-parametric approach based on a Kernel estimator of density function and instead of endogenising the monetary (nominal) poverty line, changes in the monetary poverty line have been endogenised, following Naranpanawa (2005).

In this study, for the base case we used two different poverty lines for rural and urban areas estimated by the Bangladesh Bureau of Statistics (BBS) for the year 2000[7] which were adjusted by the percentage change value from the model to perform the post shock FGT calculations. We compute the poverty indices by using the software DAD[8].

3. 1 Theoretical Structure of the CGE Model of Bangladesh:

The CGE model for Bangladesh developed in this study, is named as Bangladesh model, follows closely the IDC-GEM; a Computable General Equilibrium Model of The South African Economy (Horridge et al. 1995) which includes multiple households and a SAM based system of income and expenditure. The theoretical structure of the model was also based closely on the Australian ORANI-G framework which again draws heavily from ORANI, a multisectoral CGE model for the Australian economy (Dixon et al. 1982).
The model has a theoretical structure that is typical of most static models and consists of the following structural components.

1) producers' demands for produced inputs and primary factors;
2) producer's supplies of commodities;
3) demands for inputs for capital formation;
4) household demands;
5) export demands;
6) government demands;
7) the relationship of basic values to production costs and to purchasers prices;
8) market-clearing conditions for commodities and primary factors;
9) numerous other macro-economic variables and price indices.

There are six types of agents in the model: industry, households, government, investment, export and inventory. Each private agent's behaviour is directed through conventional neoclassical microeconomics. Households maximize utility and producers minimize their

[7] The estimates of poverty line for 2000 by the BBS are US$ 146(per person/per day) for rural areas and US$ 167(per person/per day) for urban areas. By converting to domestic currency at the 2000 exchange rate of US$1=TK.52.14, the monetary poverty line for rural areas are TK.7612.73 whereas the urban figure is TK.8707.71.
[8] DAD or Distributional analysis software (Duclos and Abdelkrim 2006) was developed specifically for poverty and inequality estimation. It is freely distributed and available at www.mimap.ecn.ulaval.ca.

cost, which results in corresponding demand and supply equations of the model. All agents are assumed to be price takers, with producers operating in competitive markets. The basic theoretical assumptions made in the model are as follows.

3.1.1 Input demands for production of commodities:

It is assumed that producers minimize their input costs for a given level of output with nested Leontief/Constant returns to scale (CES) production functions. Producers are constrained in their choice of inputs by a two-level nested production technology. At the top level, intermediate-input bundles, other cost and primary-factor bundles are combined using a Leontief production function. Consequently, they are all demanded in direct proportion to output. At the second level, intermediate input bundles are formed as combinations of domestic goods and the imported equivalents[9], the primary factor bundles are formed as combinations of land, capital and composite labour. The composite labour bundle is formed of various occupational labour types. In all cases, the aggregate function follows a Constant Elasticity of Substitution (CES) form. In this study, the economy is divided into 86 industries and 94 commodities (as in I-O table 2000 for Bangladesh), which imply some industries can produce several commodities.

In this model labour is split into four occupational categories, such as male low skilled, male high skilled, female low skilled and female high skilled. These occupational classifications are obtained from the Social Accounting Matrix 2000 for Bangladesh by applying the mapping between sectors of the SAM and the I-O Table 2000 for Bangladesh.

3.1.2 Demands for input to capital creation:

[9] Substitution between imported and domestic inputs is modeled using (Armington 1969) assumption that imports are imperfect substitutes for domestic supplies.

Capital is assumed to be produced with inputs of domestically produced and imported commodities. At the bottom level, the total cost of all imported and domestic commodities is minimized subject to a CES function. At the top level, the total cost of commodity composites is minimized subject to the Leontief production function. Here the production structure is similar to current production; the only exception is that no primary factors are used directly as input to capital formation.

3.1.3 Household demands:

Following multiple household version of ORANI-G (Horridge 2004) the model has nine household groups which are based on the classification in the 2000 Social Accounting Matrix for Bangladesh. In SAM 2000, households are decomposed into nine groups in terms of location, urban and rural. Rural households, depending on occupation and ownership of agricultural land households have five groups: 1) Landless (No cultivable land); 2) Marginal farmers (up to 0.49 acres of land); 3) Small farmers (0.5 to 2.49 acres of land); 4) Large farmers (2.50 acres of land and above); 5) Non-agricultural. On the other hand, on the basis of educational level of the head of the household, urban households are classified as 1) Illiterates (no education); 2) Low education (class1-classIX); 3) Medium education (class X to class XII) and 4) High education (graduation and above).

Household groups choose their purchases to maximize their utility with an additive nested utility function subject to an aggregate expenditure constraint, which again leads to the Linear Expenditure System (LES). The imported and domestic commodities are substitutes according to a CES aggregation.

3.1.4 Export Demands:

The model's export demand commodities are divided into two groups: traditional exports and non-traditional exports. Traditional export comprise the bulk of the exports and the export demand for this type of commodity is represented by a downward sloping function of its price in foreign currency units, while for non-traditional export goods, exports are assumed to be in direct proportion to the aggregate of the group of non-traditional exports.

3.1.5 Government demand for commodities:

Government spending is assumed to be exogenously determined in the model.

3.1.6 Distributional aspect of the model:

One distinguishing feature of the present model is that it is capable of estimating the distributional impact of policy shocks. For this it requires the mechanism through which it can capture the mapping of the value added from production process to returns to factors of production and from factor returns to the income of different types of households. This model has a SAM extension that performs the complete income mapping.

The model contains four institutions: households, firms, government and the rest of the world which receive income and the ownership of the factors of production determine their income. All labour income accrues to households as they own all labour. They also receive the gross operating surplus from the firm's capital income. Apart from these, households also receive income from the rest of the world, inter-household transfers and transfers from government. Household's disposable income is obtained by subtracting income taxes and other transfers paid to government from household's total income. Household's savings are obtained by deducting household's consumption expenditure, household's transfer payment to the rest of the world and transfer payment to other households from disposable income.

Government receives taxes from various sources such as total indirect tax revenues, gross operating income and transfers to government, total income tax from households, corporation tax and transfers from the rest of the world. The total government expenditure consists of current government expenditure and investment expenditure where the current expenditure includes government purchases of both domestically produced and imported commodities, interest on public debt and transfer to the rest of the world and households. Firms receive income from gross operating surplus which consists of aggregate payments to land, capital, interest on public debt and transfers from the rest of the world. Its expenditure side includes tax payments to government, dividends to households and transfers to the rest of the world. The last institution, the rest of the world's income, consists of sales of imports to households, firms, government and investors whereas its outlay includes expenditure on exports, transfer to households, firms and government.

3.2 Model Database:

The present model required an input-output database with separate matrices for basic, margins and tax flows for both domestic and imported commodities. The Input-Output Table 2000 for Bangladesh (GOB 2003) served as the initial solution of the model. However, the required input–output database was not available readily from the I-O table[10]. To convert the I-O table into the format required by this model, some steps were taken which were performed by using GEMPACK (Harrison and Pearson 1996). However, to match with the multiple households' equations in the model equations, households were classified by taking information from Social Accounting Matrix (SAM) 2000 for Bangladesh. The elasticity parameters needed for the model were borrowed from similar studies and the GTAP6 database for Bangladesh.

Further, to implement the income distribution part of the model, following IDC-GEM (Horridge et al. 1995), we needed data on the generation of income flow from different

[10] I-O Table 2000 for Bangladesh consists of a non-symmetric supply and use table, where production activities distinguished from commodities. I-O table 2000 also contains separate tables for taxes on imports and taxes on domestic products by commodities.

activities to factors of production, the mapping of these factor incomes to households and the spending of income by households on commodities. Social Accounting Matrix (SAM) 2000 provides information on the household's sources of income and expenditures. To see the poverty impacts, the aggregate results from the model were linked to the Household Income and Expenditure Survey 2000 data conducted by the Bangladesh Bureau of statistics.

