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WTO Negotiations on the Non-agricultural Market Access (NAMA): Implications for the Bangladesh Economy

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1. Introduction

WTO negotiations with respect to the non-agricultural commodities (all those are not covered under the negotiation on agriculture, sometimes referred to as industrial or, manufactured goods) center around the enhancement of Non-Agricultural Market Access (NAMA), and are, therefore, proceeding towards the elimination or the reduction of bound tariff rates, bringing unbound tariff rates under binding commitments which will be subject to formula cuts, and identifying and removing Non-tariff Barriers (NTBs). The consensus on NAMA modalities, reached so far, include the use of a ‘Swiss-type’ formula for the reduction in the bound tariff rates, consideration of a non-linear mark up approach for establishing base rates of the unbound tariff rates, special and differential treatments for the developing countries in terms of allowing them ‘less than full reciprocity’ of commitments, and to keep LDCs above any commitment to undertake tariff cuts.

The important considerations under the NAMA negotiations are the extent and modalities of tariff cut for industrial goods in order to reduce and ultimately eliminate high bound tariffs rates, tariff peaks and tariff escalation. Although, for the developed countries almost all of their tariff lines are bounded, in case of developing countries, the proportions of the bound tariffs to total tariff lines are quite low. As trade theory suggests, for small and vulnerable economies, industrial tariffs are used as a tool to protect domestic industries with artificially maintaining high price in the local market. It is also true that for many developing countries, tariff revenue acts as a major source of government revenue. Therefore, it is quite common that the developing countries might keep the floor open to adjust with economic shocks by not-committing to WTO, or not setting bound tariff rates. Similar considerations are applicable for ‘less than full reciprocity’ flexibility for the developing countries to be allowed for industrial tariff cut, and the importance of agreement on suitable ‘Swiss type’ formula.

It is, however, important to note that though the LDCs are exempted from tariff cuts under the NAMA negotiations, they are likely to experience both positive and negative impacts on their economy if NAMA negotiations are implemented. On the positive side, because of tariff cuts by the developed and developing countries, LDCs are likely to have greater market access in many of these countries. However, on the negative side, LDCs may suffer from possible preference erosion in countries (for example in the EU) where they are currently enjoying duty-free and quota-free market access.

Against these backdrops, this present study tries to analyze the current status of the NAMA negotiations with respect to the types of the formula for industrial tariff cut and the possible impacts that the variants of existing formulas can have at the global and country level. This study

also estimates the possible extent of welfare loss/gain for Bangladesh if NAMA negotiations are implemented.

2. Negotiations on NAMA: Background and the Current State of Art

Trade negotiations in the Uruguay Round, under the broad title of Non-agricultural Market Access (NAMA), achieved a progress in terms of reducing developed country's average tariff rates from 6.3 percent to 3.8 percent, and an increase in developing country's binding coverage from 21 percent to 73 percent. Under the ongoing Doha Round, the negotiations on NAMA incorporate the reduction or elimination of overall industrial tariff rates as well as the reduction or elimination of tariff peaks and tariff escalation, and also the removal of the non-tariff barriers (NTBs). In line with the work programmes, set in article 16 of the Doha Ministerial declaration, negotiations on NAMA were launched in January 2002 with the creation of a Negotiating Group on Market Access (NGMA). The sectors which should be covered for the formula approach for tariff reduction, as proposed by the NGMA in 2003, include (i) electronics and electrical goods, (ii) fish and fish products, (iii) footwear, (iv) leather goods, (v) motor vehicle parts and components, (vi) stones, gems, and precious metals, and (vii) textiles and clothing.

The July 2004 package moved onward with a framework for establishing modalities for NAMA negotiations and the 6th Ministerial Declaration in Hong Kong in December 2005 set out the mandate to use a 'Swiss type' formula for the reduction in the bound tariff rates. However, there have been intense debates, and a number of proposals have been put in place with respect to the value and the number of coefficient used in the tariff-cut formula, and no consensus has yet been reached.

According to the July 2004 framework, NAMA tariff reduction should have comprehensive product coverage, should commence from bound rates, and all non-ad-valorem duties are to be converted to ad-valorem equivalents and to bind them in ad-valorem terms. Although the tariff reductions are to be from the bound tariff rates, the implication will exert to the applied rates too, as in most of the cases the developed country MFN applied tariffs and bound tariffs don't have wide spreads for industrial commodities.

The rationale for applying a formula cut approach for tariff reduction includes the willingness of making the process transparent, efficient, equitable and predictable. There were intensive discussions among the member countries regarding the development of modalities for NAMA, and finally they reached a consensus of applying the formula approach, and the negotiation so far proceeded, the formula will be a 'Swiss type with coefficients'. This makes the proposals of US and EC with single coefficient formula redundant and consideration now centers to the ABI and Caribbean formulas.

One of the key features in the NAMA negotiations so far is that LDCs are exempted from taking any tariff cut initiative, rather, for the developing countries and for LDCs, there were considerations in terms of 'special and differential treatments and less than full reciprocity in reduction commitments'. LDCs are only 'expected to increase their binding commitments substantially'. The July package proposed enhanced Duty Free Quota Free market access

provisions for non-agricultural products originating from the least developed countries to counterattack the effects of tariff cuts by the developed and developing countries. On the other hand, for the developing countries, the differential treatment has been set out with flexibilities in terms of:

- (a) applying less than formula cuts to up to 10 percent of the tariff lines provided that the cuts are no less than half the formula cuts and that these tariff lines do not exceed 10 percent of the total value of a Member's imports; or
- b) keeping, as an exception, tariff lines unbound, or not applying formula cuts for up to 5 percent of tariff lines provided they do not exceed 5 percent of the total value of a Member's imports' (Annex B-8, July 2004 modalities).

Additionally, participants with a binding coverage of non-agricultural tariff lines of less than 35 percent are taken to be exempted from tariff cuts and are expected to increase binding coverage to 100 percent.

3. The Tariff Cut Formulas

The Hong Kong Ministerial Declaration has specified the mandate to apply a 'Swiss formula with coefficients' for tariff cut under NAMA negotiations. Before the declaration, the negotiation evolved around some linear formulas with single or multiple coefficients, as well as some tiered and non-linear formulas with constant and multiple coefficients, proposed by different countries and country-groups. India, at the initial stage of the negotiation, proposed a linear formula with two coefficients: 50 percent tariff cut for the developed countries and 33 percent cut for the developing countries. China proposed a non-linear formula with variable coefficients dependent on the simple average of the base rates, The proposal by the USA incorporated a non-linear formula applicable in two phases: in phase one (2005 – 2010), tariffs of 5 percent or below would be eliminated and tariffs above 5 percent are subject to a Swiss formula, and in phase two (2010- 2015), tariffs will be brought to zero using a linear cut formula. The European Commission proposal was to reduce all tariffs and their dispersion by compressing them into a range- influential in reducing peak tariffs and tariff escalation. Finally, the Korean proposal suggested a linear cut formula depending upon the trade weighted average. Afterward, there have been a number of proposals by some group of countries which suggested some modifications of the original Swiss formula with constant coefficient (box 1, equation 1). The proposal by US, Norway and Rest of South Asia suggested the application of fixed number of two coefficients to the Swiss formula (box 1, equation 2). However, Chile, Columbia and Mexico proposed the use of four coefficients in the same formula. The March 2005, Argentina, Brazil and India (ABI formula) suggested incorporating the tariff average in the multiple coefficient Swiss formula. Finally, the Caribbean countries proposed a constant value in the ABI version of the Swiss formula which changes from country to country, based on the level of development (higher the development level lower the coefficient) (box 1, equation 3).

Box 1: Different Variants of Swiss Formula

The original 'Swiss formula' is a non-linear formula with a single coefficient. However, European Commission has proposed some conditional flexibilities for the developing countries. The formula, originally proposed, is the following:

where, T_1 = Final bound tariff rate

T_0 = Base tariff rate

B = Fixed constant

The basic feature of the formula is that the higher is the initial (base) tariff rate the deeper will be the tariff cut. This led to a concern for the developing countries since their bound tariff rates are much higher than those of the developed countries. As a result they would have to undergo a steeper tariff reduction process.

The second variant of the Swiss formula (equation 2) is the one with a fixed number of coefficients, the number of coefficients should be two as suggested by the US, Norway and Rest of South Asia, and four as suggested by Chile, Columbia and Mexico.

where, $B_i = 1, 2, 3, \dots$

Finally, the formula suggested by Argentina, Brazil and India (ABI), and the Caribbean countries is as follows:

where, T_a = Average bound rate of member countries

C_j = Constant value which changes from country to country, based on the level

of development, higher the development, lower the coefficient, as suggested by the Caribbean countries

and $C_j = 0$ for the ABI formula.

The agenda set in the Hong Kong Ministerial Declaration in December 2005 agreed on applying some ‘Swiss formula with coefficients’ that would ensure ‘less than full reciprocity’ of the developing countries as compared to the developed countries. This commitment made the proposed formulas by the US, EU, Rest of South Asia, China and Korea redundant, and only the ABI and Caribbean formulas sustained after this consideration. A recent study by Ranjan (2006) highlights that the US’s proposal of the values of the coefficients to be 10 and 15 for the developed and the developing countries respectively does not guarantee the ‘less than full reciprocity’ principle to be adopted. On the other hand, the ABI formula has its competency with the Hong Kong Declaration, and in addition to this, the use of average tariff rates as coefficients allows the existing tariff structure being taken into account in designing the new tariff structure, and therefore, sounds more realistic and adaptable. Furthermore, the Caribbean formula incorporates the internal need for tariff in a country in terms of a source of revenue and domestic protection, and therefore, in addition to the ABI formula, can be considered for negotiation.

4. The Concerns over Possible Preference Erosion for LDCs.

The general rule of the WTO is to apply agreements on a non-discriminatory basis among countries (the Most Favoured Nation provision). However, from broader development perspectives WTO negotiations allow the developing and the least developed countries some special and differential provisions in the degree of trade liberalization and market access facilities. In terms of tariffs, the preferential provision is that for developing and the LDCs products, the developed country markets allow less than MFN tariff facilities and therefore there arises a preferential margin between the two rates. In European Union market, under 'Generalized System of Preference (GSP)' and Everything-But-Arms (EBA) provisions, commodities originating from LDCs enjoy zero tariff market access. However, the limiting factor is the Rules of Origin (RoO) requirements, i.e. to take advantage of the zero tariff facility, a certain level of domestic value addition is necessary. Among some other non-reciprocal preferential trading arrangements for developing and least developed countries, there are the Caribbean Basin Trade Partnership Act, the Andean Trade Promotion and Drug Eradication Act, the African Growth and Opportunity Act (U.S.); and the Cotonou convention (EU) (Boxes 2 & 3). The Duty Free Quota Free market access agreement for the LDCs that has been granted in the Hong Kong Ministerial Declaration for 97 percent commodities from the LDCs to the US market is another S&DT provision for the LDCs.

Box 2 : European Union Preferential Schemes	
1. Generalized System of Preference (GSP):Graduation Criteria:	
<p>An <i>index</i> combining the development and specialization level of a country:</p> $I = \frac{\ln(Y_i / Y_{EU}) + \ln(X_i / X_{EU})}{2}$ <p>where, Y_i (Y_{EU}) is the GDP per capita in the beneficiary country (EU) and X_i (X_{EU}) is the manufactured exports of the beneficiary country (EU) to the EU (beneficiary country).</p>	<ul style="list-style-type: none"> • All countries designated as high income by the World Bank lose eligibility for all products automatically. • Sectoral eligibility can be lost either for a development index value greater than -2 and supplies more than 25% of the EU total imports; or, for a development index greater than -2 and sectoral specialization index higher than a threshold level and supplies more than 2% of EU total imports.
2. GSP+ :	
<p>Special incentive arrangements that reward -</p> <ul style="list-style-type: none"> • Compliance with international standards in human and labour rights, • Protection of environment, • Combating drug production and trafficking, • Good governance. 	
3. Everything But Arms (EBA):	
<ul style="list-style-type: none"> • Provided for 49 UN-defined Least Developed Countries. • Provides duty free access for all products except fresh bananas, rice and sugar. • Preferences are granted for an unlimited period and are not subject to periodic review. 	
4. Cotonou Convention:	
<ul style="list-style-type: none"> • Limited to African, Caribbean and Pacific (ACP) countries. • Less generous in terms of duty reduction than the EBA scheme. • In terms of cumulation rules, it is more generous. 	
<p><i>Source:</i> Francois, et al (2005)</p>	

Box 3 : United States Preferential Schemes	
GSP Scheme (from 1976)	
(All eligible countries enjoy zero tariffs on around 4,650 tariff lines; LDCs have duty-free market access for an additional 1,750 lines)	
Non-eligibility criteria for GSP facilities:	Criteria used in eligibility decision:
<ul style="list-style-type: none"> a) Do not offer reasonable and equitable market access for American goods b) Do not adequately and effectively protect US intellectual property rights c) Do not reduce trade-distorting investment policies and export practices d) Harbour international terrorists e) Nationalize American property without compensation f) Are members of a commodity export cartel causing 'serious disruption to the world economy' g) Are communist states (except those that have been granted permanent normal trading status). 	<ul style="list-style-type: none"> a) Level of economic development b) Protection of workers and human rights c) Whether the country receives preferences from other countries.
A country loses eligibility for a specific product if:	
	<ul style="list-style-type: none"> a) Its exports exceed a certain 'competitive need limit', at present which is \$110 million per tariff line, b) The country has a market share larger than 50 percent of total US imports in that category.
The AGOA initiative (from 2000)	
(Currently 37 Sub-Saharan African (SSA) countries are eligible for preferential treatment consists of duty-free and quota-free access to the US markets for all products covered by GSP plus 1800 new items)	
The Andean Trade Preference Act (from 1991)	
(To combat drug production and trafficking in the Andean countries: Bolivia, Colombia, Ecuador and Peru. It provides duty-free access to U.S. markets for approximately 5,600 products)	
CBI Initiative (from 1983)	
(Currently provides 24 beneficiary countries with duty-free access to the US market for most goods)	
Source: Francois, <i>et al</i> (2005)	

These S&DT provisions for the developing and the LDCs are supposed to result in preference erosion (defined as the decrease in the margin between a preferential tariff rate and the MFN tariff rate originating from multilateral tariff liberalization) with the tariff cuts by the developed and advanced developing countries under the NAMA negotiation. If MFN tariffs are reduced by these developed and advanced developing countries, then the LDCs, who enjoy preference margins in these economies for their limited, low-value-added manufacturing exports, will suffer from the possible erosion of these preferences. Similarly, with industrial tariff reduction on an MFN basis, the preferential treatments that many LDCs are enjoying under the various Regional Trading Agreements (RTAs), will be eliminated.

