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Trade policy, poverty and income distribution in computable general equilibrium models: An application to the South Asia free trade agreement

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TRADE POLICY, POVERTY AND INCOME DISTRIBUTION IN COMPUTABLE GENERAL EQUILIBRIUM MODELS: AN APPLICATION TO THE SOUTH ASIA FREE TRADE AGREEMENT

By John Gilbert

Introduction

In line with trends in the other economies, South Asia has been actively engaged in trade liberalization during the past decade, both on a unilateral and a regional basis. On the regional side, the economies of South Asia have sought to promote intraregional trade as a group, in addition to pursuing agreements with economies outside the region (for example, India's interest in a possible Association of Southeast Nations (ASEAN)+6 arrangement, and Bay of Bengal Initiative for Multi-sectoral Technical and Economic Cooperation (BIMSTEC) promoting trade cooperation among South Asia and South-East Asia as well as with larger economies of Asia such as Japan). The most comprehensive South Asian regional agreement is the South Asia Free Trade Agreement (SAFTA). This framework agreement, signed in 2004, is an extension of the earlier SAARC Preferential Trading Arrangement (SAPTA) established in 1995. It brings together Bangladesh, Bhutan, India, Maldives, Nepal, Pakistan and Sri Lanka, and requires a phase-out of all duties by 2012 for the developing economies and by 2016 for the least developed economies.

The empirical literature analysing the potential economic impact of SAFTA is still rather thin. Pigato and others (1997) compared SAPTA with unilateral reform options using the GTAP model, and concluded that the latter was preferable from a net welfare perspective, but that the benefits of regional liberalization outweighed the costs. Bandara and Yu (2003) also used the GTAP model to consider aggregate welfare changes, and found that the potential net benefits were generally positive but small.

An important but unanswered question is how SAFTA may affect broader socio-economic variables in the region, particularly with regard to income distribution and poverty. South Asia is one of the poorest regions in the world. This fact is a major trade policy concern, as illustrated by the recent collapse of negotiations on the Doha Development Agenda over the failure to agree on agricultural safeguard measures for developing economies, for example. Countries in the region (notably India) pushed strongly for these measures out of a strong desire to protect their large and poor rural populations.

Because of its ability to consistently track the effect of policies across an entire economic system, computable general equilibrium (CGE) analysis has become a mainstay of the trade policy literature (see recent surveys by Scollay and Gilbert, 2000; Gilbert and Wahl, 2002; Robinson and Thierfelder, 2002; and Lloyd and MacLaren, 2004). There has been significant growth in the CGE literature on the effects of trade liberalization on poverty and income distribution (see Hertel and Reimer, 2005; Hertel and Winters, 2005; and Gilbert (forthcoming) for overviews of this literature). In the case of South Asia, there have been a number recent CGE studies of individual economies that feature multiple representative households as a means of quantifying the impact of trade policy changes on various groups in society (Cockburn, 2002; Naranpanawa, 2005; Annabi and others,

2006; Acharya and Cohen, 2008; Gilbert, 2007; Amed and O'Donoghue, 2008; Panda and Ganesh-Kumar, 2008; and Polaski and others, 2008). To date, however, no multiregional models have been applied to SAFTA that allow for analysis of multiple household impacts.

The primary objective of this chapter is to describe a new CGE model of South Asia, and its application to understanding the socio-economic aspects of SAFTA. The model, which currently covers Bangladesh, India, Sri Lanka and the rest of South Asia, is being expanded to include Nepal and Pakistan. The model incorporates modifications to the household structure to capture implications of reform for intra-household income changes.

Section A of this chapter outlines the policy environment, including the pattern of trade among South Asian economies. Section B describes the regional model built for this study, and the results of the preliminary simulations and the policy implications are considered in section C. Section D provides the conclusion.

A. Trade and protection environment

As the latest development in a long line of regional trading efforts in South Asia – a more detailed description of the evolution of economic integration in the region is provided by Bandara and Yu (2003) – SAFTA will require the developing South Asian economies to reduce their tariffs to a maximum of 20 per cent initially, followed by annual cuts to zero over a five-year period for developing economies and an eight-year period for LDCs. In order to assess the potential impact of closer trading relations between the economies of SAFTA, it is useful to begin with an assessment of the current trade and protection pattern.

Regional trade (exports plus imports) shares from 1999 to 2006 are presented in annex table 1.[1] The first set of numbers (SAFTA as destination) shows the percentage of SAFTA member economy exports that are directed to other economies in SAFTA. The second set of numbers (SAFTA as source) shows the percentage of exports from SAFTA economies that are directed to the individual members of SAFTA. For most economies within SAFTA, the regional market is only a small proportion of their external trade. The only exception is Nepal, which is heavily dependent on the region. Intraregional trade has grown in importance over the period covered for Nepal, Pakistan and Sri Lanka, but has remained constant for the other economies. Overall, the intraregional trade share for SAFTA has remained constant at roughly 4 per cent, a very low level compared with other regional trading groups.