3.3 Model closure:

In this study simulation experiments were carried out to identify the short run and long run impacts of a complete removal of all tariffs on imported goods and services on major macro economic variables, household welfare level and poverty level. In order to simulate, the model setting of exogenous variables which defines the closure of the model was necessary. The set of assumptions underlying the short run and long run simulations are given below.

In the short run, capital stock and land remains fixed and the only way to change the output level in each industry is to change the labour inputs. However, it is assumed that the rate of return in each industry adjust to reflect any changes in the output level. Thus, with a given investment budget, changes in the allocation of investment budgets among investing industries in response to changes in relative rates of return are allowed.

In the labour market, it is assumed that, there is elastic supply at fixed real wage rate, the employment will adjust according to the change in labour demand. The balance of trade as a fraction of GDP is specified as endogenous, and the real absorptions (real private consumption expenditure, real government expenditure and real investment expenditure) have been considered as fixed in the short run. Along with these, all technical change variables, shift variables and foreign prices of imports, number of households, and real demands for inventories are considered as exogenous.

In contrast, in the long run, it is assumed that capital stock is free to adjust while the rate of return on investment is fixed. Aggregate employment is fixed while real wages would adjust to accommodate policy changes. The changes in the balance of payment is set at zero, thus the model allows the changes in the real absorptions which would be required to accompany any balance of trade surplus or deficit situation. It is also assumed that nominal household consumption follows post tax household's income and real government consumption follows real private consumption. In line with the short run, inventory demands, production technology, land, foreign prices of imports and number of households are held fixed. The nominal exchange rate is fixed and serves as a numeraire in this model both in the short run and long run. This implies that changes in the domestic price level are evaluated relative to world prices.

4 Simulation results:

In this study simulation experiments were carried out to identify the short run and long run impacts of a complete removal of all tariffs on imported goods and services on major macro economic variables, household welfare level and poverty level. In this section the simulated outcomes are presented under the two main headings: impacts on macro variables and poverty impacts. The first section will trace macro and sectoral effects, factor market effects and household's income and consumption effects whereas the following section will describe the poverty implications by considering the changes in income and prices created in the main model.

4. Macroeconomic impacts:

4.1.1 Impacts on major macro variables:

Table 3 displays projections of the effects of the tariff cut on a number of key macro variables such as aggregate employment, real GDP, real wages, consumer price index (CPI), poverty line, aggregate imports and exports, trade balance and aggregate consumption. It is worthwhile to mention here that we have to rationalize particular simulation results in terms of the model's theoretical framework and underlying closures. As stated in section 3, in the short run closure, on the supply side of the economy, we fixed the level of capital usage in each industry, technology and real wage. With fixed real wage and slack labour market, aggregate employment will be determined endogenously from the model. Table 3 shows that the aggregate employment has increased by 1.47 per cent in the short run, which is more than the increase in real GDP (0.70 per cent). The reason is our assumption about fixed industry usage of capital and land. With capital and land fixed, an increased use of labour influence a decline in marginal productivity of labour as output expands. Hence employment rises more than real GDP.

Now with real GDP determined from the supply side and domestic absorption (aggregate real household consumption, aggregate real investment and aggregate government spending) fixed, the trade balance as a proportion of GDP shows an improvement of 0.004 (Table 3). The projected increase in the import volume index of 1.53 per cent is offset by a 9.72 per cent increase in export which results in a movement towards surplus of the balance of trade. In the short run, in Bangladesh, the sectors experiencing the largest export expansion are shrimp, leather products, readymade garments, knitting, toiletries manufacturing followed by miscellaneous industries and jute and jute products in which the country has comparative advantage. The movement of the trade surplus is the result of an improvement in international competitiveness, i.e., a reduction in domestic costs relative to foreign prices.

Table 3: Projected effects of a 100 per cent tariff cut in all sectors: selected macro variables

Macro Variables	Short run	Long run

Real GDP(expenditure side)	0.70	0.82
Aggregate Employment	1.47	0
Aggregate Real Household Consumption	0	0.57
Consumer Price Index	-3.61	-1.25
Export Volume Index	9.72	6.35
Import Volume Index	1.53	2.70
Terms of Trade	-0.57	-0.30
Exports Price Index	-0.57	-0.30
Poverty Line(Rural)	-2.03	-0.55
Poverty Line(Urban)	-1.69	-0.46
Ordinary Change to Nominal Trade balance to GDP ratio	0.004	0
Real Devaluation	4.20	1.55

Table 3 also shows that in the short run, consumer prices fall by 3.61 per cent which also results in a real exchange rate depreciation of 4.20 per cent. Tariff cut reduces the prices of imported manufactured goods that are used as an input which again reduces the cost structure of industries and wage cost for all sectors (under full wage indexation assumption).Thus trade liberalisation helps to reduce the inflationary pressure on the economy.

In contrast to the short run, in the long run most macroeconomic variables show a similar direction but with a different magnitude. For example, the percentage changes in the long run GDP is 0.82, which is higher than the short run real GDP of 0.70 per cent. The main difference between the short run and the long run simulation is that in the long run, the employment level and capital rates of return are assumed to be unchanged, so the variation in the real GDP comes from only variable capital inputs. As opposed to short run results, in the long run, real aggregate consumption increases by 0.57 per cent which implies aggregate welfare effects of tariff liberalisation. By assumption government consumption demand is also expected to increase by 0.57 per cent. Further, real wage increases by 3.24 per cent which indicates the increased derived demand for labour.

Exports and imports both register positive growth in the long run; however, the export growth is more pronounced than import growth. Export grows at the rate of 6.35, which is less than that of the short run figure (Table 3). Rationalizing the results in terms of

assumed model closure can clear this. In the short run, with fixed domestic absorption, any increase in real GDP is reflected entirely in the expenditure side by a change in the balance of trade (X-M); in contrast, in the long run with fixed balance of trade assumption, expansion of the economy is manifested by increase in domestic absorption, and less happens to exports and imports. As in the short run, in the long run we observe the real exchange rate depreciation by about 1.55 per cent and the export price decreased by 0.30 per cent which again results in the deterioration of terms of trade.

The percentage changes in the poverty line both for the rural and urban areas also have decreased in both short run and long run (Table 3), implying that the tariff cut has made the prices of the basic need commodities cheaper.

4.1.2 Sectoral effects:

The effects at sectoral level or the reallocation of output effects depends largely on the sectoral structure of imports and exports, initial tariff rates and the trade elasticities[11]. Taking these factors into account Appendix Table-1 provides the sectoral results of the simulations. In the short run, tariff reduction results in a fall in import prices which in turn increases the level of imports. In the short run imports tend to rise, mostly for fruit cultivation, spice cultivation, milk fat, fish, fish seafood, sugar-gur-molass, tea products, process food, jute products and china pottery. These are the commodities which had high import penetration and a high tariff rate before (Appendix Table-2). Faced with lower domestic demand, producers reduce the domestic production in these sectors. In the short run, the maximum decline in production is for fruit cultivation, spice cultivation, sweetener industry, food processing, petroleum refinery, glass industry and cement manufacturing (Appendix Table -1).

The Fan decomposition[12] reveals that in the short run for the majority of the above mentioned industries, a substitution from domestic goods to cheaper import variety has

[11] Base data for tariff rates, export shares and import shares in Bangladesh for the year 2000 has been provided in appendix section.