From the analysis of preferential margins currently enjoyed by the LDCs in developed country markets (Tables 1 and 2, and Figures 1 and 2) it is evident that the MFN applied rates are high for the LDC products of export interest and therefore the formula cut approach resulting in higher reductions of the high tariff rates would have a significant implication in terms of

preference erosion for the LDCs. One possible dimensions of preference utilization is that it could fall if the existing preference margin is not sufficient enough to cover the administrative costs including those to fulfill the Rules of Origin (RoO) requirements, and therefore there is an additional possibility of loss of market access for the LDCs; or at least the NAMA negotiation may not be able to provide additional market access for LDC industrial products. It is estimated that compliance costs including red tape, paperwork for restrictive rules of origin, and other administrative burdens impose the equivalent of a 4 percent tariff and as many developed country tariffs on industrial products are equal to or even less than 4 percent, a further reduction will not be beneficial in enhancing real market access (Francois *et al*, 2005).

Table 1: Tariffs under Preferential Schemes

Preferential Agreement	Average Tariff Rate (all HS-6 products)	Average Tariff Rate (tariff peak products)
Canada		
GSP	4.3	28.2
LDCs 1/	4.4	22.8
MFN	8.3	30.5
European Union		
GSP	3.6	19.8
Non-ACP LDCs	0.9	12.4
MFN	7.4	40.3
Japan		
GSP	2.3	22.7
LDCs	1.7	19.0
MFN	4.3	27.8
United States		
GSP	2.4	16
Non-AGOA LDCs	1.8	14.4
MFN	5.0	20.8

Note: 1/ Does not reflect the recent Canadian initiative with regard to LDCs' exports; for example, under the revised GSP (2002) apparels exports enjoy zero-tariff access to the Canadian market under an LDC-friendly RoO criteria of 25 percent local value addition requirement.

Sources: Hoekman, Ng, and Olarreaga (2002) and IMF staff estimates as quoted in Subramanian, A. (2004) and Rahman and Sadat (2006).

Table 2: Estimated Preference Margins for Developing Countries, Percentage Points

Granting Countries	EU	EU	USA	USA	Japan	Japan	Canada	Australia	Quad + Australia
Beneficiaries									
LDCs	6.6 ^a	4.1 ^d	3.2 ^a	2.6 ^d	2.6 ^a	10.9 ^d	4.2 ^d	3.6 ^d	4.6 ^d
Sub Saharan Africa	4.0 ^b		1.3 ^b		0.1 ^b				
African LDCs	2.3 ^b		2.1 ^b		0.4 ^b				
World Bank Low Income Countries	3.8 ^c		0.5 ^c						
All	3.8^a	3.4^d	2.6^a	2.6^d	2.0^a	3.4^d	1.6^d	1.5^d	3.4^d

Note: a. Subramanian (2003, p8);

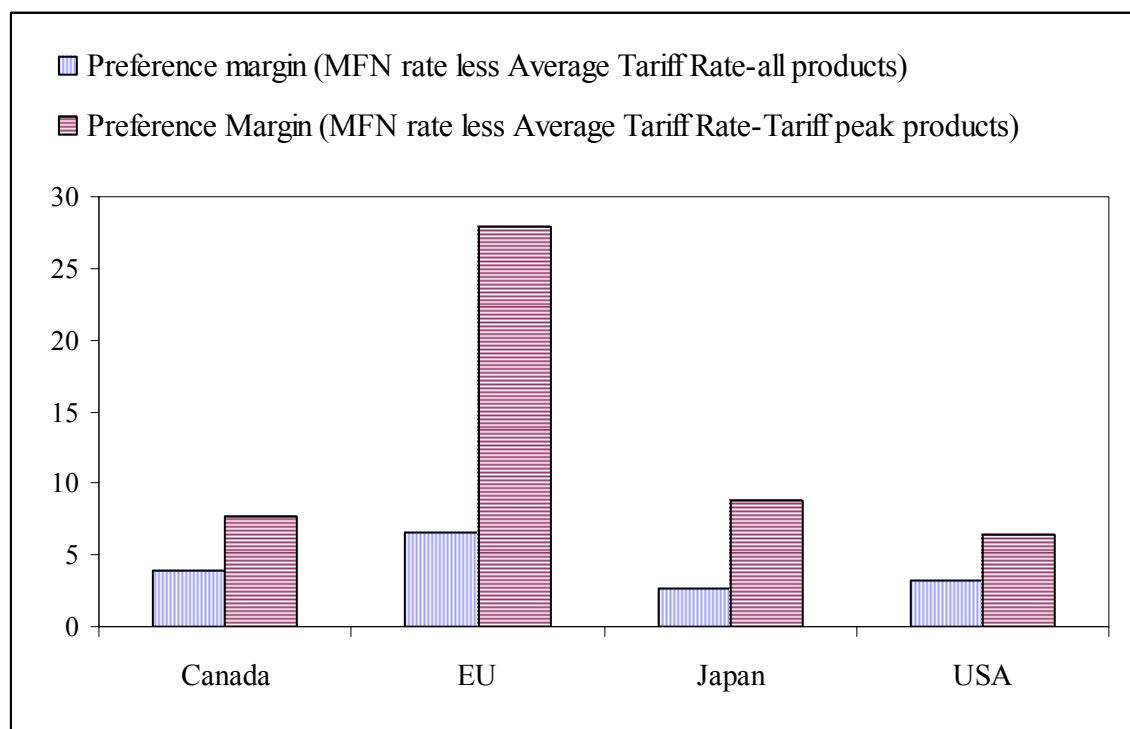
b. Brenton and Ikezuki (2005, p.27);

c. van der Mensbrugge (2005);

d. Low, Piermartini and Richtering (2005).

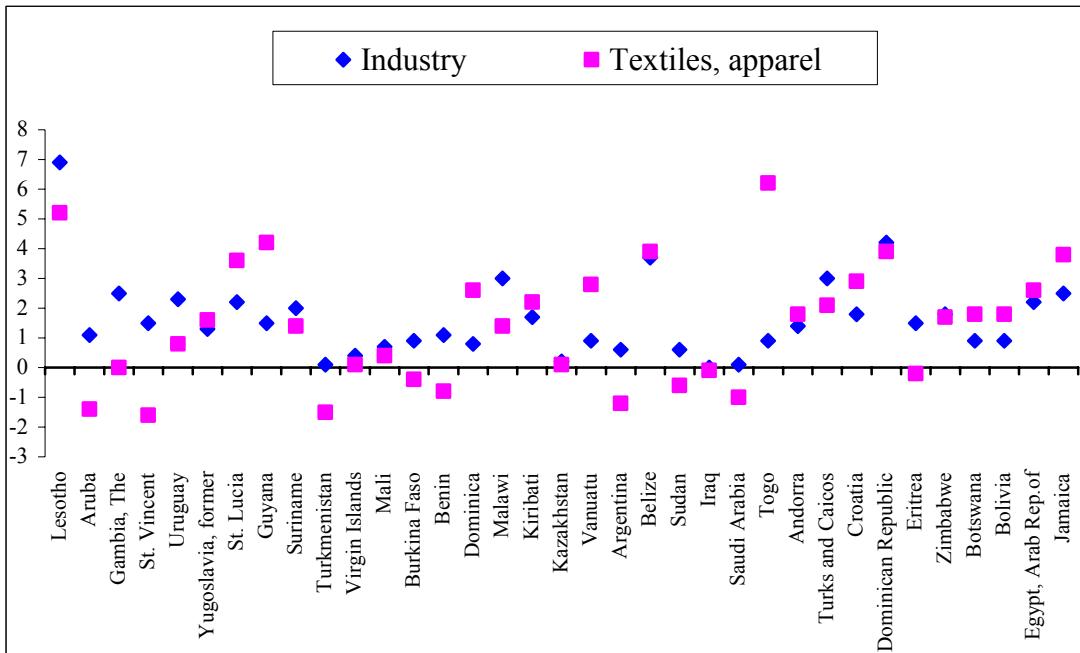
Source: Table adopted from Hoekman (2005), p 8, Table-1.

Figure 1: Preference Margin Enjoyed by the LDCs



Source: Drawn using calculations based on Table 5.1

Figure 2: True Preference Margins



Source: Bouët, *et al* (2005)

There are several studies regarding the estimation of the extent of preference erosion that might occur with the tariff cuts proposed under NAMA negotiations. Considering the likely dimensions of non-reciprocal preference erosion for developing countries arising from MFN tariff cut on non-agricultural products, a study estimated the amount for the developing countries as a whole to be \$ 2 billion net gain in terms of the value of adjusted preference margins if the Quad plus Australia were to reduce MFN tariffs on non-agricultural products using a Swiss formula with a coefficient of 10. However, significant gains and losses underlie the net figure, with the 10 largest developing country losers (excluding LDCs) from non-reciprocal preference erosion being the Dominican Republic, Honduras, Kenya, Mauritius, Saint Lucia, El Salvador, Guatemala, Namibia, Nicaragua and Swaziland. On the other hand, for the LDCs there is a net loss of \$170 million under the same liberalization scenario, where only two LDCs, Nepal and Maldives, experience a gain (Low *et al*, 2005).

The studies relating potential preference erosion due to trade liberalization resulting from NAMA negotiations (or trade liberalization as a whole) can be categorized from 3 different methodological applications- the general equilibrium analysis using CGE modelling techniques, the partial equilibrium analysis, and the simple identification of preference erosion possibilities based on the estimations of preference margins and utilization rates of preferences. In terms of preferential market access provisions and utilization, the European Union market has been considered as the most significant by almost all relevant studies. The zero tariff facilities provided under the Everything But Arms (EBA) provision in EU for developing and least developed countries allow them to enjoy preferential treatment and therefore MFN liberalization

may make them vulnerable to preference erosion. However, the assessment of vulnerability to preference erosion in terms of preference utilization rate identified 33 countries including only 11 LDCs, and 21 sectors as vulnerable to preference erosion in the EU market (Curran *et al*, 2006). The study highlighted clothing as the most affected sector for the LDCs, but the preference margin being low, the only matter to worry about is the possibility of huge employment losses and lack of diversification of export sectors. Another study of comparative analysis on the exposure to preference erosion for South Asian countries identified that the magnitude of preference erosion will not be higher due to low coverage, preference utilization rate and utility rate, and the most affected country will be India in terms of her pearl exports to USA.

A country study on Bangladesh by Rahman and Shadat (2006), using the estimation of preference margins and utilization of preferences methodology, estimated the amount of preference erosion under different scenarios of Swiss formula tariff cuts in the EU market. Bangladesh, like any other LDCs will face two opposite directional effects – one due to Swiss formula tariff cut under NAMA (LDCs being exempted), and the other with MFN tariff reduction, where the former will result in preference erosion and the latter to some recovery. The study estimated the net preference erosion taking into account both the effects. For Example, with a Swiss coefficient of 0.3, net preference erosion on all products is \$ 53 million; if the value of the coefficient is 0.5, net preference erosion is \$316.8 million and if the coefficient is taken to be 0.8, the preference erosion amounted to be \$24.3 million. Again, disaggregated estimate for woven and knit RMG exports from Bangladesh reveals the fact that due to non-compliance with the RoO requirements, there will be net preference gain in the woven RMG sector, where as the knit RMG sector which is now enjoying almost 90 percent of the GSP facilities, net preference erosion in this sector will outperform the gains. Similar simulation exercises for the USA market show that import tariffs on Bangladeshi commodities will be reduced by \$122.9 million, \$87.8 million and \$61.4 million with 0.3, 0.5 and 0.8 Swiss formula coefficients, respectively, since Bangladesh is not enjoying zero tariff facilities for her principal (RMG) exports to USA. However, the problem with this methodology is that it is a partial equilibrium method and the estimation uses the impact of tariff reduction on aggregate tariffs payable, without taking into account resulting terms of trade shocks and thereby changes in international demand for Bangladeshi commodities. The figures estimated can no way be termed as welfare effects of tariff reduction. Moreover, the study is based only on the RMG exports and preference utilization rates are assumed to remain constant.

Econometric assessment of actual preference utilization, and based on this, global general equilibrium estimates of preference erosion in the EU market for the LDCs and low income countries by Francois, Hoekman, & Manchin (2005) suggest an income effect of \$ 222.5 million in total of which Bangladesh accounts for \$101 million, for African LDCs, the figure is much higher (\$458.3 million), and for low income countries like India, there is a positive income effect of \$ 174 million. The magnitude of loss is reduced substantially if all OECD countries are allowed to reduce MFN tariff rates. This is because EU has been the most aggressive in giving preferential facilities as a development initiative. Again, being adjusted for the compliance costs including administrative costs and costs for fulfilling Rules of Origin requirements, the magnitude, and even in some cases, the direction of the income effect due to preference erosion is changed. For example, for Bangladesh, the value reduced to \$ 77.2 million from \$101 million,

for India, there is a substantial increase to \$ 267.9 million, and for African LDCs the huge negative figure turned out to be slightly positive.

All the study findings so far, conclude the possibility of preference erosion, higher for higher preference utilization given the existing preferential schemes. Therefore, as a part of the NAMA negotiation, various proposals have surfaced to address the issue of preference erosion, including:

- The formation of a “competitiveness fund” or other development assistance so that countries affected by preference erosion can undertake adjustment programs; and this is considered as one of the basis for ‘Aid for Trade’ facilitation.
- To add a “correction coefficient” which is expected to improve margins of preference for products that enjoy nonreciprocal preferential access at present, along with longer staging for these products to preserve the margin of preference.
- There can be delayed or gradual reduction of tariffs on products that have significant export activity and margins of preference.
- An ‘index of vulnerability’ is proposed to be developed in order to identify products of special concern to particular countries, especially LDCs.
- Among the ‘trade solutions’ to preference erosion, there can be
 - multilateral trade concession schemes designed to protect the preference dependent countries, and
 - Compensation of preference erosion through preferences in other countries.