A problem with trade shares is that they are not normalized by country size; thus, they may give a misleading picture of the relative importance of international trade flows. The trade intensity index, defined as the ratio of the intraregional trade share to the share of the region in world trade, provides an indication of the degree to which a particular trade linkage is stronger than might normally be expected, given the size of the economies in world trade. The results of calculating this index are presented in annex table 2. Values greater than unity indicate an "intense" trading relationship, while values of less than unity are interpreted as relatively weak. Normalized in this way, the trading relationships

[1] In this section all calculations are based on COMTRADE data from 1999-2006. However, where the reporter data is missing, the relevant flows have been reconstructed using the mirror data from partners.

in the region actually appear quite strong. In part, this reflects geographical proximity, and the intensity index does not correct for this in the way that it would be done by a full gravity model. However, it is clear that smaller economies in the region are heavily reliant on trade with the larger economies, and that trade in the region is much higher than would be expected given the size of South Asia in world trade.

To further analyse the pattern of trade, it is useful to work with the sectoral profiles. The complementarity index is a measure of the degree of overlap between the export profile of one region and the import profile of another. In other words, it provides an index of the degree to which sales by one country (or region) on international markets match what another country tends to buy from international markets.[2] The index is often used, ex ante, to evaluate the potential for mutually beneficial inter-industry trade. The results of complementarity calculations for the member economies of SAFTA as a whole are presented in annex table 3. A value of 100 indicates a perfect match of the trade profiles, while an index of 0 indicates no overlap. Overall, it appears that the degree of complementarity has been increasing substantially over the period, although it remains at a relatively low level when compared to other regional groups.

Finally, consider the export similarity profiles in annex table 4. Constructed in much the same way as the complementarity index, export similarity is a measure of the degree of overlap between two competing economies. An index of 100 indicates that the two groups share identical export profiles, while an index of 0 indicates that the two groups compete in entirely separate markets. The calculations compare each country with SAFTA as a whole. Hence, the figures for India are inflated by its dominant role in the group.[3] Nonetheless, for Nepal, Pakistan and Sri Lanka, the similarity indices remain high. In other words, they tend to have a revealed comparative advantage in similar products. The values of the index are declining over time, however. In conjunction with the increase in complementarity, this does suggest production shifts are gradually aligning these economies.

Annex table 5 describes the state of protection in the countries of interest, using the bilateral applied tariff (trade weighted). Substantial progress has been made in lowering the average level of protection in the SAFTA economies over the past decade; however, applied tariffs remain moderately high on average, with a tendency towards high agricultural protection, especially in India. In many cases there is also a very substantial degree of binding overhang (cases where the bound tariff exceeds the applied tariff), especially in Bangladesh, but also in India and Sri Lanka. Overall, the protection levels in the SAFTA economies suggest that there is significant potential for efficiency gains from trade reform in general.

Annex table 6 reviews the poverty/income distribution statistics in the region. These have been drawn from the World Bank (2007), and data haven extracted for the latest year available for each economy in South Asia. The most basic measure of poverty is the head count ratio, that is, the proportion of the population that falls below a defined poverty line. Commonly used criteria are the international US$ 1.00/day standard and the US$ 2.00/day standard, with the higher standard more widely applied to countries with

[2] The index has been calculated from COMTRADE data, using HS1996 2-digit classifications. Again, wherever possible, the gaps have been filled using the mirror data.

[3] A country's export similarity with itself is, by definition, 100 per cent.

higher average incomes.[4] The overall percentage of the population under the poverty line in India has been falling since 1996. Poverty depth and severity has also fallen during the period. Nonetheless, the proportion of population in poverty in India remains high, and there is also considerable variation in poverty levels between urban and rural populations. In Bangladesh, the poverty head count is even higher, at 35 per cent, while it is 25 per cent in Nepal. In Pakistan and Sri Lanka, the rates are much lower at 9 per cent and 6 per cent, respectively. Nonetheless, poverty remains an issue, as at the US$ 2.00/day level the corresponding rates are 60 per cent and 41 per cent.

Two other measures are provided in annex table 1, both of which attempt to address the issue of poverty depth. The poverty gap measure is the mean distance below the poverty line as a proportion of the poverty line. The squared poverty gap weights individual poverty gaps by the gaps themselves, and provides a measure of inequality among the poor. The areas with the greatest poverty depth are again Bangladesh, rural India and Nepal. Finally, the Gini coefficient is a common measure of overall income inequality, with the greatest levels of inequality in Nepal and Sri Lanka.