[12] The Fan decomposition shows how the change in demand for a locally produced commodity may be split between 1) local market effects –overall increase in local demand; 2) Domestic share effect- Replacement of imported by domestic goods; and 3) Export effect- An increase in exports.

led the contraction of their outputs. For other industries such as wheat, other grain, sugarcane cultivation, oilseed cultivation, tea products, handloom cloth and dyeing and bleaching, the shrinking local market effects have contributed to a marginal decline in their output whereas for medicines, fertilizer insecticides, chemical products and the cement industry, increased import penetration contributed to their decline in output.

On the other hand, industries, which were less protected before have been able to expand their output. In the short run, among agricultural industries, the expanding sectors are jute cultivation, tea cultivation and shrimp farming, whilst in the manufacturing sector, readymade garments, knitting, balling, jute fabrication, toiletries, cloth milling, leather industries are the largest winners because of trade liberalisation. The Fan decomposition shows that for most of the expanding manufacturing and agricultural industries it is the increase in exports which has led this expansion. A decomposition analysis of output price with AnalyseGE (Horridge, Harrison, and Pearson 2004)[13] shows that decreases in the prices of material inputs and the reductions in labour cost have contributed to the significant expansion of the above mentioned export industries. Further, some export oriented industries have reaped the benefit of cheaper inputs; cheaper fish imports which have expanded the fish process industry where it uses 89 per cent of imported fish. Similarly, increased imports of mill cloth have contributed to expansion in the readymade garment industry where 70 percent of mill cloths are used. Along with the expansion of agricultural and manufacturing industries, service sectors also have expanded after tariff liberalisation. Transport industries such as water transport, air transport, wholesale trade, retail trade, and public administration defense and communication sectors expand in the short run. Expansions in agricultural and manufacturing sectors have contributed mostly to the expansion of these service sectors.

Similar to the short run, in the long run imports are higher for fruit cultivation, spice cultivation, tea products, fish seafood followed by sugarcane, china pottery, process food, milk fat and leather products. However, the increase is greater in the long run compared to the short run. As a result, oil industry, food process, paper industry, petroleum refinery,

[13] AnalyseGE is a software tool that provides modeler a "point and click" access of the model equations, the data and the simulation results. By quickly moving between these information sources modeler can explain the main mechanism of simulation results.

glass industry, and cement manufacturing have shown contractions as a result of cheaper imports (Appendix Table-1). As in the short run, the Fan decomposition reveals that these commodities were mainly directed to final consumption. Our simulation results also show tariff reduction has increased real wage (3.243) and decreased the cost of using capital (-1.295). This increase in real wage can be directly traced as a result of the increased demand for labour for the labour intensive sectors. Since the use of capital in production is more attractive relative to labour, industries that are able to take advantage of the cheaper effective cost of capital are able to expand. As a result, positive output effects of manufacturing industries have become more pronounced in the long run compared to the short run. The industries which expanded in the short run grew further in the long run. As examples, readymade garment, knitting, toiletries, miscellaneous industries and the shrimp farming are the largest winners in the long run. The rate of increase in the output levels is higher in the long run than in the short run. Increased employment of capital and hence increased investment has contributed to this expanded output in the long run.

As opposed to the short run, in the long run jute fabrication and baling industries are expected to contract. Among the agricultural products, it is the contraction of jute output which has led to contraction of these industries. A decomposition analysis by AnalyseGE reveals that increased average input cost, especially increased in the labour cost, has contributed to its declining production. A decreased output also contributed to decreased volume of exports in the long run compared to the short run. However, in the long run, some domestic agricultural industries such as paddy, wheat, other grain and pulse cultivation have experienced positive gains. Sales decomposition analysis shows that for these commodities intermediate demand increases significantly, both for domestic and imported commodities. Increased output of these commodities have in turn helped to increase output of rice milling and grain milling as they are the main users of these commodities.

Along with the expansion of most agricultural and manufacturing industries many service sectors also experience output gains. With the exception of mining and quarrying, all service sectors have shown positive responses in the long run. This may be the result of

increased output for both agricultural and industrial industries which increases activity in wholesale trading, retail trading as well as in other services.

4.1.3 Results for factor price changes:

Our simulation results show both in the short run and long run there is a reallocation of resources towards more exportables sectors from non-exportables sectors and from the sectors in which demand for imported good increases. Thus, there is a differential impact on relative factor prices both in the short run and long run. Table-4 shows in the short run all the factors of production suffered from a decline in their remuneration. The main reason for this is the contraction of major domestic sectors and the fall in price. For example, for land, contraction in the agricultural output such as paddy, wheat, sugar cultivation, fruit cultivation, spice cultivation, fishing and forestry has reduced the demand for land whereas expanding output in other agricultural products such as jute cultivation, cotton cultivation, tea cultivation and shrimp farming has increased the demand for it. In the short run, the decreased demand for land has offset the increased demand for it which in turn results a downward pressure on its factor return (-3.53 per cent). The same is true for capital, with increasing demand in expanding capital intensive sectors such as manufacturing and some service sectors such as urban building, rural building, electricity water generation, whole sale trade and retail trade, housing service return of capital increase, whereas, in declining sectors such as food processing, petroleum refinery, cement manufacturing industry, mining and quarrying capital returns decline (Appendix Table-1). In aggregate, return on capital decreased by 1.24 percent in the short run. For labour return, because of full wage indexation assumption, nominal wage declined by 3.61 per cent as tariff removal led to a fall of CPI by 3.61 per cent in the short run (Table 4).

Table 4: Projected effects on factor prices

Model code	Variable	Short run	Long run
P1lab_i	Price of labour	-3.61	1.96

P1cap_i	Price of capital	-1.24	-1.30
P1lnd_i	Price of land	-3.53	0.99

Unlike with the short run, all factor returns registered a positive change except the return for capital. The reason again lies in the closure rule. In the long run, increased demand for labour in the relatively labour intensive sectors such as ready made garments, knitting, toiletries, and cloth mills has increased the return to labour (Table 4). With the increase in labour return, producers will try to substitute alternative factors which results the decrease in employment. With the decrease in labour employment, K/L ratio increases, which in turn decreases marginal productivity of capital, as a result, capital rewards decline (Table 4).

4.1.4: Household's income effect:

Variation in factor remuneration affects the income of household groups according to their sources of income. Table 5 shows in the short run, tariff liberalisation has led to nominal income falling for all household groups. The most substantial decline has occurred for the landless household group (-2.26 per cent) whereas for the rural marginal farmer, small farmer and non-agricultural household groups these values are -1.94 per cent, -1.85 per cent, and -1.84 per cent respectively. The least value (-1.51 per cent) is for the large farmer household group in the rural areas. Similarly, in urban areas, richer household groups such as medium-educated and high-educated household groups experience a lower percentage decrease in their income compared to other urban groups (Table 5).

In contrast, in the long run, the percentage changes in income are positive for all household groups both in rural and urban areas (Table 5). These underlying differences in the distributional results lie in the fact that various factors of production are rewarded differently in short run and long run because of assumed closures. For instance, in the

Table 5: Effects on household income (percentage change from base)

Household groups	Short run	Long run
Rural		

Landless HH	-2.26	1.84
Marginal farmer HH	-1.94	1.14
Small farmer HH	-1.85	1.05
Large farmer HH	-1.51	0.43
Non-agricultural HH	-1.84	1.13
Urban		
Illiterate HH	-1.89	1.24
Low-educated HH	-1.75	0.85
Medium-educated HH	-1.52	0.55
High-educated HH	-1.53	0.39

long run, real wage increases result from the increase in derived demand for labour whereas in the short run, the gain from the removal of tariff was absorbed by the increase in the employment. The distributional results also vary depending on the sources of income. Referring to Appendix Tables 4 and 5 which show the sources of income for rural and urban households, in rural areas, landless household and marginal farmer household groups mainly depend on labour income, whereas in urban areas, well off household groups rely on capital income. Therefore, the factorial income distribution predicts that a fall in the wage income will affect the rural poor more than that of the urban household group. Accordingly, a decline in the capital income is likely to hurt the rich urban group more than rural poor.