5. The Methodology

The purpose of this section is to describe in details the methodology of linking the global computable general equilibrium (CGE) model, namely the GTAP model with a country CGE model for Bangladesh. The CGE analysis is the dominant methodology for the *ex ante* analysis of the economic consequences of comprehensive trade agreements whether multilateral or bilateral in nature (Francois and Shiells, 1994). This is the dominant methodology because no other approach offers the same flexibility for looking at prospective changes in trade policy while respecting the fundamental economy-wide consistency requirements such as balance of payments equilibrium and labour and capital market constraints that are so important in determining the consequences of comprehensive trade reforms.

5.1. The GTAP Model

A global CGE modelling technique, namely the global computable general equilibrium (CGE) modelling framework of the Global Trade Analysis Project (GTAP) (Hertel, 1997), is the best possible way for the *ex ante* analysis of the economic and trade consequences of comprehensive

multilateral or bilateral trade agreements. The GTAP model is a comparative static, global computable general equilibrium model, and is based on neoclassical theories.² The GTAP model is a linearised model, and uses a common global database for the CGE analysis. The model assumes perfect competition in all markets, constant returns to scale in all production and trade activities, and profit and utility maximising behaviour of firms and households respectively. The model is solved using the software GEMPACK (Harrison and Pearson, 1996).

Household income and expenditure

In the GTAP model each region has a single representative household, termed as the regional household. The income of the regional household is generated through factor payments and tax revenues (including export and import taxes) net of subsidies. The regional household allocates expenditure over private household expenditure, government expenditure and savings according to a Cobb Douglas per capita utility function. Thus each component of final demand maintains a constant share of total regional income.³

The private household buys commodity bundles to maximise utility subject to its expenditure constraint. The constrained optimising behaviour of the private household is represented in the GTAP model by a Constant Difference of Elasticity (CDE) implicit expenditure function. The private household spends its income on consumption of both domestic and imported commodities and pays taxes. The consumption bundles are Constant Elasticity of Substitution (CES) aggregates of domestic and imported goods, where the imported goods are also CES aggregates of imports from different regions. Taxes paid by the private household cover commodity taxes for domestically produced and imported goods and the income tax net of subsidies.

The government consumption

The government also spends its income on domestic and imported commodities and also pays taxes. For the government, taxes consist of commodity taxes for domestically produced and imported commodities. Like the private household, government consumption is a CES composition of domestically produced goods and imports.

Savings and Investment

In the GTAP model the demand for investment in a particular region is savings driven. In the multi country setting the model is closed by assuming that regional savings are homogenous and contribute to a global pool of savings (global savings). This is then allocated among regions for investment in response to the changes in the expected rates of return in different regions. If all other markets in the multi regional model are in equilibrium, if all firms earn zero profits, and if all households are on their budget constraint, such a treatment of savings and investment will lead to a situation where global investment must equal global savings, and Walras' Law will be satisfied.

² Full documentation of the GTAP model and the database can be found in Hertel (1997) and also in Dimaranan and McDougall (2002).

³ Savings enter in the static utility function as a proxy for future consumption

Producers' income

In the GTAP model, producers receive payments for selling consumption goods and intermediate inputs both in the domestic market and to the rest of the world. Under the zero profit assumption employed in the model, these revenues must be precisely exhausted by spending on domestic intermediate inputs, imported intermediate inputs, factor income and taxes paid to regional household (taxes on both domestic and imported intermediate inputs and production taxes net of subsidies).

Production technology

In the GTAP model a nested production technology is considered with the assumption that every industry produces a single output, and constant returns to scale prevail in all markets. Industries have a Leontief production technology to produce their output. Industries maximise profits by choosing two broad categories of inputs namely, a composite of factors (value added) and a composite of intermediate inputs. The factor composite is a CES function of labour, capital, land and natural resources. The intermediate composite is a Leontief function of material inputs, which are in turn a CES composition of domestically produced goods and imports. Imports are sourced from all regions.

International trade

The GTAP model employs the Armington assumption which provides the possibility to distinguish imports by their origin and explains intra-industry trade of similar products. Following the Armington approach import shares of different regions depend on relative prices and the substitution elasticity between domestically and imported commodities.

Closure

All experiments were carried out within a modified standard GTAP closure.

Base data and base year adjustments

In contrast to the version 5 of the GTAP database, version 6 has 2001 as the base year instead of 1997, updated national, economic and trade data, and more importantly protection data from a new source.⁴ The new GTAP database has lower tariffs than the earlier versions as a result of the reform efforts between 1997 and 2001 (which includes, for example, China's progress towards WTO accession and continued implementation of the Uruguay Round Agreement) and the inclusion of bilateral trade preferences. The GTAP database has been further adjusted to incorporate the phasing out of the Multi Fibre Agreement (MFA) in 2005. It was also checked whether China's accession to WTO posed any impact on the simulation results. Due to the lack of access to any detailed information on China's commitment to WTO with respect to her tariff cuts, this paper performed this exercise by an ad hoc cut of China's tariff rates by 50 percent, and updated the database accordingly. But, it appears that the simulation results do not vary much

⁴ The source of the new protection data is the MAcMaps, a product of the joint CEPII (Paris)/ITC(Geneva) project, which has a detailed database on bilateral tariff protection that integrates trade preferences, specific tariffs and a partial evaluation of non-tariff barriers (NTBs).

(between with or without China's WTO accession). Therefore, the simulation results are reported where base-year data has been adjusted only for the MFA phase out.

Data, region and commodity aggregation

This study applies version 6 of the GTAP database, which uses 2001 as the base (Dimaranan and McDougall, 2002). Data on regions and commodities are aggregated to meet the objectives of this study. The version 6 of GTAP database covers 57 commodities, 87 regions/countries, and 5 factors of production. The current study has aggregated 57 commodities into 14, and 87 regions into 19 as shown in tables 3 and 4 below.

In the GTAP database, each industry produces one commodity. So there is a one to one relation between industries and commodities. Given the focus of the present study Bangladesh and other LDCs separated as different regions. Also, other South Asian countries are kept as separated countries. The GTAP database 6 does not include Pakistan as a separate country, rather it is included under the category 'Rest of South Asia' where data from all the South Asia countries except Bangladesh, India and Sri Lanka are lumped together. Apart from India, Sri Lanka, Brazil, China and Thailand all other developing countries are grouped as other developing countries. Also, the leading developed countries are put as separate regions.

Table 3: Commodity Aggregation in the GTAP model

Constructed broad sectors	Commodities included
Paddy Rice	Paddy rice
Milled Rice	Processed Rice
Wheat	Wheat
Other Cereal	Cereal grains not included elsewhere
Commercial crop	Vegetables, fruits, nuts, oil seeds, sugar cane, sugar beet,
Milk and Dairy	Raw milk and dairy products
Other food	Meat, meat products, vegetable oils and fats, sugar, food products, beverages and tobacco products
Live Stock	Cattle, sheep, goat, horses etc.
Other Agriculture	Plant-based fibres, crops not included elsewhere, forestry, fishing
Mineral	Coal, oil, gas and other minerals
Textile	Textile
Wearing Apparel	Apparel
Leather	Leather products
Chemicals	Chemical, rubber, plastic prods
Machinery	Machinery and equipment nec
Petroleum	Petroleum, coal products
Other Manufacturing	Paper products, publishing , Wood products, Electronic goods, transport equipments etc.
Services	Electricity; gas manufacture, distribution; water; construction, trade, transport nec; sea transport; air transport; communication; financial services nec; insurance; business services nec; recreation and other services; public administration, defence, health, education; dwellings.

Table 4: Region aggregation in the GTAP Model

Aggregated regions	Comprising regions
Bangladesh	Bangladesh
LDCs	Other LDCs
India	India
Sri Lanka	Sri Lanka
Rest of South Asia	Comprising Pakistan, Bhutan, Nepal and Maldives
Thailand	Thailand
China	China and Hong Kong
Brazil	Brazil
DEVG	Other Developing Countries
Australia	Australia and New Zealand
Japan	Japan
Korea	Republic of Korea
USA	USA
Canada	Canada
EU	EU-15
ROW	Rest of the World

5.2. The Bangladesh Dynamic CGE Model

Bangladesh dynamic computable general equilibrium (CGE) model, in line with Annabi *et al* (2006), allows examining the effects of different multilateral trade negotiations on the economy of Bangladesh. The model also allows welfare and poverty analysis of different household groups. The model is calibrated with a Social Accounting Matrix (SAM) of Bangladesh for the year 2000. The model adopts the representative household approach, and the poverty and welfare effects of different policy shocks are estimated using the Bangladesh Household Income and Expenditure Survey (HIES), 2000.

5.2.1. Basic Features of the Model

It has been highlighted by Annabi *et al* (2006) that majority of the CGE models used in poverty and inequality analysis are static in nature, therefore, unable to account for growth effects, which makes them inadequate for the long run analysis of the poverty impacts of economic policies. These static models cannot capture accumulation effects, and fail to examine the transition path of the economy where short-run impacts of any policy reforms are likely to be different from the long-run impacts. To overcome this limitation, a sequential, dynamic CGE model is suggested. In a sequential dynamic CGE model the economic agents do not have any intertemporal optimisation behaviour; rather, these agents are myopic. In this dynamic model a series of static CGE models are linked between periods, while exogenous and endogenous variables are updated with an updating procedure. Below a brief description of the static and dynamic aspects of the model is presented. The list of equations and variables is presented in the annex to this paper.

Static Aspects of the Model

In the case of production, each sector has a representative firm. The production system is characterised by a nested structure, where sectoral output is a *Leontief* function of value added and total intermediate consumption, and value added, in turn, is represented by a constant elasticity of substitution (CES) function of capital and composite labour.

Turning to consumption, a linear expenditure system (LES), which is derived from the maximisation of a *Stone–Geary* utility function, is applied to represent household demand function. The minimal consumption levels in the LES function are calibrated using guess-estimates of the income elasticity and the *Frisch* parameters. The model assumes household saving as a fixed proportion of the total disposal income.

Imperfect substitution between foreign and domestic goods is assumed, which is captured by the standard *Armington* assumption with a constant elasticity of substitution function (CES) between imports and domestic goods. On the supply side, constant elasticity of transformation (CET) between exports and domestic sales is assumed. The model also assumes a finite elasticity export demand function, which expresses the limited power of the local exporters in the world market.

The source of government income is the direct tax revenue from households and firms and indirect tax revenue on domestic and imported goods. Government allocate its expenditure between the consumption of goods and services (including public wages) and transfers. The loss in government revenue due to any tariff cut is compensated by indirect or direct tax mechanism, which is inbuilt in the model.

The model is solved for each period, and the general equilibrium in each period is achieved by the equality between supply and demand of goods and factors, and the equality between investment and saving. In each period the nominal exchange rate acts as the numéraire.

Dynamic Aspects of the Model

The model considers a capital accumulation equation, which updates capital stock in each period. The model assumes that the stocks are measured at the beginning of the period and flows are measured at the end of the period.

The model introduces an investment demand function which determines the pattern of reallocation of new investment among sectors after any shock. Investment in this function is by sector of destination rather than by origin (product). The total investment by destination equals the total investment by origin in the SAM. The investment by destination matrix is used to calibrate the sectoral capital stock in the base run. The capital accumulation rate (ratio of investment to capital stock) increases with respect to the ratio of the rate of return to capital and its user cost.

Total labour supply increases at an exogenous rate, which is equal to the population growth rate and the labour force growth rate. Other nominal variables (which are indexed), such as transfers

and the minimal level of consumption in the LES function, and government savings, current account balance also increase at the same rate.

An adjustment variable, which is introduced in the investment demand function, helps in bringing the equality between total savings and total investment in each period. The model allows all variables in the baseline to increase at the same rate in level, and the prices remain constant. This method is useful for the welfare and poverty analysis since all prices remain constant along the business as usual (BAU) path.

5.2.2. A Numerical Representation of the Bangladesh Economy

The 2000 SAM of Bangladesh has been used in the Bangladesh dynamic model. The SAM has been constructed using (i) the 1999–2000 input-output table⁵; (ii) the Household Income and Expenditure Survey (HIES) 1999–2000 (BBS, 2000a); (iii) the Labour Force Survey 1999–2000 (BBS, 2000b); and (iv) the National Income Estimates (BBS, 2002).

The Bangladesh SAM 2000 includes 21 sectors and four factors of production: skilled and unskilled labour and agricultural and non-agricultural capital. The SAM also decomposes households into nine groups based on location (urban or rural) and assets (land or education). Rural households are further disaggregated into five groups: landless (no cultivable land), marginal farmers (up to 0.49 acre of land), small farmers (0.5 to 2.49 acres of land), large farmers (2.50 acres of land and more), and non-agricultural. On the other hand, urban households are classified into four groups: illiterate (no education), low education (grades one to nine), medium education (grades 10 to 12), and high education (high school graduate and above). Table 5 summarises the basic features of 2000 SAM of Bangladesh

Table 5: Features of 2000 SAM of Bangladesh

Set	Description of Elements
Activities	
Agriculture (5)	Paddy, Grains, Commercial Crops, Livestock, Forestry
Industries (14)	Rice Milling, Other Food, Leather products, Jute Textile, Yarn, Textile, Woven Ready Made Garments, Knit Ready Made Garments, Chemicals, Machinery, Petroleum Products, Cement, Steel, and Other Industries.
Services (2)	Construction, Other Services.
Institutions	
Households (9)	<ul style="list-style-type: none"> - Rural Agriculture: 4 categories according to land ownership: Landless, Marginal Farmer, Small Farmer, and Large Farmer. - Rural Non-Farmer: 1 category according to occupation - Urban: 4 categories according to the level of education of the household's head: Illiterate, Low Education, Medium Education, and High Education.
Others (2)	Government, Rest of the World
Factors of production	
Labour (2)	Unskilled: Class 0-IX Skilled: Class X and above
Capital (2)	Agricultural capital Non agricultural capital

⁵ Prepared by the Sustainable Human Development Project, Planning Commission, Government of Bangladesh.