B. Methodology

This section describes a new, custom-built CGE model of South Asia, with sub-economy models for key countries in the region, programmed using the GAMS system. The section outlines key characteristics of the model structure and experimental design. The model is a multiregional competitive CGE covering Bangladesh, India and Sri Lanka, and an aggregate region representing the remaining countries in the South Asia region as well as an incompletely modelled ROW region.[5] Overall, the structure of the model that we built for this study is a regional CGE similar in many respects GTAP and other global models. Hence, the description is kept brief.

1. Model

The model identifies 16 production sectors. Each sector produces a joint product for domestic and foreign markets, with the allocation between the two based on a constant elasticity of transformation (CET) function. The production functions are nested constant elasticity of substitution (CES) functions with intermediate goods used in fixed proportions, and all primary factors in variable proportions with a common elasticity. Intermediate inputs are composites of imported goods and domestic production, with proportions that are variable and specified independently by industry. Competitive conditions hold, so firms pay market prices for all inputs, and make zero (economic) profit. Primary endowments are fixed, and may be treated as specific or mobile. The dataset contains five primary factors. In the default medium run closure all factors except natural resources are treated as mobile across economic activities.

The model identifies several consumption agents, government, investment and multiple consumer households. The number of consumer households varies by region, depending on available data, with between 5 and 10 categories in the various regions. The

[4] See Chen and Ravallion, 2004, for more in-depth discussion of poverty measures and trends in global poverty.

[5] The authors have a social accounting matrix for Nepal, with four household groups, which is currently being incorporating into the model, and for Pakistan, which will be incorporated at a later date.

final consumption of each household is modelled using Stone-Geary utility functions, which generate linear expenditure systems (LES) characterizing demand for each household category. Changes in household welfare are measured by equivalent variation (EV).[6] The parameters of the functions vary by household to capture differences in consumption patterns. The amount of government consumption and investment is held constant in the default closure. All agents consume composites of imported goods and domestic production, with proportions that are variable and specified independently by agent (sometime called the SALTER specification). On the income side, factors are owned in varying proportions by the households, and fixed proportions are maintained in household savings, taxation and government transfers.

The exportables produced by domestic firms are allocated over destination regions using a second level CET function, hence the aggregate exportable is a composite of exports to the various regions. (The elasticity on both CET functions is set such that export destinations are very close to perfect substitutability). Similarly, on the import side, the imports of each country are a CES composite of regional imports (that is, a second level Armington function). Unlike at the first level, this function is common across all agents in the domestic economy. Demand for regional exports is derived from the Armington import structure for all regions that are explicitly modelled. In the case of regions that are not explicitly modelled (in this instance, the ROW region), the computational complexity of the model is reduced by using constant elasticity of demand (CED) functions to represent ROW demand responses. The prices of imports from the ROW region are fixed.

An international transportation sector accounts for the difference between the FOB price of exports and the CIF price of imports. Transportation margins vary by commodity along all international routes. Unlike in the GTAP model, because the focus here is on a single relatively small (in global terms) region, the price of international transportation services is fixed.

The price normalization and closure rules are similar to those used in many single country models. The current account balance is fixed and the nominal exchange rate is allowed to vary in order to maintain a balance within each country. The numeraire in each country is the consumer price index. A numeraire region must also be defined for which the nominal exchange rate is fixed, which in this model is the ROW region.

The model includes a full range of distortions in the form of taxes and subsidies on economic activities at all levels to ensure that adequate account is taken of the second-best implications of the policy scenarios.

2. Data

The CGE model requires appropriate data in the form of a Social Accounting Matrix (SAM) for each country, trade flow matrices, and estimates of the model parameters and their distributions.[7] These have been compiled from various sources, and reconciled.

[6] Equivalent variation is the monetary value of the increment in income that would have to be given to (or taken away from) a household at today's prices, to make them as well off today as they would be under the proposed policy change.

[7] The SAM is an account of all of the flows between economic agents at a specific point in time.

The base data on trade, production, aggregate consumption and employment is extracted from the GTAP6 database, and has a base year of 2001. Information on sources of household income (ownership of primary factors and transfers/taxes) and variation in consumption patterns across households were obtained from Pradhan and Sahoo (2006) for India, from Fontana and Wobst (2001) for Bangladesh, and from Naranpanawa (2005) for Sri Lanka.[8] The household categories are listed in annex table 2. The information in these studies was aggregated/disaggregated and rebalanced where necessary to match the GTAP data dimensions and ensure consistency with the aggregate GTAP6 household consumption data.[9] Model elasticity parameters were obtained from the existing estimates in GTAP6.