4.1.5 Consumption effects:

Tariff removal has decreased the prices of imports which has led the aggregate consumption price index to decline by 3.607 per cent in the short run and 1.247 per cent in the long run. However, across the households, the variation in the drop in consumer prices is not uniform. In the short run, the highest drop is seen in the urban high educated household (-3.637) and illiterate household (-3.625) followed by non-agricultural household (-3.615) where as in rural areas for landless household, the decreases in CPI is 3.610 followed by marginal farmer household and small farmer household. The same pattern is also seen in the long run. Thus tariff liberalisation benefited those household groups whose consumer basket is dominated by goods with declining prices as a result of

the tariff reform. Table 6 shows the comparative households results on prices, and nominal and real consumption for various household groups. On average, in the long run, nominal consumption declines for all household groups; the landless is the most affected group. The results change significantly when these are expressed in real terms.

Table 6: Households consumption effects

	Consumer prices		Long run	
Household groups	**short run**	**long run**	**Nominal consumption**	**Real consumption**
Landless HH	-3.610	-1.211	-0.879	0.337
Marginal farmer HH	-3.593	-1.191	-0.819	0.377
Small farmer HH	-3.588	-1.193	-0.719	0.480
Large farmer HH	-3.560	-1.182	-0.665	0.523
Non-agricultural HH	-3.615	-1.241	-0.561	0.689
Illiterate HH	-3.625	-1.270	-0.868	0.407
Low educated HH	-3.615	-1.282	-0.764	0.524
Medium educated HH	-3.599	-1.299	-0.576	0.733
High educated HH	-3.637	-1.324	-0.340	0.997

The relatively larger reduction in consumer prices offset the overall decline in the nominal consumption. In the long run, real consumption has increased for all the household groups. This implies that tariff reduction has a welfare enhancing impact on households. However, the increase is more prevalent in urban household groups. Rural landless achieve the least. This also means that policy change benefits urban rich more than the rural poor. Our simulation results show that trade liberalisation brings the largest price falls in fruit cultivation, tobacco, milk fat, fish seafood, tea product, process food, wooden furniture, petroleum products, china pottery, cement, fabricated metal products and transport equipment. Consumption shares for different commodities by household groups (Appendix Table 3) confirm that these products contribute more to the expenditure baskets of urban households than of rural households. As a result, the real effect is greater on urban groups than on rural groups.

4.2 Poverty implications:

To evaluate the impacts of trade policy simulations on the poverty profiles of various representative households, we have used Foster, Greer, and Thorbecke (1984) class of poverty decomposition approach which can be expressed as:

$$P_\alpha = 1/n \sum_{i=1}^{q} \left(z - y_i / z \right)^\alpha$$

where n is the number of people, q is the number of poor people, z is poverty line, y_i is the income of i-th individual and α is a parameter which acts as a measure of poverty aversion. The parameter α can take any positive value or zero. The higher the value, the more the relative importance accorded to individuals below the poverty line. When parameter α = 0, P_0 is simply the head count index, q/n which shows the number of households below the poverty line divided by the total households in the group. For α = 1, P_α becomes the income poverty gap where relative importance to individuals below the poverty line is proportional to their income. When α = 2, P_α measures the severity of poverty, where a greater weight is assigned to the households with income far below the poverty line. By using the observed distribution of all the households in the Household Income and Expenditure Survey 2000, household size, their sample weight and the income change results from the model, the following poverty results were obtained.

4.2.1 Base year poverty profiles:

The base case scenario suggests to us that the incidence of poverty is higher in rural areas compared to urban areas (Table 7). In rural areas, about 49 per cent of rural populations are poor while for urban areas this figure is only 32.56 per cent. In terms of poverty gap and severity of poverty, poverty incidence is higher in rural areas compared to their urban counterparts (Table 7). If we decompose by households, we find, in rural areas, the landless household group has the highest proportion of the poor at 71.85 per cent, followed by marginal farmer and small farmer households at 60.66 per cent and 45.46 per cent respectively (Table 7). As with the headcount index (P_0), the same trend is observed for the poverty gap (P_1) and poverty severity (P_2), with the landless household having the highest poverty gap (21.63 per cent) and poverty severity (8.45 per cent) followed by the

marginal farmer household and small farmer household with the values of poverty gap (P_1) and poverty severity (P_2) of 15.96 per cent, 10.30 per cent, 5.70 per cent and 3.35 per cent respectively (Table 7). Thus, in rural areas the landless households proved to be the most deprived group followed by the marginal farmer household group. In urban areas poverty incidence is mainly concentrated in the illiterate household group with the highest proportion of the poor at 60.11 per cent followed by the low-educated household at 24.34 per cent respectively (Table 7). In terms of poverty gap (P_1) and poverty severity (P_2) this group also experiences the highest incidence of poverty with the values at 17.44 per cent and 6.77 per cent respectively.

Table 7: Base year estimates of FGT poverty Indices in Bangladesh.

	Poverty Index (in percentages)		
Household groups*	Head count Index(P_0)	Poverty gap(P_1)	Squared Poverty gap(P_2)
Rural(All)	**49.20**	**13.09**	**4.73**
Landless HH	71.85	21.63	8.45
Marginal farmer HH	60.66	15.96	5.70
Small farmer HH	45.46	10.30	3.35
Large farmer HH	20.40	4.36	1.24
Non-agricultural HH	43.45	11.42	4.10
Urban (All)	**32.56**	**8.70**	**3.21**
Illiterate HH	60.11	17.44	6.77
Low-educated HH	24.34	5.32	1.61
Medium-educated HH	5.77	0.97	0.32

Source: Simulation results of Bangladesh model and Bangladesh Household Income and Expenditure Survey 2000.
*High–educated household group has not been incorporated in this table as their per-capita income is well-above the poverty line.

For the low-educated household group, their values for the poverty gap (P_1) and poverty severity (P_2) 5.32 per cent and 1.61 per cent also indicates the higher vulnerability of this group compared with other urban household groups. The high incidence of income poverty among the rural landless, marginal farmer household and urban illiterate can be explained by the fact that these household groups receive income mainly from labour and especially unskilled labour income (Appendix Table 4 and 5). For the landless household group in rural areas, they depend heavily on selling labour in both agricultural and non-agricultural labour markets for their livelihoods. The seasonal nature of agricultural employment and limited opportunities for non-farm employment cause the great majority

of them to suffer from chronic and transitory food insecurity (Hossain, Naher, and Shahabuddin 2005). In urban areas the illiterate household group is mainly involved in petty trade activities or service sectors such as push-carts, rickshaw drivers, the shoe cleaners and so on. Most of this group has migrated from the rural areas where they were mostly landless or asset less and could not earn a livelihood.

4.2.2 Post simulation poverty profiles:

Tables 8 and 9 present the simulation results for the FGT poverty indices. The three types of FGT Poverty estimates were estimated and compared with the base case. A negative value of the changed poverty indices depicts a reduction in the poverty estimates whereas the positive value indicates an increase in the poverty estimates. Table 8 shows that in the short run the poverty consequences are mixed for rural and urban households. In the short run, the three measures of poverty decrease marginally for overall rural households whereas for overall urban households the first measure (head count index) decreases, however, the poverty gap (P_1) and poverty severity (P_2) increase. The implication of the result is that in the short run in rural areas trade liberalisation has a positive impact on poverty, whereas in urban areas, trade liberalisation has helped some of the poor people (0.58 per cent) to go from poor to non poor, but increased value of P_1 and P_2 by 0.38 per cent and 0.62 per cent respectively remind us of the situation of deterioration of households who remained poor. In other words, in urban areas in the short run the poverty situation has intensified. This variation mainly comes from the differences in the changes in household's income and consumer prices because of tariff removal. In contrast, in the long run, removal of import tariffs leads all poverty indicators to reduce for overall rural and urban areas. (Table 9). The head count index decreases by 3.00 per cent and 2.79 per cent among overall rural and urban households respectively, whereas the poverty gap and poverty severity decrease by 5.27 per cent, 6.34 per cent, 4.25 per cent, and 5.30 per cent respectively (Table 9).