The basic structure of the 2000 Bangladesh SAM is summarised in table 6. Tariff rates vary across the sectors and range from as low as 0 percent (paddy sector) to as high as 72.9 percent (cement). The tariff rate on rice sector is only 2.2 percent. Woven ready-made-garment (RMG) has the highest sectoral import penetration ratio (85 percent), followed by machinery (48 percent). The import penetration in rice sector is only 2 percent. The highest shares in total imports are for machinery (26 percent), followed by petroleum (12 percent). The rice sector has only 1.7 percent share in total imports. The sectoral export orientation ratio is the highest for woven RMG (99 percent). However, in 2000 the rice sector had zero exports. Together woven and Knit RMG exports account for 67 percent of total exports. In the case of value addition together, the service and construction sectors account for 60 percent of total value added in the economy. The contribution of the rice sector in total value-added is 2.8 percent. The aggregate agricultural and the manufacturing sectors contribute 17 percent and 23 percent of the total value added respectively. The share of intermediate consumption in total demand is highest for the the paddy sector (114 percent). This figure is greater than 100 because of the negative stock variation in this sector. It should, however, be mentioned that paddy is not consumed, but it serves only as an input in rice milling.

Table 6: Basic Structure of the SAM 2000

	Tariff rates	Import penetration ratio	Import share	Export orientation ratio	Export share	Value-added share	Share of intermediate demand in absorption
Paddy	0.0	0.0	0.0	0.0	0.0	5.9	114.4
Grains	18.0	16.3	1.3	0.0	0.0	0.7	102.5
Commercial Crops	7.1	15.4	8.5	3.6	2.7	5.0	50.1
Livestock	24.0	3.8	2.1	4.9	4.4	3.7	50.1
Forestry	22.0	0.1	0.0	0.0	0.0	1.6	63.9
Rice	2.2	2.0	1.7	0.0	0.0	2.8	1.7
Other food	12.9	16.8	12.1	1.1	1.0	2.8	24.2
Leather	20.6	0.7	0.1	30.9	6.8	0.7	44.3
Jute textile	25.0	0.0	0.0	26.6	3.6	0.7	18.7
Yarn	16.8	15.8	1.7	0.0	0.0	0.5	101.1
Textile	5.5	7.0	1.8	0.0	0.0	1.6	44.3
Woven RMG	0.8	85.1	2.1	99.2	40.2	2.0	8.4
Knit RMG	1.4	22.1	0.9	82.8	26.8	1.4	3.1
Chemicals	20.9	29.5	9.9	4.2	1.6	1.8	77.9
Petroleum	55.3	43.0	12.1	1.3	0.3	0.7	64.9
Other Industry	17.4	17.4	8.0	4.4	2.6	3.1	65.5
Cement	72.9	46.5	2.5	0.0	0.0	0.2	107.1
Steel	31.5	21.8	6.7	0.0	0.0	2.4	78.2
Machinery	13.6	48.4	26.2	0.2	0.1	2.4	42.4
Construction	0.0	0.0	0.0	0.0	0.0	9.4	11.4
Services	10.4	0.7	2.4	1.9	9.8	50.7	66.0

Source: SAM 2000 for Bangladesh.

Notes: The model assumes that the elasticity of substitution between capital and labour = 1.2; the elasticity of substitution between skilled and unskilled labour = 0.8; and the capital stock depreciation rate = 5 percent.

Import penetration ratio = ratio of imports to domestic demand; Export orientation ratio = ratio of exports to output

The income composition of households, which is derived from SAM 2000, is presented in table 7. It appears that all the nine household categories receive most of their income from factor remuneration. For the poorer households, such as landless, household with illiterate head, marginal farmer, non-agriculture, and small farmer households, unskilled labour is the primary source of income. In contrast, households with medium-, and high-educated heads receive most of their incomes from non-agricultural capital and skilled labour income. Households with low-educated heads are heavily dependent on incomes from both unskilled labour and non-agricultural capital. For the large farmers, agricultural capital income is the principal source of their income. These considerable differences in income sources for different households are expected to generate varying income and poverty effects when different policy shocks are introduced in the model.

Table 7: Income Composition of the Households

Household Categories	Percentage Contributions to the Household Income from								Total
	Skilled labour	Unskilled labour	Non-agricultural capital	Agricultural capital*	Dividends	Intra-household transfers	Public transfers	Remittances	
Rural									
Landless	3.19	90.63	0.00	0.00	-	5.30	0.37	0.51	100.00
Marginal farmers	4.73	59.16	24.80	2.01	-.	8.38	0.35	0.57	100.00
Small farmers	17.07	37.67	24.57	15.67	-	4.26	0.10	0.66	100.00
Large farmers	9.88	5.28	34.43	49.74	-	0.41	0.01	0.24	100.00
Non-agriculture	23.01	40.45	27.79	4.79	-	2.96	0.38	0.61	100.00
Urban									
Illiterate	1.69	67.41	28.79	0.00	-	1.66	0.05	0.40	100.00
Low education	7.31	41.07	41.27	6.69	-	2.94	0.26	0.45	100.00
Medium education	30.82	1.20	58.75	7.88	0.06	0.37	0.74	0.18	100.00
High education	20.08	0.26	59.72	14.95	0.20	1.14	3.43	0.21	100.00
All	16.06	35.08	35.00	10.32	0.02	2.52	0.53	0.43	100.00

Source: SAM 2000 for Bangladesh.

Note: * Agricultural capital is nothing but 'land' here.

‘-’ denotes not applicable to this household category.

Table 8: Consumption Composition of the Households

	Percentage Contributions to the Household Consumption from								
	Rural Households					Urban Households			
	Landless	Marginal farmers	Small farmers	Large farmers	Non-agriculture	Illiterate	Low education	Medium education	High education
PDDY	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
GRNS	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
COMC	8.78	8.71	8.46	8.07	7.96	7.49	6.75	5.79	5.21
LIVS	7.51	7.43	7.19	6.73	6.70	6.33	5.55	4.59	4.03
FORS	0.12	0.10	0.10	0.09	0.13	0.16	0.16	0.16	0.17
RICE	29.93	29.63	28.65	26.81	26.71	25.23	22.13	18.31	16.05
FOOD	18.07	17.85	17.28	16.17	16.20	15.37	13.50	11.13	9.78
LEAT	1.45	1.43	1.53	1.63	1.55	1.40	1.47	1.48	1.30
JTEX	1.26	1.31	1.34	1.62	1.33	1.13	1.40	1.68	1.79
YARN	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
TEXT	3.84	3.80	4.04	4.32	4.11	3.71	3.90	3.93	3.45
WRMG	0.90	0.89	0.95	1.01	0.97	0.87	0.91	0.92	0.81
KRMG	0.60	0.59	0.63	0.68	0.64	0.58	0.61	0.61	0.54
CHEM	2.19	2.36	2.26	2.68	2.32	2.05	2.22	2.65	2.44
PETR	2.69	2.36	2.37	1.98	2.97	3.56	3.57	3.57	3.97
OIND	4.10	3.95	4.12	4.53	4.50	4.44	4.81	4.74	4.92
CEMT	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
STEL	1.80	1.88	1.93	2.33	1.92	1.62	2.01	2.42	2.56
MACH	0.05	0.05	0.05	0.06	0.05	0.04	0.05	0.06	0.07
CONS	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
SERV	16.73	17.65	19.10	21.28	21.94	26.02	30.96	37.96	42.91
All	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00

Note: **PDDY** = Paddy; GRNS = Grains; COMC = Commercial Crops; LIVS = Livestock; FORS = Forestry; RICE = Rice; FOOD = Other food; LEAT = Leather; JTEX = Jute textile; YARN = Yarn; TEXT = Textile; WRMG = Woven ready-made garments; KRMG = Knit readymade garments; CHEM= chemicals and fertilizer; PETR = petroleum; OIND= other industries; CEMT = Cement; STEL = Steel; MACH machinery; CNST= construction; SERV= services.

The consumption composition of households, as derived from the SAM 2000, is reported in table 8. It appears that agricultural commodities account for, on average, 40 percent of the consumption of the households. However, this share is close to 45 percent among the rural households; whereas, for the urban households the shares are well below the 40 percent marks. On average, rice alone accounts for more than 25 percent of the consumption share. The relatively higher dependence on rice and other food by the poorer households is noteworthy. It is also observed that the shares of non-food items are considerably high among the richer households. These differences in the consumption composition for different households are expected to cause varying consumption effects as a result of different policy shocks.

It is, however, important to note that, in contrast to the static CGE models, which make counterfactual analysis with respect to the base run (generally the initial SAM), a dynamic CGE model allows the economy to grow even in the absence of a shock. This scenario of the economy (without a shock) is termed as the business-as-usual (BAU) scenario. The counterfactual analysis of any simulation under the dynamic CGE model is, therefore, done with respect to this growth path. One of the salient features of the dynamic model is that it takes into account not only efficiency effects, as also present in the static models, but also accumulation effects. The sectoral accumulation effects are linked to the ratio between the rate of return to the capital stock and the cost of investment goods.

5.3. Linking the Global Model with the Country Model

We assume that the Bangladesh dynamic CGE model is a single country CGE model that has capital and labour mobile among sectors, and exports and domestically produced goods are imperfect substitutes. Therefore, the export prices are not identical to prices of domestically produced goods. The two are related via a constant elasticity of transformation (CET) frontier. This gives individual export supply functions a marked upward slope. This type of model is compatible with fixed export prices (the small country assumption), and therefore zero optimal tariffs.

For each good, the export price is related to the export and domestic quantity ratio for that good, this export prices can be shocked independently and export quantities will adjust to suit. This type of model also assumes that cost, insurance and freight (CIF) inclusive import prices are fixed, and that users substitute between imports and domestic goods via a constant elasticity of substitution (CES) nest, with the ease of substitution governed by an Armington elasticity. Therefore, the changes in world import prices can directly be introduced in the model.

The method of linking the global model with the country CGE model, therefore, can be stated as a way where the price and volume shocks from the GTAP model are introduced in the country CGE model as external shocks. The GTAP simulation results generate changes in world import and export prices and world export demand for various commodities. It is however, important to note that in the GTAP framework, because of the Armington assumption, there are no world prices of imports and exports. Each country or region faces different world prices. In the Bangladesh dynamic model we have assumed a downward sloping export demand functions for Bangladesh's export items. Therefore, any changes in the world export demand and world export prices for Bangladesh are plugged into the export demand function of the Bangladesh dynamic

model. In the same way the changes in the world import prices for Bangladesh are plugged into the import demand function of the Bangladesh dynamic model.

6. Welfare Effects and Preference Erosion for Bangladesh for NAMA Scenarios: Estimates from the GTAP Model

The shortcomings of the partial equilibrium method in estimating the preference erosion and the welfare effects of the NAMA negotiations on the LDCs lead us to explore the general equilibrium method. The GTAP based global general equilibrium model helps us to estimate the actual welfare loss or gains and the preference erosion or export market gains in a holistic framework and it takes into action the interlinkages among different sectors and different countries in the world.

6.1. GTAP Simulation Design for Different NAMA Scenarios

Table 9 presents two NAMA scenarios which have been simulated in the GTAP model. In order to explore the effects of the implementation of a full NAMA negotiation we consider NAMA1 where all developed and developing countries eliminate their tariffs on non-agricultural commodities by 100 percent. This scenario helps us to understand the maximum effects that a NAMA negotiation can have on different economies.

Table 9: NAMA Scenarios

Name	Explanation	Developed Countries' Non-Agricultural Tariffs Reduction	Developing Countries' Non-Agricultural Tariffs Reduction	LDCs' Non-Agricultural Tariffs Reduction
NAMA1	Full Implementation of NAMA	100%	100%	NA
NAMA2	The SWISS Formula1	Coefficient 0.10	Coefficient 0.20	NA
NAMA3	The SWISS Formula2	Coefficient 0.20	Coefficient 0.30	NA

Note: 'NA' indicates 'Not Applicable'

As has been discussed in Section 3 that the current debates on tariff cuts under NAMA negotiations centre around the values of the coefficients in a modified Swiss type formula. It has been argued by the leading developing countries that the coefficients in the Swiss formula should be different for the developing and developed countries, and they are arguing for a lower coefficient for the developed countries and a higher coefficient for the developing countries which will lead to a higher tariff cut for the developed countries.

In order to explore the impacts of the Swiss type formula we used a disaggregate database on bound tariff, namely the MacMap database. The MacMap database provides information on bound Tariffs at the HS 2 digit classification for a number of 219 countries based on CEPII's Bound Tariffs Database version 2005⁶. The commodity classification at the 2 digit HS code has been matched with the GTAP commodity classification, and in the same way the country classification in the MacMap database has been matched with the country or regional classification in the GTAP model. After this rearrangement, the modified Swiss type formula - the ABI formula (as discussed in Section 3) - is used to cut the bound tariff rates applying two different coefficients for the developed and developing countries: a coefficient of 0.10 for the former group of countries and a coefficient of 0.20 for the latter group of countries. The LDCs are expected from any tariff cut under the NAMA negotiations.

Box 3: Tariff Cuts by the leading Developed and Developing Countries under NAMA2							
		Base year applied tariff rate	New applied Tariff rate		Base year applied tariff rate	New applied Tariff rate	
USA	Textile	5.71	0.44	INDIA	Textile	41.04	8.92
	Wearing Apparel	10.62	0.45		Wearing Apparel	33.86	8.53
	Leather	6.03	0.44		Leather	43.23	9.02
	Wood Products	1.73	0.37		Wood Products	36.50	8.69
	Paper products	0.03	0.03		Paper products	31.60	8.38
	Petroleum, coal products	0.32	0.19		Petroleum, coal products	35.99	8.66
	Chemicals	2.62	0.40		Chemicals	41.22	8.93
	Transport equipments	1.82	0.38		Transport equipments	31.44	8.37
	Electronic equipments	1.38	0.35		Electronic equipments	18.59	7.07
	Machineries	1.33	0.35		Machineries	23.48	7.67
EU	Other manufacturing	4.94	0.43		Other manufacturing	68.39	9.77
	Textile	5.11	1.24	BRAZIL	Textile	35.39	5.68
	Wearing Apparel	9.77	1.40		Wearing Apparel	35.00	5.67
	Leather	5.15	1.24		Leather	34.96	5.67
	Wood Products	2.20	0.94		Wood Products	28.53	5.47
	Paper products	0.00	0.00		Paper products	28.37	5.46
	Petroleum, coal products	0.55	0.41		Petroleum, coal products	32.95	5.61
	Chemicals	4.23	1.18		Chemicals	24.77	5.31
	Transport equipments	2.38	0.97		Transport equipments	32.89	5.61
	Electronic equipments	2.33	0.96		Electronic equipments	33.46	5.63
	Machineries	1.92	0.88		Machineries	33.24	5.62
	Other manufacturing	7.62	1.35		Other manufacturing	34.14	5.65

Source: Estimates under NAMA2 using the MacMap and the GTAP databases

One interesting point to note here that, the MacMap database provides information on the bound tariff rate, whereas the GTAP database presents the applied tariff rates of the countries. NAMA negotiations are all about cutting the bound tariff rates. It has already mentioned in the earlier

⁶ <http://www.cepii.fr/anglaisgraph/workpap/summaries/2005/wp05-18.htm> . For documentation see: 'Binding Overhang and Tariff-Cutting Formulas' by Hedi Bchir, Sébastien Jean and David Laborde, CEPII Working Paper No 2005-18, October 2005

sections that the bound tariff rates are much higher than the applied tariff rates in many of the countries under consideration. Therefore, once the bound tariff rates are cut using the modified Swiss formula, with coefficients of 0.10 and 0.20 for the developed and developing countries, the new bound tariff rates are matched with the applied tariff rates, and only if the new bound rates are lower than the applied rates, the new bound rates are introduced in the GTAP model as tariff cut shocks. NAMA2 scenario takes into account all these dimensions. Box 3 shows the figures of the tariff cuts by the four leading developed and developing countries under NAMA2.

The third simulation, namely NAMA3, leads to a tariff cut in the developed and developing countries by considering coefficients 0.20 for the developed and 0.30 for the developing countries in the modified Swiss formula. It appears that, compared to NAMA2, higher values of the coefficients in the Swiss formula under NAMA3 leads to a relatively less deep cut in tariffs. Box 4 presents the changes in tariffs under NAMA3 in four leading developed and developing countries.

Box 4: Tariff Cuts by the leading Developed and Developing Countries under NAMA3

		Base year applied tariff rate	New applied Tariff rate			Base year applied tariff rate	New applied Tariff rate
USA	Textile	5.71	0.79	INDIA	Textile	41.04	13.68
	Wearing Apparel	10.62	0.81		Wearing Apparel	33.86	12.07
	Leather	6.03	0.87		Leather	43.23	11.36
	Wood Products	1.73	0.82		Wood Products	36.50	12.25
	Paper products	0.03	0.61		Paper products	31.60	11.64
	Petroleum, coal products	0.32	0.03		Petroleum, coal products	35.99	11.09
	Chemicals	2.62	0.24		Chemicals	41.22	11.59
	Transport equipments	1.82	0.70		Transport equipments	31.44	12.09
	Electronic equipments	1.38	0.62		Electronic equipments	18.59	11.08
	Machineries	1.33	0.56		Machineries	23.48	8.91
EU	Other manufacturing	4.94	0.55	BRAZIL	Other manufacturing	68.39	9.89
	Textile	5.11	2.29		Textile	35.39	7.82
	Wearing Apparel	9.77	2.00		Wearing Apparel	35.00	7.89
	Leather	5.15	2.45		Leather	34.96	7.87
	Wood Products	2.20	2.00		Wood Products	28.53	7.86
	Paper products	0.00	1.32		Paper products	28.37	7.48
	Petroleum, coal products	0.55	0.00		Petroleum, coal products	32.95	7.47
	Chemicals	4.23	0.47		Chemicals	24.77	7.76
	Transport equipments	2.38	1.85		Transport equipments	32.89	7.20
	Electronic equipments	2.33	1.38		Electronic equipments	33.46	7.75
	Machineries	1.92	1.36		Machineries	33.24	7.79
	Other manufacturing	7.62	1.21		Other manufacturing	34.14	7.77

Source: Estimates under NAMA3 using the MacMap and the GTAP databases

6.2. Welfare Effects of NAMA Scenarios: GTAP Simulation Outcomes

Table 10 presents the welfare effects on selected countries, and annex table 1 presents the decomposition of the welfare effects for all the countries or regions in the GTAP model under consideration for NAMA1, NAMA2 and NAMA3 scenarios. It appears that a full implementation of the NAMA negotiations (NAMA1 scenario) will lead to a net welfare gain for Bangladesh and other LDCs. From annex table 1 it is understood that the welfare gain in Bangladesh and other LDCs are mainly driven by the favorable terms of trade shock, as the export prices of their products increase, whereas import prices decline in many cases. However, compared to the DFQF scenarios in chapter 4 the gains due to the favorable terms of trade are less pronounced. This is because of the resultant preference erosion of Bangladesh's and other LDCs' products in the countries, especially in the EU, where they are enjoying preference margins over other developing and developed countries.

Table 10: Welfare Effects of NAMA Scenarios on Selected Countries and Regions (million US\$)

	NAMA1	NAMA2	NAMA3
Bangladesh	108.9	89.5	63.2
India	706.3	582.4	760.7
Sri Lanka	210.5	179.7	130.0
Rest of South Asia	9.7	106.6	130.6
Other LDCs	27.3	13.8	10.1
Other Developing Countries	2043.6	1563.6	1637.8
USA	-5465.6	-4651.3	-2869.5
EU	2588.2	2668.1	2080.5
World	22941.1	18858.9	16700.4

Source: GTAP simulation results

It also appears that Bangladesh and other LDCs also gain from the NAMA2 scenarios, however, the gains are very smaller compared to those under the DFQF scenarios in chapter 4 of this volume. The developing countries have significant welfare gains from the NAMA scenarios. However, the welfare gains vary depending on the values of the coefficients in the Swiss formula. It appears that the higher the value of the coefficient the higher is the gain for the developing countries. Among the developed countries, USA and Canada suffers from welfare loss, mainly driven by the negative terms of trade shock. However, EU and all other developed countries register welfare gains under all NAMA scenarios.

6.3: Estimating the Preference Erosion for Bangladesh in the EU market

As has been mentioned earlier the EU market is the major RMG export destination of Bangladesh where, as an LDC, Bangladesh enjoys preference margins over other developing and developed countries. On the other hand, Bangladesh's RMG products enter into the USA market by facing the MFN tariffs. Therefore, the reduction in the tariffs in the USA market under the NAMA negotiations is likely to generate positive export growth in that market. Table 11, figures

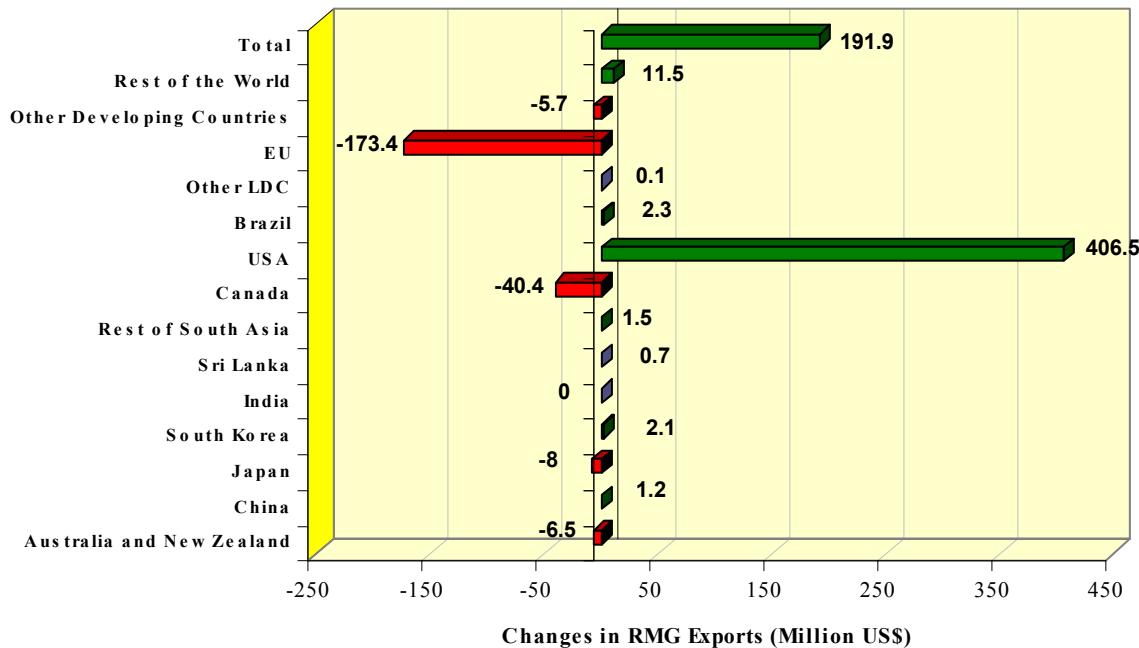
3, 4 5 present the changes in the volume of Bangladesh's RMG exports to different destinations under the NAMA scenarios. Table 11 presents the figures for only the USA and the EU market, while figures 3, 4 and 5 show the changes in Bangladesh's RMG export volumes in all markets as specified in the GTAP model. It is also important to note that, though Bangladesh qualifies for DFQF access in the EU market, because of the stringent RoO all of the Bangladesh's RMG products can not enter the EU market under the DFQF facilities. On the basis of the estimates of the rate of actual preference utilisation in the present study we assume that roughly 50 percent of the Bangladesh's RMG exports in the EU market can enjoy preference margins. In line with the assumption some adjustments are made in the GTAP model in order to capture this dimension.

Table 11: Bangladesh's RMG Exports Volume Change in the USA and EU under NAMA (Million US\$)

	NAMA1	NAMA2	NAMA3
USA	406.5	375.2	318.2
EU	-173.4	-143.6	-124.8
Total	191.9	182.3	158.3

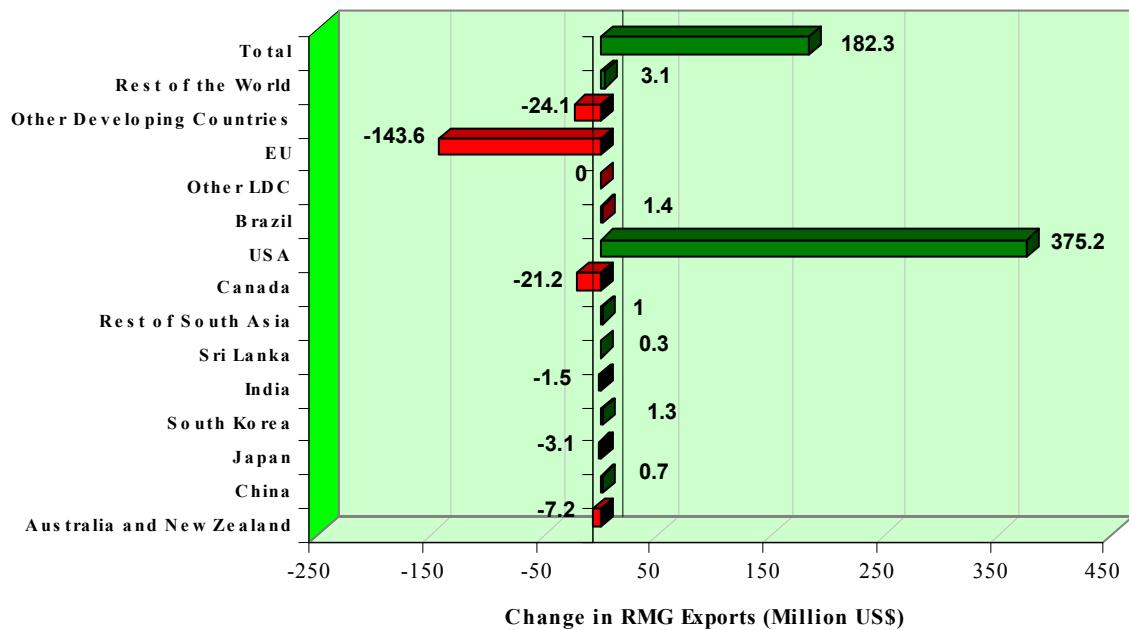
Source: GTAP simulation results

Figure 3: Preference Erosion and Gains of Bangladesh's RMG Exports in different Markets under NAMA1



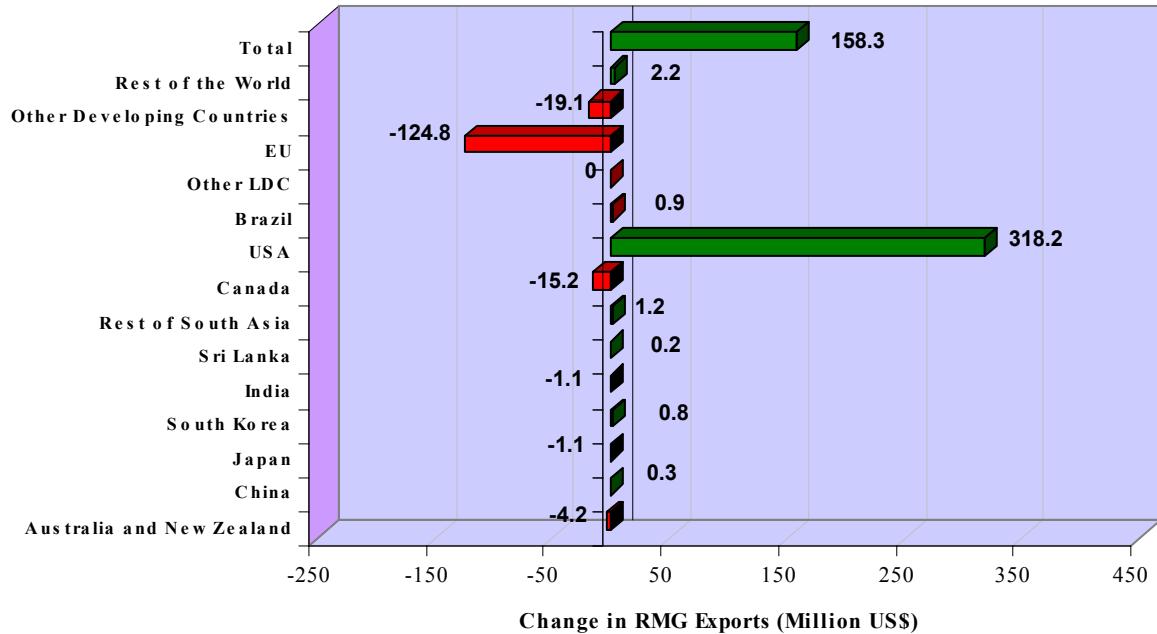
Source: GTAP simulation results

Figure 4: Preference Erosion and Gains of Bangladesh's RMG Exports in different markets under NAMA2