Table 8: FGT Poverty Indices (in percentages) for tariff policy experiment (Short run)

	Poverty indices	% changes of poverty indices from base case

Household groups	Head count ratio(P_0)	Poverty gap(P_1)	Squared poverty gap(P_2)	Head count ratio(P_0)	Poverty gap(P_1)	Squared poverty gap(P_2)
Rural(All)	**49.06**	**13.06**	**4.72**	**-0.28**	**-0.23**	**-0.21**
Landless HH	71.93	21.75	8.50	0.11	0.55	0.59
Marginal farmer HH	60.41	15.95	5.69	-0.41	-0.06	-0.18
Small farmer HH	45.35	10.24	3.32	-0.24	-0.58	-0.90
Large farmer HH	20.14	4.27	1.20	-1.27	-2.06	-3.23
Non-agricultural HH	43.24	11.35	4.07	-0.48	-0.53	-0.73
Urban(All)	**32.37**	**8.73**	**3.23**	**-0.58**	**0.34**	**0.62**
Illiterate HH	60.19	17.53	6.81	0.13	0.52	0.59
Low-educated HH	24.34	5.33	1.62	0	0.19	0.62
Medium-educated HH	4.77	0.85	0.28	-17.33	-13.05	-12.22

Source: Simulation results of Bangladesh model and Bangladesh Household Income and Expenditure Survey 2000.

Decomposing these results among household types, poverty incidence varies greatly across rural and urban areas for different household groups. For example, in the short run, in rural areas, rural landless households experience an increase in poverty incidence (Table 8). The reason for this is that for this household group, as we stated before, nominal post tax income suffered a lot because of their declining factor income. For this household group, trade liberalisation in the short run has not been offset with the bigger fall in the monetary poverty line. Moreover, reduction in the government transfer payment due to tariff induced government revenue loss also has triggered this situation in the short run for this household group.

For other rural household groups, all poverty indicators show a reduction in the short run. The large farmer household group experiences the largest decrease in poverty (Table 8). On the other hand, for urban groups, decomposition results show slightly increased poverty for urban illiterate and low-educated household groups. All the poverty indicators reveal impressive improvement for urban medium-educated household group in the short run.

Under long run simulation of tariff removal, decomposition results among household groups show a reduction of all poverty indicators for all household groups (Table 9) both in rural and urban areas, suggesting that the trade liberalisation policy has a poverty reducing effect in the long run. In rural areas, the most beneficiary group is the marginal farmer household whereas in urban areas, medium-educated households benefited most

because of tariff liberalisation. (Table 9). These differences in poverty across different household groups can be traced to the changes in the factor prices, changes in the sources of household's income and by the changes in the consumer prices.

In the short run, trade liberalisation encourages a reallocation of resources from heavily protected and inward oriented paddy and other food crop sectors to manufacturing and service sectors, which leads to a fall in the remuneration of labour and land relative to capital. Thus, in the short run, the effects on nominal income are biased against rural and urban poor households who largely depend on labour income. However, the significant drop in consumer prices has offset all of these negative effects except in the case of rural landless, urban illiterate and urban low-educated households.

On the other hand, in the long run, tariff removal has stimulated the export oriented labour intensive manufacturing industries such as ready made garment and knitting industries which attract labour from the low productive import competing agricultural and manufacturing sectors which in turn increase the nominal income of a substantial part of low-income households, especially the rural poor and the urban poor who are dependent mostly on labour income. In this case the income effect is more dominant than the price effect. Thus, poverty impacts depend on the model closure.

Table 9: FGT Poverty Indices (in percentages) for tariff policy experiment (Long run)

	Poverty indices			% changes of poverty indices from base case		
Household groups	Head count ratio(P_0)	Poverty gap(P_1)	Squared poverty gap(P_2)	Head count ratio(P_0)	Poverty gap(P_1)	Squared poverty gap(P_2)
Rural(All)	**47.72**	**12.40**	**4.43**	**-3.00**	**-5.27**	**-6.34**
Landless HH	70.45	20.45	7.83	-1.95	-5.46	-7.34
Marginal farmer HH	57.92	15.23	5.36	-4.52	-4.57	-5.96
Small farmer HH	44.55	9.75	3.13	-2.00	-5.34	-6.57
Large farmer HH	19.86	4.21	1.18	-2.65	-3.44	-4.84
Non-agricultural HH	43.24	11.35	4.07	-0.48	-0.61	-0.73
Urban(All)	**31.65**	**8.33**	**3.04**	**-2.79**	**-4.25**	**-5.30**
Illiterate HH	58.78	16.73	6.42	-2.21	-4.07	-5.17
Low-educated HH	23.81	5.07	1.52	-2.18	-4.70	-5.59
Medium-educated HH	4.77	0.85	0.28	-17.33	-12.37	-12.5

Source: Simulation results of Bangladesh model and Bangladesh Household Income and Expenditure Survey 2000

In this study we used a range of other poverty measures such as Watt's index, Sen index and S-Gini index as a check on the robustness of the FGT poverty measures. The results of these indices under the bench mark and the two different policy scenarios have been presented in Appendix Table 6 to Table 9. The results are consistent with those from the FGT indices, suggesting that poverty indices measured in this study are robust in nature.

5. Conclusions:

This paper investigates the contribution of trade liberalisation policies to household welfare and poverty in Bangladesh. Since the effect of trade liberalisation on poverty and welfare works through many transmission channels such as firms, households and government, an economy wide framework which includes details on income and expenditures of various agents in the economy and which can identify the direct and indirect effects on these channels is best suited. Thus this paper analyses the trade liberalisation effects in a CGE framework. The model used here is static in nature and of the neoclassical type. It is based on the IDC-GEM, a model for the South African Economy, developed by Horridge et al.,(1995).

The model simulation results show that both in the short run and long run, the complete removal of tariffs favours export-oriented labour intensive sectors, especially readymade garments and the knitting industry. The female low skilled category gained most both in short run and long run because of the higher intensity of these industries. Real consumption of households increased for all household groups in the long run as tariff elimination led consumer prices to fall. However, the increase was more for urban households as compared with rural ones. Further, expansion of service sectors became a regular phenomenon both in the short run and long run.

Poverty consequences are mixed for rural and urban households in the short run. In the short run, the three measures of poverty decreased marginally for overall rural households, whereas for overall urban households the head count index decreased, however, the poverty gap and poverty severity increased. The implication of the result is

that in the short run in rural areas, trade liberalisation has a positive impact on poverty whereas in urban areas, trade liberalisation has helped some of the poor people to go from poor to non poor, but the increased value of the poverty gap and poverty severity remind us that in urban areas in the short run the poverty situation has intensified. In contrast, in the long run, removal of import tariffs leads all poverty indicators to reduce for overall rural and urban areas. The conclusion from this study is that tariff liberalisation policy is welfare inducing and poverty reducing both in the short run and long run, however, their extent is larger in the long run compared to the short run.

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Appendix

Table 1: Projections of Percentage Change in Industry Effects

	Short run		Long run	
Industry	**Output level**	**Employment**	**Output level**	**Employment**
Paddy	-0.057	-0.096	0.117	-0.38
Wheat	-0.225	-0.375	0.213	-0.262
Othergrain	-0.201	-0.445	0.365	-0.293
JuteCultiv	2.278	3.397	-0.261	-0.683
SugcaneCulti	-0.856	-1.836	-1.02	-1.931
PotatoCulti	-0.033	-0.08	0.138	-0.624
VegCulti	0.333	0.746	-0.92	-1.837
PulseCulti	-0.051	-0.121	0.177	-0.572
OilseedCulti	-0.512	-0.934	-1.969	-2.859
FruitCulti	-1.28	-3.786	-1.799	-3.184
CottonCulti	0.694	1.955	0.503	-0.258
TobaccoCulti	-0.245	-0.494	-0.575	-1.342
TeaCulti	2.161	4.671	0.48	-0.122
SpiceCulti	-2.301	-5.104	-3.541	-4.99
OthcropCulti	0.031	0.07	-0.201	-0.995
LivstockRear	0.054	0.125	0.588	-0.05
PoultryRear	-0.188	-0.448	0.313	-0.404
ShrimFarming	2.683	6.111	2.113	1.819
Fishing	-0.211	-0.557	0.458	-0.287
Forestry	-0.088	-0.26	0.703	-0.038
RiceMilling	-0.057	-0.274	0.041	-1.232
GrainMilling	-0.286	-1.466	0.291	-1.01
FishProcess	0.565	3.261	0.172	-1.151
OilIndustry	-0.499	-2.319	-2.65	-3.884
SweetenerInd	-0.841	-1.003	-0.996	-1.255
TeaProduct	-0.612	-1.017	-0.145	-0.788
SaltRefining	-0.011	-0.017	0.513	-0.006
FoodProcess	-1.051	-2.233	-1.432	-2.28
TannFishing	1.516	4.959	1.265	0.153
LeatherInd	1.739	5.242	1.501	0.43
Baling	7.198	21.699	-0.595	-1.591
JuteFabricat	4.927	5.62	-0.515	-0.703
YarnIndustry	0.982	1.385	0.821	0.354
ClothMill	2.727	5.348	3.074	2.284
HandloomClot	-0.375	-0.497	0.253	-0.141
DyeingBlech	-0.222	-0.36	0.294	-0.325
RMG	4.853	8.128	5.37	4.72
Knitting	5.41	9.092	8.809	8.137
ToiletrieMfg	2.448	5.828	10.56	9.555
CigarettInd	0.108	0.807	0.691	-0.709

BidiIndustry	0.01	0.035	0.458	-0.689
SawPlane	0.075	0.18	0.266	-0.669
Furniturind	0.456	1.093	0.56	-0.378
PaperInd	-0.64	-2.206	-2.46	-3.579
PrintPub	0.432	0.699	-0.17	-0.781
PharmaMfg	0.315	0.728	0.512	-0.402
FertiliseInd	0.649	2.852	3.469	2.193
BasiChemical	0.356	0.776	-0.884	-1.742
PetroleumRef	-2.805	-12.506	-7.013	-8.205
EarthwareInd	0.05	0.223	-0.775	-2.014
ChemicalInd	-0.366	-1.164	-0.279	-1.381
GlassInd	-1.996	-3.888	-4.202	-4.966
ClayInd	0.116	0.269	0.994	0.07
CementMfg	-2.198	-6.282	-4.938	-5.953
BasicMetaMfg	-0.363	-0.723	-0.526	-1.326
MetalMfg	-0.635	-1.285	-0.59	-1.403
MachineEquip	-0.729	-1.083	-3.497	-4.007
TranspoEquip	-0.205	-0.792	-0.936	-2.117
MiscellaInd	1.554	4.145	5.049	4.01
Urbanbuild	0.183	0.51	1.152	0.112
RuralBuild	0.06	0.198	1.068	-0.062
PPlantBuild	-0.011	-0.052	1.155	-0.124
RuRoadBuild	-0.015	-0.044	1.124	0.059
PoRoadBuild	0.406	0.692	1.114	0.446
CaDyothBuild	-0.013	-0.022	1.115	0.416
ElectWatGene	0.292	1.294	0.764	-0.486
GasExtDist	-0.145	-0.503	0.405	-0.745
MinQuarring	-0.164	-0.376	-0.048	-0.817
WholeTrade	0.622	1.433	1.024	0.111
RetailTrade	0.534	1.235	1.01	0.094
AirTransport	1.435	2.231	1.104	0.533
WatTransport	2.981	11.627	1.274	0.099
LanTransport	0.579	1.789	1.073	-0.019
RaiTransport	0.629	0.765	1.016	0.729
OthTransport	1.905	3.717	0.707	-0.067
HousingServ	0.027	0.341	0.505	-0.981
HealthServ	0.116	0.244	0.551	-0.295
EducatServ	-0.013	-0.015	0.196	-0.062
PubAdDefence	5.325	6.605	1.221	0.922
BanInsRestat	0.713	1.128	0.569	-0.021
ProfesioServ	0.893	2.359	0.667	-0.329
HotelRest	0.258	0.493	0.479	-0.288
Entertainmen	0.057	0.109	0.238	-0.527
Communicatio	1.866	3.655	0.506	-0.269
OthServices	0.201	0.243	0.096	-0.184
InfotechEcom	1.427	2.783	0.551	-0.225

Table 2: Base data-Tariff rates, Export share and Import shares.

Commodity	EXPSHR	IMPSHR	TARFRATE
1 Paddy	0	0	0
2 Wheat	0	0.3416	0.0321
3 Othergrain	0	0.0067	0
4 JuteCultiv	0.1966	0	0
5 SugcaneCulti	0	0	0
6 PotatoCulti	0	0.0033	0.05
7 VegCulti	0.0324	0.2754	0.038
8 PulseCulti	0	0	0
9 OilseedCulti	0	0.3034	0.0467
10 FruitCulti	0	0.0691	0.2107
11 CottonCulti	0	0.6579	0
12 TobaccoCulti	0.0283	0.174	0.1075
13 TeaCulti	0.4493	0	0
14 SpiceCulti	0	0.1146	0.2317
15 OthcropCulti	0.003	0.104	0.0268
16 Meat	0	0.0264	0.0005
17 MilkFat	0	0.509	0.316
18 Animaldraft	0	0.0161	0.003
19 Manure	0	0.0159	0
20 HidesSkins	0	0.0224	0.0061
21 PoultryMeat	0	0.0103	0
22 PoutryEggs	0	0.0043	0.1014
23 Shrimp	0.3487	0	0
24 Fish	0	0.0001	0.1137
25 Forestry	0	0.0005	0.0797
26 RiceflorBran	0	0.0184	0.0159
27 FlourBrafeed	0	0.0121	0.1184
28 FishSeafood	0.0955	0.0337	0.1616
29 EdiNoedOil	0	0.508	0.0585
30 SugGuMolass	0	0.0552	0.1818
31 TeaProduct	0	0.0124	0.2049
32 Salt	0	0.0275	0.1142
33 ProcessFood	0	0.1095	0.1724
34 TaningLethr	0	0.0003	0.0161
35 LethrProdt	0.3465	0.0084	0.1441
36 Baling	0	0	0
37 JuteProduct	0.5611	0.0003	0.0968
38 Yarn	0	0.317	0.0337
39 MillCloth	0	0.2902	0.0192
40 HandlmCloth	0	0	0
41 DyeingBlech	0	0.0293	0
42 RMG	0.7585	0.3885	0.0044
43 Knitting	0.7529	0.0629	0.0777