Source: GTAP simulation results

Figure 5: Preference Erosion and Gains of Bangladesh's RMG Exports in different markets under NAMA3



Source: GTAP simulation results

It emerges from the analyses of the aforementioned table and figures that the falls in the RMG exports volume in the EU market under the three NAMA scenarios are substantially very high. These falls in the RMG exports in the EU market are nothing but the losses in RMG exports due to the preference erosion of Bangladesh in that market. Under NAMA1, NAMA2 and NAMA3 the losses in the EU market, originating alone from the preference erosion of the RMG exports, are around 173.4 million US\$, 143.6 million US\$ and 124.8 million US\$ respectively. We also observe some erosion of the preferences in the Canadian market under all the NAMA scenarios

It, however, also becomes evident that Bangladesh stands to gain from the NAMA scenarios in the USA market. The RMG exports to the US market increase by 406.5 million US\$, 375.2 million US\$ and 318.2 million US\$ under NAMA1, NAMA2 and NAMA3 scenarios respectively. The large export gains in the USA market result in net gains in the RMG exports under all the NAMA scenarios.

7. The Impacts of NAMA Scenarios on the Bangladesh Economy: Estimates using the Bangladesh Dynamic CGE Model

Bangladesh dynamic CGE model has been used to explore the impacts of NAMA scenarios on the economy of Bangladesh. The detailed methodology of linking the global general equilibrium model with the Bangladesh dynamic model has been elaborated in chapter 2 of this volume. In brief, the price and volume shocks from the GTAP model for different NAMA scenarios are introduced in the Bangladesh dynamic model as shocks to generate the macroeconomic, sectoral, welfare and poverty impacts in the short and long run.

Table 12: Macroeconomic Impacts of different Scenarios (Percentage deviation from the BAU path)

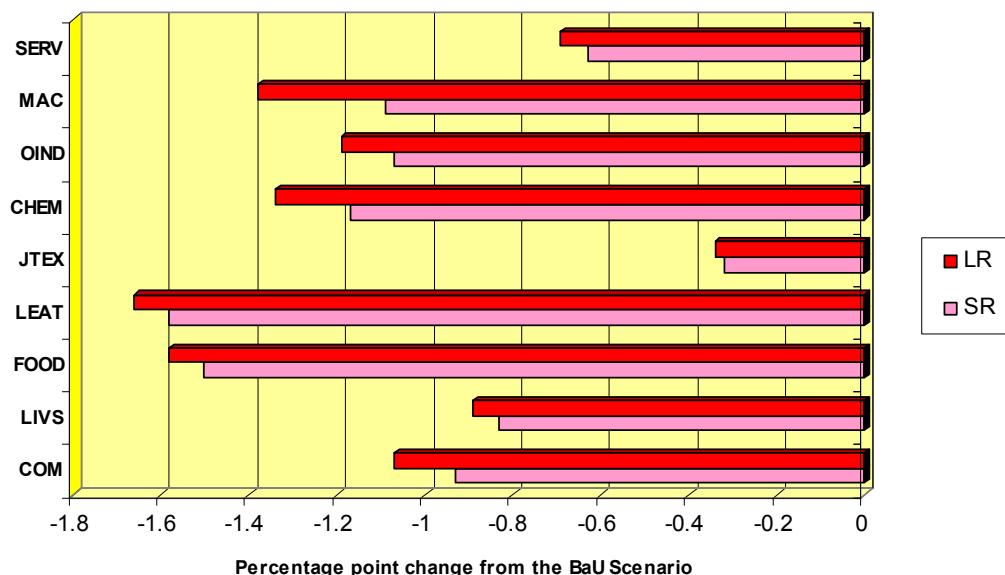
Variable	NAMA 1		NAMA 2		NAMA3	
	SR	LR	SR	LR	SR	LR
<i>Real GDP</i>	0.18	0.20	0.14	0.16	0.10	0.12
<i>Aggregate welfare</i>	0.19	0.23	0.16	0.19	0.12	0.14
<i>Head-count Poverty</i>	-0.10	-0.12	-0.08	-0.10	-0.06	-0.07
<i>Imports</i>	1.37	1.53	1.13	1.27	0.81	0.91
<i>Exports</i>	3.31	3.71	2.81	3.15	2.02	2.27
<i>Urban CPI</i>	0.92	0.97	0.78	0.82	0.56	0.59
<i>Rural CPI</i>	0.90	0.95	0.77	0.81	0.55	0.58
<i>Skilled wage rate</i>	1.16	1.29	0.99	1.09	0.71	0.78
<i>Unskilled wage rate</i>	1.19	1.31	1.01	1.11	0.73	0.80
<i>Agricultural capital rental rate</i>	1.00	1.03	0.85	0.88	0.61	0.63
<i>Non-agricultural capital rental rate</i>	1.10	1.16	0.93	0.99	0.67	0.71

7.1. Results of the Bangladesh Dynamic Model for NAMA1

The NAMA1 scenario leads to some positive impacts on the macro variables (table 12). There is a little but positive impact on real GDP both in the short and long run. There are also some positive impacts on aggregate welfare both in the short and long runs. Head-count poverty declines by little margins. The impacts on both imports and exports are positive. There are increases in the consumer price indices wage rates and the capital rental rates, though the increases in the wage rates and capital rental rates are higher than those of the consumer price induces..

The sectoral impacts are reported in the annex tables 2 and 3. The sectoral impacts are also seen to be smaller but positive in magnitudes. It appears that the NAMA1 scenario leads a rise in export pries and export demand of woven and knit RMG products. As a result, in the short run, these two sectors expand, though in modest margins. However, some other export oriented sectors, like the leather sector, suffer from negative export demand shocks, and therefore, contract. The textile sector expands because of the increased demand of raw materials from the RMG sectors. This leads to a reallocation of resources from the agriculture and other import-competing sectors to the expanding sectors, namely the woven and knit RMG and the textile sector in the economy. As a result of the expansion of the leading export-oriented sectors, which are mainly unskilled labour-intensive sectors, the wage rates of the unskilled labour increases more than that of the skilled labour (table 12). The pattern of the impacts in the long run is similar to those in the short run, though the positive impacts on the RMG sectors are strengthened.

Figure 6: More Concentration of the Export Basket? (Export growth of other sectors under NAMA1)



Source: Simulation Results

Note: COMC = Commercial Crops; LIVS = Livse stock and Fishery; FOOD = Other food; LEAT = Leather; JTEX = Jute textile; CHEM= chemicals and fertilizer; OIND= other industries; Mac = Machineries; SERV= services.

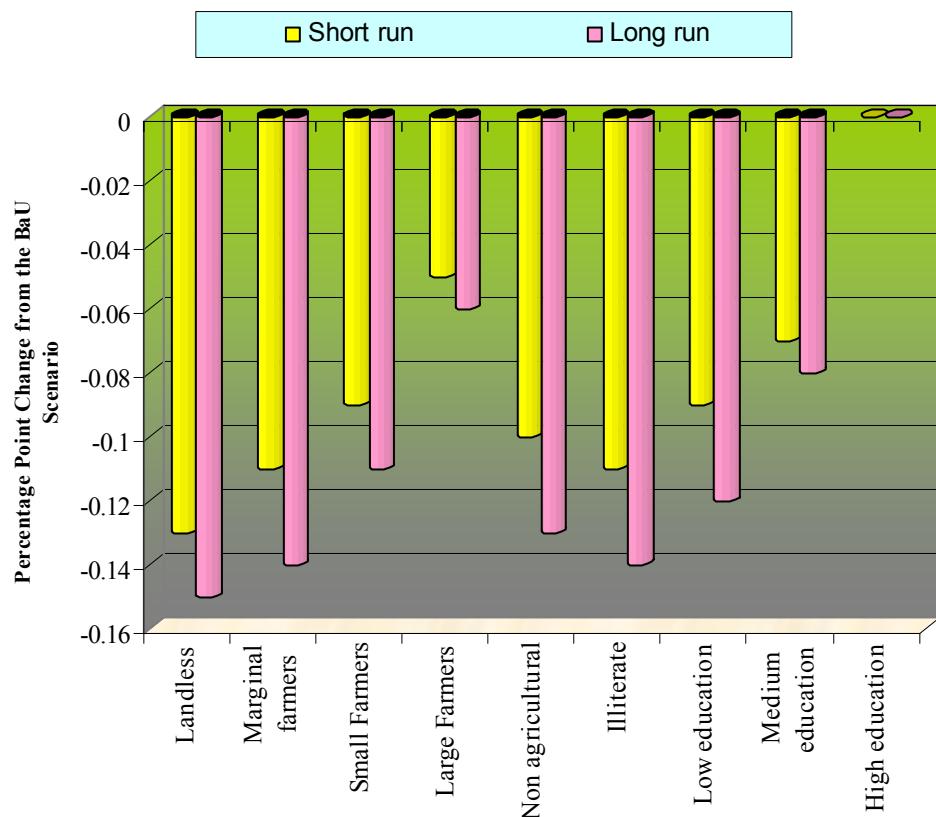
SR and LR refer to years 2006 and 2020 respectively.

As in the DFQF scenarios under NAMA1 scenario, apart from the knit and woven RMG sectors, all other export-oriented sectors suffer from negative growth (figure 6). It thus follows that because of the NAMA1 scenario the export basket in Bangladesh is likely to be more concentrated as the share of woven and knit RMG sectors increase and the shares of other export items fall in total exports.

The income and welfare impacts on the households are reported in the annex table 4. It emerges from the analysis of that table that NAMA1 scenario leads to rise in income for all the households and it also generates increase in consumer prices for all households. As the increases in incomes are greater than those of the consumer prices indices, all households experience welfare gains. It should, however, be noted that the magnitudes of the welfare gains are very small.

The impacts on the poverty measures of the households are presented in the annex table 5 and figure 7. It appears that NAMA1 reduces head-count poverty for all households except by some modest margins. The poorer households, namely the landless households in the rural area and the urban households with illiterate heads, gain most because of the relatively higher rise in the wage rate of the unskilled labour.

Figure 7: Short and Long run Impacts of NAMA1 Scenario on Households' Head-count Poverty



Source: Simulation Results

7.2. Results of Bangladesh Dynamic Model for NAMA 2

As in the NAMA1 scenario, the macroeconomic impacts of NAMA2 scenario are positive, but less profound (table 12). Real GDP and aggregate welfare increase and head-count poverty falls both in the short and long run. Both imports and exports register some positive growth, though lesser in magnitudes compared to NAMA1. The consumer price indices, wage rates and capital rental rates increase both in the short and long run. But, the magnitudes of the changes are very smaller than those under NAMA1.

NAMA2 scenario also generates some positive impact on the world export prices demand for Bangladeshi RMG products (annex tables 2 and 3). Therefore, exports from woven and knit RMG sector increase under this scenario. As in NAMA1, the expansions of the RMG sectors are associated by some expansion of the textile sector because of the increased demand for raw materials in the RMG sectors. As a result of the expansion of these two RMG sectors we observe a reallocation of resources towards these expanding sectors. It should, however, be mentioned that NAMA2 scenario generates smaller impacts at the sectoral level and thus expansions of the RMG sectors are small compared to those under NAMA2.

Annex tables 4 and 5 suggest that the impacts on households' income, welfare and poverty are positive but smaller in magnitudes than those under NAMA1. The rise in welfare of the poorer households is higher than those of the richer households. Head-count poverty in both the rural and urban areas fall and the poorer households stand to gain more than the richer households.

7.3. Results of Bangladesh Dynamic Model for NAMA 3

The macroeconomic impacts under NAMA3 are very much similar to those under NAMA2 (table 12); however, the impacts are smaller in magnitudes. There are positive impacts on real GDP, aggregate welfare and head-count poverty both in the short and long run. Also, both imports and exports increase, though by smaller margins compared to NAMA2. NAMA3 also leads to increases in the consumer price indices, wage rates and capital rental rates both in the short and long run. However, the changes are smaller than those under NAMA2.

The pattern of the sectoral impacts is similar to those under NAMA2. As in NAMA2 the woven and knit RMG sectors and the textile sector expand under NAMA3 scenario (annex tables 2 and 3). This read to a reallocation of resources towards these expanding sectors. It is, however, important to note that NAMA3 scenario results in smaller impacts at the sectoral level and thus expansions of the RMG sectors are less profound compared to those under NAMA3.

The welfare and poverty impacts are also similar as in NAMA2 (annex tables 4 and 5). The impacts on households' income, welfare and poverty are positive but smaller in magnitudes than those under NAMA2. Head-count poverty in both the rural and urban areas falls. As in NAMA2, it appears that the poorer households stand to gain more than the richer households in terms of increase in welfare and reduction in poverty.