44 ToiletrieMfg	0.2532	0.2089	0.121
45 CigarettInd	0	0.0093	0.0204
46 BidiIndustry	0	0	0
47 BasicWProdt	0	0.0282	0.1761
48 WoodnFur	0	0.0082	0.2332
49 PulpPaBoard	0	0.4229	0.0734
50 PrintPub	0	0.1276	0.0306
51 Medicines	0	0.2584	0.0115
52 FertzerInsec	0.224	0.45	0.0093
53 Chemicals	0	0.7946	0.0851
54 PetroProduct	0.0198	0.6111	0.2443
55 Chinapottery	0.064	0.0906	0.2675
56 ChemProdt	0	0.5213	0.0482
57 GlassProdt	0	0.6466	0.1667
58 BricTCProdt	0	0.0223	0.0762
59 Cement	0	0.6736	0.1663
60 IronStBasic	0	0.3574	0.0534
61 FabMetProdt	0	0.2877	0.153
62 Machinery	0.0266	0.7108	0.0589
63 TransEquipmt	0	0.4779	0.0885
64 MiscellaInd	0.4618	0.5042	0.0672
65 UrbanBuild	0	0	0
66 RuralBuild	0	0	0
67 BldgMantence	0	0	0
68 PlantConst	0	0	0
69 RuRoads	0	0	0
70 PortAirRlwy	0	0	0
71 CaDyothBuild	0	0	0
72 InfrastrMtn	0	0	0
73 ElectWater	0	0	0
74 GasExtDist	0	0.022	0.0734
75 MinQuarring	0	0.1001	0.0798
76 WholeTrade	0	0	0
77 RetailTrade	0	0	0
78 AirTransport	0.0411	0	0
79 WatTransport	0.1242	0	0
80 LanTransport	0	0	0
81 RaiTransport	0	0	0
82 Warehousing	0	0	0
83 HousingServ	0	0	0
84 HeathServ	0	0	0
85 EducatServ	0	0	0
86 PubAdDefence	0.2513	0.0413	0
87 BanInsurance	0.0146	0.0201	0
88 ProfesioServ	0.0208	0.0141	0
89 HotelRest	0	0	0

90 Entertainmen	0.001	0.0003	0
91 Communica	0.1276	0.0213	0
92 Othservices	0	0	0
93 InfTechServ	0.0356	0.0158	0
94 Waste	0	0.7168	0.0705
Total	5.2385	12.692	5.158

Table 3: Consumption shares for 94 commodities by Household groups

Commodity	Landless	Marginal	Small	Large	Non-agr	Illiterate	Low-edu	Medium-edu	High-edu
1 Paddy	0	0	0	0	0	0	0	0	0
2 Wheat	0	0	0	0	0	0	0	0	0
3 Othergrain	0	0	0	0	0	0	0	0	0
4 JuteCultiv	0.54	0.56	0.58	0.71	0.59	0.5	0.63	0.79	0.85
5 SugcaneCulti	0.15	0.15	0.15	0.14	0.14	0.13	0.12	0.1	0.09
6 PotatoCulti	1.29	1.28	1.24	1.18	1.18	1.12	1.01	0.86	0.77
7 VegCulti	2.46	2.44	2.38	2.26	2.25	2.15	1.93	1.65	1.47
8 PulseCulti	1.6	1.59	1.55	1.47	1.47	1.4	1.26	1.07	0.96
9 OilseedCulti	0	0	0	0	0	0	0	0	0
10 FruitCulti	3.05	3.03	2.95	2.8	2.79	2.66	2.39	2.04	1.82
11 CottonCulti	0	0	0	0	0	0	0	0	0
12 TobaccoCulti	0.03	0.03	0.03	0.03	0.03	0.03	0.03	0.02	0.02
13 TeaCulti	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01
14 SpiceCulti	0.37	0.36	0.35	0.34	0.34	0.32	0.29	0.25	0.22
15 OthcropCulti	1.47	1.46	1.42	1.35	1.35	1.29	1.15	0.99	0.88
16 Meat	2.64	2.62	2.55	2.42	2.41	2.3	2.06	1.77	1.58
17 MilkFat	0.46	0.45	0.44	0.42	0.42	0.4	0.36	0.31	0.27
18 Animaldraft	0	0	0	0	0	0	0	0	0
19 Manure	0	0	0	0	0	0	0	0	0
20 HidesSkins	0	0	0	0	0	0	0	0	0
21 PoultryMeat	1.23	1.22	1.19	1.13	1.13	1.08	0.97	0.83	0.74
22 PoutryEggs	1.43	1.42	1.38	1.31	1.31	1.25	1.12	0.96	0.85
23 Shrimp	1.21	1.2	1.17	1.11	1.1	1.05	0.95	0.81	0.72
24 Fish	17.1	16.98	16.53	15.69	15.65	14.93	13.39	11.46	10.21
25 Forestry	0.85	0.75	0.75	0.64	0.96	1.16	1.19	1.23	1.39
26 RiceflorBran	26.16	25.98	25.29	24	23.94	22.84	20.49	17.53	15.63
27 FlourBrafeed	1.62	1.61	1.57	1.49	1.48	1.41	1.27	1.09	0.97
28 FishSeafood	0.7	0.69	0.67	0.64	0.64	0.61	0.55	0.47	0.42
29 EdiNoedOil	2.5	2.48	2.42	2.3	2.29	2.18	1.96	1.68	1.49
30 SugGuMolass	3.62	3.59	3.5	3.32	3.31	3.16	2.84	2.43	2.16
31 TeaProduct	0.21	0.18	0.2	0.18	0.25	0.3	0.29	0.21	0.21
32 Salt	0	0	0	0	0	0	0	0	0
33 ProcessFood	1.79	1.77	1.73	1.64	1.63	1.56	1.4	1.2	1.07
34 TaningLethr	0	0	0	0	0	0	0	0	0
35 LethrProdt	1.71	1.7	1.83	1.98	1.88	1.72	1.85	1.92	1.71

36 Baling	0	0	0	0	0	0	0	0	0
37 JuteProduct	0.9	0.94	0.97	1.19	0.98	0.84	1.06	1.32	1.42
38 Yarn	0	0	0	0	0	0	0	0	0
39 MillCloth	0	0	0	0	0	0	0	0	0
40 HandlmCloth	3.41	3.39	3.63	3.93	3.75	3.42	3.67	3.82	3.41
41 DyeingBlech	0	0	0	0	0	0	0	0	0
42 RMG	0.38	0.38	0.41	0.44	0.42	0.38	0.41	0.43	0.38
43 Knitting	0.09	0.09	0.1	0.11	0.1	0.09	0.1	0.1	0.09
44 ToiletrieMfg	0.39	0.42	0.4	0.49	0.42	0.38	0.42	0.51	0.48
45 CigarettInd	0.57	0.49	0.53	0.49	0.67	0.8	0.77	0.56	0.56
46 BidiIndustry	0.12	0.1	0.11	0.1	0.14	0.17	0.16	0.12	0.12
47 BasicWProdt	0	0	0	0	0	0	0	0	0
48 WoodnFur	0.01	0.01	0.02	0.02	0.02	0.01	0.02	0.02	0.02
49 PulpPaBoard	0.16	0.17	0.18	0.22	0.18	0.15	0.19	0.24	0.26
50 PrintPub	0	0	0	0	0	0	0	0	0
51 Medicines	0.43	0.47	0.45	0.54	0.47	0.42	0.46	0.57	0.53
52 FertzerInsec	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.02
53 Chemicals	0	0	0	0	0	0	0	0	0
54 PetroProduct	0.87	0.76	0.77	0.65	0.98	1.19	1.22	1.26	1.42
55 Chinapottery	0.27	0.29	0.3	0.36	0.3	0.26	0.32	0.4	0.44
56 ChemProdt	0.21	0.22	0.21	0.26	0.22	0.2	0.22	0.27	0.25
57 GlassProdt	0.19	0.2	0.21	0.25	0.21	0.18	0.23	0.28	0.3
58 BricTCProdt	0	0	0	0	0	0	0	0	0
59 Cement	0	0	0	0	0	0	0	0	0
60 IronStBasic	0	0	0	0	0	0	0	0	0
61 FabMetProdt	1.31	1.37	1.42	1.74	1.43	1.22	1.55	1.93	2.08
62 Machinery	0.57	0.6	0.62	0.76	0.62	0.53	0.67	0.84	0.91
63 TransEquipmt	0	0	0	0	0	0	0	0	0
64 MiscellaInd	0.03	0.03	0.03	0.04	0.04	0.03	0.04	0.05	0.05
65 UrbanBuild	0	0	0	0	0	0	0	0	0
66 RuralBuild	0	0	0	0	0	0	0	0	0
67 BldgMantence	0	0	0	0	0	0	0	0	0
68 PlantConst	0	0	0	0	0	0	0	0	0
69 RuRoads	0	0	0	0	0	0	0	0	0
70 PortAirRlwy	0	0	0	0	0	0	0	0	0
71 CaDyothBuild	0	0	0	0	0	0	0	0	0
72 InfrastrMtn	0	0	0	0	0	0	0	0	0
73 ElectWater	0.76	0.67	0.68	0.58	0.86	1.05	1.07	1.11	1.25
74 GasExtDist	0.09	0.08	0.08	0.07	0.1	0.12	0.13	0.13	0.15
75 MinQuarring	0.61	0.53	0.54	0.46	0.69	0.83	0.85	0.88	1
76 WholeTrade	0	0	0	0	0	0	0	0	0
77 RetailTrade	0	0	0	0	0	0	0	0	0
78 AirTransport	0.04	0.04	0.05	0.06	0.06	0.05	0.06	0.08	0.08
79 WatTransport	0.05	0.05	0.06	0.08	0.08	0.07	0.08	0.1	0.11