8. Conclusion

This paper has explored three different NAMA scenarios with a view to estimate the preference erosion of Bangladesh's RMG exports in the EU market and the possible gains in the USA and other markets. Using the GTAP general equilibrium method this paper has also estimated the welfare impacts of different NAMA scenarios. It appears from the simulation results that a full implementation of NAMA will lead to large preference erosion of Bangladesh RMG exports in the EU and Canadian markets, where Bangladesh is currently enjoying duty-free-quota-free market access. Though, there is a large gain in the USA market the gain is sufficient enough to offset the losses in the EU and Canadian market, and as a result, both total RMG exports and welfare rise under NAMA1. Under NAMA2 and NAMA3, which are the scenarios based on the modified Swiss-type formula with different coefficients for the developed and developing countries, also lead to a situation where the preference erosion in the EU and Canadian market is offset by the expansion of RMG exports in the US market. Therefore, total RMG exports of Bangladesh increases. Also, aggregate welfare increases, though in smaller margin.

The Bangladesh dynamic model has been applied to explore the impacts of different NAMA scenarios on the economy of Bangladesh. All NAMA scenarios generate some positive impact on the economy and leads to some expansion of the RMG sectors. They also increase households' welfare and reduce poverty.

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Annex Table 1: Decomposition of the Welfare Effects of NAMA scenarios in all regions

		Bangladesh	LDCs	India	Rest of South Asia	Sri Lanka	Thailand	China	Brazil	DEVG	Australia	Japan	Korea	USA	Canada	EU	ROW	World
NAMA 1	Allocative Efficiency	4.7	4.8	2273.5	347.7	36.4	250.0	5323	1325.8	5490.9	723.3	2155.7	1825.3	943.6	163.4	1392.6	832.3	23093.0
	Terms of Trade Effect	99.9	21.6	-1598.2	-311.5	173	-120.1	-2871.1	32.7	-4665.4	-101.3	6253.7	3003.7	-4660.1	-936.1	531.6	5825.6	678.0
	Investment-Savings Effect	3.7	0.9	31	-36.8	1.2	26.5	358	-69.4	1218.1	72.7	-370.3	-457.5	-1749.1	255.8	664	70.1	18.9
	Total	108.3	27.3	706.3	9.7	210.5	156.4	2809.9	1289.2	2043.6	694.7	8039.1	4371.4	-5465.6	-516.9	2588.2	6728.0	23800.1
NAMA 2	Allocative Efficiency	8.2	3.6	1911.5	291.5	30.7	120.0	5068.9	988	3282.5	645.1	1818.2	1394.5	1052.4	173.7	1567.6	395.8	18752.2
	Terms of Trade Effect	78.6	9.5	-1378	-171.4	147.3	-57.6	-3086.2	173.4	-2324.8	-354.4	6093.2	2562.9	-4371.2	-829.3	532.4	2949.3	-26.3
	Investment-Savings Effect	2.7	0.6	48.9	-13.6	1.7	12.7	469	-5.8	605.9	70.6	-369.2	-392.9	-1332.5	219.6	568	120.0	5.7
	Total	89.5	13.8	582.4	106.6	179.7	75.1	2451.7	1155.7	1563.6	361.3	7542.2	3564.6	-4651.3	-436.1	2668.1	3465.1	18732.0
NAMA 3	Allocative Efficiency	7.2	3.2	1685.9	257.1	27.1	105.8	4470.8	917.4	2895.2	569.0	1603.7	1229.9	928.2	153.2	1382.6	349.1	16585.4
	Terms of Trade Effect	54.4	6.6	-953.6	-118.6	101.9	-39.9	-2135.7	290.0	-1608.8	-245.2	4216.5	1773.5	-3024.9	-573.9	368.4	2040.9	151.6
	Investment-Savings Effect	1.6	0.3	28.4	-7.9	1.0	7.4	272.0	-3.4	351.4	40.9	-214.1	-227.9	-772.9	127.4	329.4	69.6	3.2
	Total	63.2	10.1	760.7	130.6	130.0	73.3	2607.1	1164.0	1637.8	364.7	5606.0	2775.6	-2869.5	-293.3	2080.5	2459.6	16700.4

Source: GTAP Simulation Results

Annex Table 2: Effects on Sectoral Prices (Percentage deviation from the BAU Path), and Export Demand Shock

	Variable	Year	PDDY	GRNS	COMC	LIVS	FORS	RICE	FOOD	LEAT	JTEX	YARN	TEXT	WRMG	KRMG	CHEM	PETR	OIND	CEMT	STEL	MACH	CNST	SERV
NAMA 1	Price of Import		0.00	0.01	-0.02	-0.04	0.00	0.02	0.00	-0.02	-0.01	-0.02	0.00	-0.01	-0.02	-0.02	-0.01	-0.02	-0.01	-0.01	-0.02	0.00	-0.02
	World export demand																						
	Price of world export		0.00	0.00	0.89	0.85	0.00	0.00	0.00	0.81	0.79	0.00	0.00	0.67	0.67	0.75	0.81	0.89	0.00	0.00	0.79	0.00	1.03
	Price of FOB export	SR	0.00	0.00	0.55	0.53	0.00	0.00	0.16	0.53	0.81	0.00	0.00	1.11	1.13	0.47	0.83	0.47	0.00	0.00	0.47	0.00	0.69
		LR	0.00	0.00	0.55	0.53	0.00	0.00	0.16	0.55	0.83	0.00	0.00	1.07	1.11	0.49	0.85	0.47	0.00	0.00	0.49	0.00	0.69
	Producer price	SR	1.01	0.89	0.97	0.95	0.97	1.03	0.91	1.09	1.01	0.91	0.99	1.11	1.03	0.91	0.91	0.95	0.89	0.87	0.87	0.93	1.05
		LR	1.03	1.01	1.05	1.01	1.05	1.05	0.99	1.15	1.05	0.97	1.01	1.07	1.01	1.03	1.03	1.05	1.09	1.03	1.03	1.01	1.13
	Price of value added	SR	1.19	0.95	1.03	1.09	1.03	1.17	1.05	1.11	1.20	1.13	1.24	1.48	1.34	0.89	0.79	1.01	0.73	0.85	0.87	1.09	1.15
		LR	1.17	1.15	1.17	1.13	1.11	1.15	1.15	1.13	1.19	1.15	1.17	1.24	1.17	1.15	1.13	1.15	1.15	1.13	1.13	1.15	1.20
	Rate of return to capital	SR	1.19	0.75	0.91	1.03	0.97	1.17	0.95	1.05	1.20	1.09	1.28	1.76	1.48	0.71	0.59	0.89	0.38	0.67	0.63	1.01	1.09
		LR	1.05	1.03	1.03	1.03	1.03	1.05	1.03	1.03	1.05	1.05	1.07	1.19	1.08	1.03	1.03	1.03	1.01	1.03	1.01	1.03	1.05
NAMA 2	Price of Import		0.00	0.01	-0.02	-0.03	0.00	0.02	0.00	-0.01	-0.01	-0.01	0.00	-0.01	-0.01	-0.02	-0.01	-0.01	-0.02	-0.02	-0.02	0.00	-0.02
	World export demand		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Price of world export		0.00	0.00	0.74	0.71	0.00	0.00	0.00	0.68	0.66	0.00	0.00	0.56	0.56	0.63	0.68	0.74	0.00	0.00	0.66	0.00	0.86
	Price of FOB export	SR	0.00	0.00	0.46	0.45	0.00	0.00	0.13	0.45	0.68	0.00	0.00	0.93	0.94	0.40	0.69	0.40	0.00	0.00	0.40	0.00	0.58
		LR	0.00	0.00	0.46	0.45	0.00	0.00	0.13	0.46	0.69	0.00	0.00	0.89	0.93	0.41	0.71	0.40	0.00	0.00	0.41	0.00	0.58
	Producer price	SR	0.84	0.74	0.81	0.79	0.81	0.86	0.76	0.91	0.84	0.76	0.83	0.93	0.86	0.76	0.76	0.79	0.74	0.73	0.73	0.78	0.88
		LR	0.86	0.84	0.88	0.84	0.88	0.88	0.83	0.96	0.88	0.81	0.84	0.89	0.84	0.86	0.86	0.88	0.91	0.86	0.86	0.84	0.94
	Price of value added	SR	0.99	0.79	0.86	0.91	0.86	0.97	0.88	0.93	1.01	0.94	1.04	1.24	1.12	0.74	0.66	0.84	0.61	0.71	0.73	0.91	0.96
		LR	0.97	0.96	0.97	0.94	0.93	0.96	0.96	0.94	0.99	0.96	0.97	1.04	0.97	0.96	0.94	0.96	0.96	0.94	0.94	0.96	1.01
	Rate of return to capital	SR	0.99	0.63	0.76	0.86	0.81	0.97	0.79	0.88	1.01	0.91	1.07	1.47	1.24	0.59	0.50	0.74	0.31	0.56	0.53	0.84	0.91
		LR	0.88	0.86	0.86	0.86	0.86	0.88	0.86	0.86	0.88	0.88	0.89	0.99	0.90	0.86	0.86	0.86	0.84	0.86	0.84	0.86	0.88
NAMA 3	Price of Import		0.00	0.01	-0.01	-0.02	0.00	0.01	0.00	-0.01	-0.01	-0.01	0.00	-0.01	-0.01	-0.01	-0.01	-0.01	-0.01	-0.01	-0.01	0.00	-0.01
	World export demand		0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	Price of world export		0.00	0.00	0.54	0.52	0.00	0.00	0.00	0.50	0.48	0.00	0.00	0.41	0.41	0.46	0.50	0.54	0.00	0.00	0.48	0.00	0.63
	Price of FOB export	SR	0.00	0.00	0.34	0.33	0.00	0.00	0.09	0.33	0.50	0.00	0.00	0.68	0.69	0.29	0.50	0.29	0.00	0.00	0.29	0.00	0.42
		LR	0.00	0.00	0.34	0.33	0.00	0.00	0.09	0.34	0.50	0.00	0.00	0.65	0.68	0.30	0.52	0.29	0.00	0.00	0.30	0.00	0.42
	Producer price	SR	0.61	0.54	0.59	0.58	0.59	0.63	0.55	0.66	0.61	0.55	0.61	0.68	0.63	0.55	0.55	0.58	0.54	0.53	0.53	0.57	0.64
		LR	0.63	0.61	0.64	0.61	0.64	0.64	0.61	0.70	0.64	0.59	0.61	0.65	0.61	0.63	0.63	0.64	0.66	0.63	0.63	0.61	0.69
	Price of value added	SR	0.72	0.58	0.63	0.66	0.63	0.71	0.64	0.68	0.74	0.69	0.76	0.91	0.82	0.54	0.48	0.61	0.45	0.52	0.53	0.66	0.70
		LR	0.71	0.70	0.71	0.69	0.68	0.70	0.70	0.69	0.72	0.70	0.71	0.76	0.71	0.70	0.69	0.70	0.70	0.69	0.69	0.70	0.74
	Rate of return to capital	SR	0.72	0.46	0.55	0.63	0.59	0.71	0.58	0.64	0.74	0.66	0.78	1.07	0.91	0.43	0.37	0.54	0.23	0.41	0.39	0.61	0.66
		LR	0.64	0.63	0.63	0.63	0.63	0.64	0.63	0.63	0.64	0.64	0.65	0.72	0.68	0.63	0.63	0.63	0.61	0.63	0.61	0.63	0.64

Source: Calculated from NAMA simulation results

PDDY = Paddy; GRNS = Grains; COMC = Commercial Crops; LIVS = Livestock; FORS = Forestry; RICE = Rice; FOOD = Other food; LEAT = Leather; JTEX = Jute textile; YARN = Yarn; TEXT = textile; WRMG = Woven ready-made garments; KRMG = Knit readymade garments; CHEM= chemicals and fertilizer; PETR = petroleum; OIND= other industries; CEMT = Cement; STEL = Steel; MACH =machinery; CNST= construction; SERV= services. SR and LR refer to years 2006 and 2020 respectively.

Annex Table 3: Effects on Sectoral Volumes (percentage deviation from the BAU path)

Variable	Year	PDDY	GRNS	COMC	LIVS	FORS	RICE	FOOD	LEAT	JTEX	YARN	TEXT	WRMG	KRMG	CHEM	PETR	OIND	CEMT	STEL	MACH	CNST	SERV	
NAMA 1	Imports	SR	0.97	1.38	1.52	1.44	1.72	1.32	1.88	1.88	2.01	0.77	0.89	1.11	0.97	1.36	0.73	1.01	0.99	0.00	1.72	0.97	
		LR	1.17	1.54	1.64	1.58	1.82	1.48	2.01	2.01	1.86	2.21	0.93	0.87	1.28	1.13	1.54	0.89	1.20	1.15	0.00	1.86	1.17
	Exports	SR	0.00	0.00	-0.93	-0.83	0.00	0.00	-1.50	-1.58	-0.32	0.00	0.00	3.91	3.58	-1.17	-0.59	-1.07	0.00	0.00	-1.09	0.00	-0.63
		LR	0.00	0.00	-1.07	-0.89	0.00	0.00	-1.58	-1.66	-0.34	0.00	0.00	5.45	4.09	-1.34	-0.81	-1.19	0.00	0.00	-1.38	0.00	-0.69
	Production	SR	0.18	-0.30	-0.16	-0.06	-0.02	0.16	-0.08	-0.59	0.06	0.20	1.26	3.87	3.63	-0.36	-0.43	-0.18	-0.63	-0.32	-0.34	0.00	0.04
		LR	0.24	-0.32	-0.14	-0.02	0.00	0.22	-0.06	-0.59	0.08	0.34	1.42	5.37	4.11	-0.38	-0.45	-0.14	-0.73	-0.36	-0.41	0.02	0.10
	Capital demand	SR	0.18	-0.16	-0.06	-0.02	0.02	0.18	0.00	-0.55	0.04	0.22	0.63	1.09	0.87	-0.22	-0.28	-0.08	-0.36	-0.18	-0.18	0.06	0.10
		LR	0.32	-0.22	-0.04	0.04	0.06	0.32	0.04	-0.51	0.20	0.40	0.71	1.86	1.22	-0.28	-0.40	-0.06	-0.63	-0.30	-0.34	0.10	0.22
	Skilled labour demand	SR	0.20	-0.47	-0.26	-0.12	-0.12	0.18	-0.16	-0.63	0.08	0.18	0.57	1.56	1.13	-0.55	-0.71	-0.28	-0.93	-0.55	-0.55	-0.06	0.04
		LR	0.14	-0.40	-0.24	-0.14	-0.14	0.12	-0.16	-0.71	0.02	0.22	0.75	1.78	1.03	-0.47	-0.57	-0.26	-0.83	-0.47	-0.53	-0.08	0.04
	Unskilled labour demand	SR	0.16	-0.49	-0.28	-0.14	-0.14	0.16	-0.20	-0.65	0.06	0.14	0.61	1.54	1.11	-0.57	-0.75	-0.30	-0.97	-0.57	-0.59	-0.08	0.00
		LR	0.12	-0.43	-0.26	-0.18	-0.16	0.10	-0.18	-0.73	-0.02	0.18	0.71	1.76	0.99	-0.49	-0.61	-0.28	-0.85	-0.51	-0.55	-0.12	0.00
NAMA 2	Imports	SR	0.86	1.23	1.35	1.28	1.52	1.17	1.66	1.66	1.45	1.79	0.68	0.79	0.98	0.86	1.21	0.65	0.89	0.88	0.00	1.52	0.86
		LR	1.03	1.37	1.45	1.40	1.61	1.31	1.79	1.79	1.65	1.96	0.82	0.77	1.14	1.00	1.37	0.79	1.07	1.02	0.00	1.65	1.03
	Exports	SR	0.00	0.00	-0.82	-0.74	0.00	0.00	-1.33	-1.40	-0.28	0.00	0.00	3.47	3.17	-1.03	-0.53	-0.95	0.00	0.00	-0.96	0.00	-0.56
		LR	0.00	0.00	-0.95	-0.79	0.00	0.00	-1.40	-1.47	-0.30	0.00	0.00	4.84	3.63	-1.19	-0.72	-1.05	0.00	0.00	-1.23	0.00	-0.61
	Production	SR	0.16	-0.26	-0.14	-0.05	-0.02	0.14	-0.07	-0.53	0.05	0.18	1.12	3.43	3.22	-0.32	-0.39	-0.16	-0.56	-0.28	-0.30	0.00	0.04
		LR	0.21	-0.28	-0.12	-0.02	0.00	0.19	-0.05	-0.53	0.07	0.30	1.26	4.77	3.64	-0.33	-0.40	-0.12	-0.65	-0.32	-0.37	0.02	0.09
	Capital demand	SR	0.16	-0.14	-0.05	-0.02	0.02	0.16	0.00	-0.49	0.04	0.19	0.56	0.96	0.77	-0.19	-0.25	-0.07	-0.32	-0.16	-0.16	0.05	0.09
		LR	0.28	-0.19	-0.04	0.04	0.05	0.28	0.04	-0.46	0.18	0.35	0.63	1.65	1.09	-0.25	-0.35	-0.05	-0.56	-0.26	-0.30	0.09	0.19
	Skilled labour demand	SR	0.18	-0.42	-0.23	-0.11	-0.11	0.16	-0.14	-0.56	0.07	0.16	0.51	1.38	1.00	-0.49	-0.63	-0.25	-0.82	-0.49	-0.49	-0.05	0.04
		LR	0.12	-0.35	-0.21	-0.12	-0.12	0.11	-0.14	-0.63	0.02	0.19	0.67	1.58	0.91	-0.42	-0.51	-0.23	-0.74	-0.42	-0.47	-0.07	0.04
	Unskilled labour demand	SR	0.14	-0.44	-0.25	-0.12	-0.12	0.14	-0.18	-0.58	0.05	0.12	0.54	1.37	0.98	-0.51	-0.67	-0.26	-0.86	-0.51	-0.53	-0.07	0.00
		LR	0.11	-0.39	-0.23	-0.16	-0.14	0.09	-0.16	-0.65	-0.02	0.16	0.63	1.56	0.88	-0.44	-0.54	-0.25	-0.75	-0.46	-0.49	-0.11	0.00
NAMA 3	Imports	SR	0.67	0.96	1.05	1.00	1.19	0.91	1.29	1.29	1.13	1.40	0.53	0.62	0.76	0.67	0.94	0.51	0.69	0.69	0.00	1.19	0.67
		LR	0.80	1.07	1.13	1.09	1.26	1.02	1.40	1.40	1.29	1.53	0.64	0.60	0.89	0.78	1.07	0.62	0.83	0.80	0.00	1.29	0.80
	Exports	SR	0.00	0.00	-0.64	-0.58	0.00	0.00	-1.04	-1.09	-0.22	0.00	0.00	2.71	2.47	-0.80	-0.41	-0.74	0.00	0.00	-0.75	0.00	-0.44
		LR	0.00	0.00	-0.74	-0.62	0.00	0.00	-1.09	-1.15	-0.23	0.00	0.00	3.78	2.83	-0.93	-0.56	-0.82	0.00	0.00	-0.96	0.00	-0.48
	Production	SR	0.12	-0.20	-0.11	-0.04	-0.02	0.11	-0.05	-0.41	0.04	0.14	0.87	2.68	2.51	-0.25	-0.30	-0.12	-0.44	-0.22	-0.23	0.00	0.03
		LR	0.16	-0.22	-0.09	-0.02	0.00	0.15	-0.04	-0.41	0.05	0.23	0.98	3.72	2.84	-0.26	-0.31	-0.09	-0.51	-0.25	-0.29	0.02	0.07
	Capital demand	SR	0.12	-0.11	-0.04	-0.02	0.02	0.12	0.00	-0.38	0.03	0.15	0.44	0.75	0.60	-0.15	-0.20	-0.05	-0.25	-0.12	-0.12	0.04	0.07
		LR	0.22	-0.15	-0.03	0.03	0.04	0.22	0.03	-0.36	0.14	0.27	0.49	1.29	0.85	-0.20	-0.27	-0.04	-0.44	-0.20	-0.23	0.07	0.15
	Skilled labour demand	SR	0.14	-0.33	-0.18	-0.09	-0.09	0.12	-0.11	-0.44	0.05	0.12	0.40	1.08	0.78	-0.38	-0.49	-0.20	-0.64	-0.38	-0.38	-0.04	0.03
		LR	0.09	-0.27	-0.16	-0.09	-0.09	0.09	-0.11	-0.49	0.02	0.15	0.52	1.23	0.71	-0.33	-0.40	-0.18	-0.58	-0.33	-0.37	-0.05	0.03
	Unskilled labour demand	SR	0.11	-0.34	-0.20	-0.09	-0.09	0.11	-0.14	-0.45	0.04	0.09	0.42	1.07	0.76	-0.40	-0.52	-0.20	-0.67	-0.40	-0.41	-0.05	0.00
		LR	0.09	-0.30	-0.18	-0.12	-0.11	0.07	-0.12	-0.51	-0.02	0.12	0.49	1.22	0.69	-0.34	-0.42	-0.20	-0.59	-0.36	-0.38	-0.09	0.00

Source: Calculated from NAMA simulation results

PDDY = Paddy; GRNS = Grains; COMC = Commercial Crops; LIVS = Livestock; FORS = Forestry; RICE = Rice; FOOD = Other food; LEAT = Leather; JTEX = Jute textile; YARN = Yarn; TEXT = Textile; WRMG = Woven ready-made garments; KRMG = Knit readymade garments; CHEM= chemicals and fertilizer; PETR = petroleum; OIND= other industries; CEMT = Cement; STEL = Steel; MACH machinery; CNST= construction; SERV= services. SR and LR refer to years 2006 and 2020 respectively.

Annex Table 4: Effects on Income and Welfare (percentage deviation from the BAU path)

	Variable	Year	Rural Households					Urban Households			
			Landless	Marginal farmer	Small farmer	Large farmer	Non-Agricultural	Illiterate	Low education	Med education	High education
NAMA 1	Income	SR	1.12	1.10	1.08	1.04	1.10	1.10	1.08	1.08	1.06
		LR	1.23	1.19	1.17	1.14	1.19	1.21	1.19	1.17	1.16
	CPI	SR	0.86	0.86	0.86	0.86	0.86	0.86	0.86	0.88	0.88
		LR	0.89	0.89	0.89	0.89	0.89	0.91	0.91	0.93	0.93
	EVs	SR	0.26	0.22	0.19	0.09	0.20	0.22	0.19	0.15	0.07
		LR	0.32	0.28	0.22	0.13	0.26	0.28	0.24	0.19	0.07
NAMA 2	Income	SR	0.94	0.93	0.91	0.88	0.93	0.93	0.91	0.91	0.90
		LR	1.04	1.01	0.99	0.96	1.01	1.02	1.01	0.99	0.98
	CPI	SR	0.72	0.72	0.72	0.72	0.72	0.72	0.72	0.74	0.74
		LR	0.76	0.76	0.76	0.76	0.76	0.77	0.77	0.79	0.79
	EVs	SR	0.22	0.19	0.16	0.08	0.17	0.19	0.16	0.13	0.06
		LR	0.27	0.24	0.19	0.11	0.22	0.24	0.20	0.16	0.06
NAMA 3	Income	SR	0.74	0.73	0.72	0.70	0.73	0.73	0.72	0.72	0.71
		LR	0.85	0.83	0.81	0.79	0.83	0.84	0.83	0.81	0.80
	CPI	SR	0.57	0.57	0.57	0.57	0.57	0.57	0.57	0.58	0.58
		LR	0.62	0.62	0.62	0.62	0.62	0.63	0.63	0.65	0.65
	EVs	SR	0.17	0.15	0.13	0.06	0.13	0.15	0.13	0.10	0.05
		LR	0.22	0.20	0.16	0.09	0.18	0.20	0.16	0.13	0.05

Source: Calculated from NAMA simulation results

Note: SR and LR refer to years 2006 and 2020 respectively.

EV measures the welfare of the households

Annex Table 5: Poverty in the BAU Scenario, and the Effects of different NAMA s on Household Poverty (percentage deviation from the BAU path)

Scenarios	Poverty Index	Year	Rural Households					Total Rural	Urban Households				Total Urban
			Landles	Margin al farmer	Small farmer	Large farmer	Non Agricultu ral		Illiterat e	Low education	Medium education	High education	
BAU Scenario	P0	2000	73.61	64.22	47.93	23.04	45.52	51.52	70.72	30.51	7.74	0.00	39.11
		SR	69.32	55.31	41.81	18.21	41.11	46.33	65.52	26.63	6.03	0.00	35.53
		LR	39.81	28.61	15.81	6.02	19.02	22.42	38.731	11.32	1.41	0.00	19.02
	P1	2000	23.01	17.22	11.32	4.82	12.32	14.13	22.34	7.52	1.52	0.00	11.44
		SR	19.92	14.43	9.03	3.81	10.33	11.84	19.42	6.14	1.23	0.00	9.82
		LR	8.11	4.91	2.61	0.73	3.52	4.21	8.51	1.74	0.44	0.00	3.91
	P2	2000	9.21	6.31	3.73	1.42	4.54	5.22	9.31	2.51	0.52	0.00	4.53
		SR	7.52	5.02	2.92	1.04	3.61	4.23	7.74	1.93	0.41	0.00	3.72
		LR	2.52	1.33	0.71	0.10	1.02	1.24	2.83	0.41	0.11	0.00	1.32
NAMA 1	P0	SR	-0.13	-0.11	-0.09	-0.05	-0.10	-0.10	-0.11	-0.09	-0.07	0.00	-0.09
		LR	-0.15	-0.14	-0.11	-0.06	-0.13	-0.12	-0.14	-0.12	-0.08	0.00	-0.11
	P1	SR	-0.05	-0.04	-0.04	-0.02	-0.04	-0.04	-0.04	-0.04	-0.03	0.00	-0.04
		LR	-0.06	-0.06	-0.04	-0.03	-0.05	-0.05	-0.06	-0.05	-0.03	0.00	-0.05
	P2	SR	-0.02	-0.01	-0.01	-0.01	-0.01	-0.01	-0.01	-0.01	-0.01	0.00	-0.01
		LR	-0.02	-0.02	-0.01	-0.01	-0.02	-0.02	-0.02	-0.02	-0.01	0.00	-0.02
NAMA 2	P0	SR	-0.11	-0.09	-0.08	-0.04	-0.08	-0.09	-0.09	-0.08	-0.06	0.00	-0.08
		LR	-0.13	-0.11	-0.09	-0.05	-0.11	-0.10	-0.11	-0.10	-0.07	0.00	-0.09
	P1	SR	-0.04	-0.04	-0.03	-0.02	-0.03	-0.03	-0.04	-0.03	-0.02	0.00	-0.03
		LR	-0.05	-0.05	-0.04	-0.02	-0.04	-0.04	-0.05	-0.04	-0.03	0.00	-0.04
	P2	SR	-0.02	-0.01	-0.01	-0.01	-0.01	-0.01	-0.01	-0.01	-0.01	0.00	-0.01
		LR	-0.02	-0.02	-0.01	-0.01	-0.02	-0.01	-0.02	-0.01	-0.01	0.00	-0.01
NAMA 3	P0	SR	-0.09	-0.07	-0.06	-0.03	-0.06	-0.07	-0.07	-0.06	-0.05	0.00	-0.06
		LR	-0.11	-0.09	-0.07	-0.04	-0.09	-0.08	-0.09	-0.08	-0.06	0.00	-0.07
	P1	SR	-0.03	-0.03	-0.02	-0.02	-0.02	-0.02	-0.03	-0.02	-0.02	0.00	-0.02
		LR	-0.04	-0.04	-0.03	-0.02	-0.03	-0.03	-0.04	-0.03	-0.02	0.00	-0.03
	P2	SR	-0.02	-0.01	-0.01	-0.01	-0.01	-0.01	-0.01	-0.01	-0.01	0.00	-0.01
		LR	-0.02	-0.02	-0.01	-0.01	-0.02	-0.01	-0.02	-0.01	-0.01	0.00	-0.01

Source: Calculated from the HIES 2000 and NAMA simulation results

Note: SR and LR refer to years 2006 and 2020 respectively. P0 is the poverty headcount ratio (percentage of poor); P1 is the poverty gap (depth); and P2 is the squared poverty gap (severity).