80 LanTransport	0.72	0.78	0.95	1.21	1.27	1.11	1.29	1.61	1.71
81 RaiTransport	0	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.01
82 Warehousing	0.13	0.14	0.17	0.22	0.23	0.2	0.23	0.29	0.31
83 HousingServ	3.82	4.15	4.53	4.73	5.29	9.35	11.5	15.27	16.99
84 HeathServ	0.45	0.51	0.45	0.53	0.49	0.46	0.43	0.52	0.36
85 EducatServ	0.53	1.03	1.39	1.93	1.66	1.31	2.59	4.45	6.99
86 PubAdDefence	0.21	0.22	0.23	0.28	0.23	0.2	0.25	0.31	0.33
87 BanInsurance	0.31	0.31	0.32	0.38	0.34	0.32	0.37	0.42	0.45
88 ProfesioServ	1.17	1.18	1.22	1.44	1.29	1.2	1.41	1.6	1.71
89 HotelRest	2.1	1.8	1.93	1.79	2.47	2.92	2.81	2.04	2.06
90 Entertainmen	0.9	0.91	0.94	1.11	1	0.92	1.09	1.23	1.32
91 Communica	0.62	0.65	0.67	0.83	0.68	0.58	0.74	0.92	0.99
92 Othservices	3.22	3.24	3.38	3.96	3.57	3.3	3.9	4.41	4.71
93 InfTechServ	0.09	0.09	0.1	0.12	0.1	0.08	0.1	0.13	0.14
94 Waste	0.06	0.06	0.06	0.07	0.06	0.06	0.07	0.08	0.08
Total	100	100	100	100	100	100	100	100	100

Table 4: Factorial income composition (%)

Households	Labour	Capital	Land	Intra-house transfers	Govt. transfers	Row transfers	Total
Rural							
Landless HH	93.19	0	0	5.84	0.41	0.57	100
Marginal farmer HH	56.83	33.18	0.71	8.35	0.35	0.58	100
Small farmer HH	52.17	36.19	6.13	4.66	0.11	0.73	100
Large farmer HH	16.52	59.71	22.89	0.53	0.02	0.32	100
Non-agricultural HH	56.21	38.02	1.74	3.01	0.39	0.62	100
Urban							
Illiterate HH	60.63	37.33	0	1.60	0.05	0.39	100
Low educated HH	41.19	53.03	2.28	2.81	0.25	0.43	100
Medium educated HH	23.93	72.32	2.57	0.34	0.68	0.16	100
High educated HH	15.39	75.13	4.99	1.07	3.21	0.20	100

Source: Model database

Table 5: Occupation wise income composition (%)

Households	Male low skilled	Male high skilled	Female low skilled	Female high skilled
Rural				
Landless HH	84.94	2.96	12.02	0.07
Marginal farmer HH	86.11	6.44	**7.**20	0.24
Small farmer HH	67.21	27.91	3.86	1.01
Large farmer HH	34.92	56.49	2.16	6.43
Non-agricultural HH	58.36	32.07	7.94	1.62
Urban				
Illiterate HH	79.91	2.05	17.91	0.12
Low educated HH	76.85	12.35	9.30	1.48
Medium educated HH	1.58	89.84	2.86	5.71
High educated HH	0.29	95.87	1.29	2.54

Source: Model database

Table 6: Other Poverty indices under trade policy scenario (Short-run)

	Sen Index (%)		Watts Index (%)		S-Gini Index (%)	
Households	Before	After	Before	After	Before	After
Landless HH	28.35	28.46	27.95	28.11	32.55	32.69
Marginal farmer HH	21.38	21.30	20.06	20.00	25.54	25.48
Small farmer HH	14.11	14.04	12.66	12.57	17.66	17.56
Large farmer HH	5.76	5.64	5.17	5.06	8.12	7.97
Non-agricultural HH	15.33	15.24	14.40	14.32	19.58	19.48
Illiterate HH	23.19	23.28	22.56	22.68	27.87	28.19
Low-educated HH	7.16	7.17	6.41	6.42	9.80	9.82
Medium-educated HH	1.37	1.28	1.24	1.23	1.92	1.90

Table 7: **Percentage changes of other poverty indices from the base case scenario (Short-run)**

	Sen Index	Watts Index	S-Gini Index
Households	% change	% change	% change
Landless HH	0.57	0.39	0.43
Marginal farmer HH	-0.30	-0.37	-0.23
Small farmer HH	-0.71	-0.50	-0.57
Large farmer HH	-2.31	-2.08	-1.85
Non-agricultural HH	-0.56	-0.59	-0.51
Illiterate HH	0.53	0.39	1.15
Low-educated HH	0.16	0.14	0.20
Medium-educated HH	-0.81	-6.57	-1.04

Table 8: Other Poverty indices under different policy scenario (Long-run)

	Sen Index (%)		Watts Index (%)		S-Gini Index (%)	
Households	Before	After	Before	After	Before	After
Landless HH	27.95	26.27	28.35	27.03	32.55	31.14
Marginal farmer HH	20.06	19.06	21.38	20.25	25.54	24.56
Small farmer HH	12.66	11.94	14.11	13.49	17.66	16.82
Large farmer HH	5.17	4.97	5.76	5.54	8.12	7.85
Non-agricultural HH	14.40	13.40	15.33	14.64	19.58	18.78
Illiterate HH	22.56	21.56	23.19	22.32	27.87	26.93
Low-educated HH	6.41	6.09	7.16	6.86	9.80	9.37
Medium-educated HH	1.24	1.19	1.37	1.25	1.92	1.84

Table 9: Percentage changes of other poverty indices from the base case scenario (Long-run)

	Sen Index	Watts Index	S-Gini Index
Households	% change	% change	% change
Landless HH	-6.01	-4.66	-4.33
Marginal farmer HH	-4.98	-5.29	-3.84
Small farmer HH	-5.68	-4.39	-4.76
Large farmer HH	-3.87	-3.82	-3.33
Non-agricultural HH	-6.94	-4.50	-4.09
Illiterate HH	-4.43	-3.75	-3.37
Low-educated HH	-4.99	-4.19	-4.39
Medium-educated HH	-4.03	-8.76	-4.17