3. Experimental design

The model is quite general in purpose, and in principle can be useful in examining a variety of developments in South Asia. Hence, both a regional trade reform scenario and a unilateral reform benchmark have been considered. In the regional scenario, a reduction in tariff peaks is considered first, corresponding to the agreed initial reduction in bilateral tariffs to a maximum of 20 per cent. Next, a halving of the preferential tariffs is considered.[10] The unilateral benchmark chosen here is a 10 per cent reduction in all applied tariffs.

All of the simulations are run as a comparative static. Therefore, the results should be interpreted as representing how the economic system would have appeared in the base year, had the proposed changes been implemented and the economic system given sufficient time to adjust to the new equilibrium. As noted above, the factor market closure allows all factors except natural resources to be mobile across economic activities, implying that the simulation is medium run in nature.[11]

Sensitivity analysis was implemented within the simulations by using an unconditional approach adopted in Gilbert and Wahl (2003). This approach improves the policy value of the simulations by highlighting results that are unlikely to be robust, and by providing an estimate of the range of potential outcomes rather than a point estimate. To undertake the analysis, key parameters (the trade elasticities) were treated as normally and independently distributed random variables.[12] Each simulation was run as a Monte-Carlo experiment, with a series of pseudo-random parameter values chosen from the underlying distributions. With a large number of iterations (in these preliminary results

[8] A newer SAM from Saluja and Yadav (2006) has a base year of 2003/04, and 73 productive sectors and 10 household categories, defined by expenditure level. This SAM will be updated later.

[9] The procedure used was to first split the factor income proportions across skilled and unskilled labour, using the aggregate level of factor use in GTAP and the allocation of labour to agricultural/non-agricultural activities. Once this mapping was complete, household incomes could be constructed that were consistent with the GTAP6 data. These matched the proportions in the original data quite closely. The consumption categories were then matched to GTAP categories, and the overall GTAP consumption proportions were used to split the individual household proportions where necessary. Finally, the RAS method was used to ensure that the household consumption shares were consistent with the household incomes and total expenditures in GTAP6.

[10] It is common to simulate an FTA with elimination of bilateral tariffs. However, given the limited success in the many developing country FTAs, the halving scenario may be more realistic.

[11] The implicit adjustment time frame in this type of simulation is roughly 10-12 years.

[12] In this chapter, the author has followed Gilbert and Wahl (2003) and used a default standard deviation of 7.5 per cent of the mean value from GTAP, implying that almost all variation will occur within 25 per cent of the mean. The results provide a measure of the underlying sensitivity of the results.

500 iterations have been used) of the simulation, the mean predictions of the variables of interest can be approximated, together with indicators of their susceptibility to parametric uncertainty (the standard deviations) and the accuracy of the simulation procedure (the standard errors).[13]

C. Preliminary results

Before turning to the estimated impact on household welfare, it is useful to review some basic data on the household categories presented in annex table 7. Unlike in the Sri Lankan data, which directly identify households by income level, the data for India and Bangladesh are grouped by archetype. In India, group H2 (rural agricultural labour) is the poorest group by a substantial margin, followed by H4 (other rural) and H3 (rural non-agricultural labour). The richest groups are H6 (urban self-employed) and H7 (urban salaried). The households differ substantially in their ownership of productive factors, with the richest rural group (H1, rural self-employed) being substantial owners of land and capital.

On the other hand, the poorer households, especially H2, receive income almost exclusively from selling their own labour (a large fraction of which is unskilled). Comparing the poorest two groups (H2 and H4) with the richest two (H6 and H7), significant differences are also observed in spending patterns, although the differences are not as great as in ownership of productive resources. In particular, the two poorest groups spend nearly 2.5 times as much of their income on basic food items (in particular, processed rice) as do the two richest groups. In textiles, the pattern is less dramatic, but the poor groups still spend about 30 per cent more than the rich groups.

In Bangladesh, the poorest groups are H1 and H2, rural groups with only limited or no holdings of land. They are followed by H7, H3 and, to a lesser extent, H8, that is, the urban illiterate and poorly educated, and rural households with small land holdings. The richest groups, by a substantial margin, are urban households with high or medium education (H9 and H10). The factor allocation pattern is similar to that of India, with the lower income groups having a much higher dependence on unskilled labour. Consumption differences are also similar, with the poorest households devoting more than double the proportion of their budget to processed rice than do the richest households.

Now consider the impact of SAFTA's reduction in tariff peaks. The welfare results, using the household EV measure, are presented in annex table 8. First consider the effect of eliminating tariff peaks by lowering those tariffs that are higher than 20 per cent to 20 per cent. The overall welfare effects of this move are very small, although all are robust to

[13] This general technique is valid for any type of model structure and the computational complexity does not increase with the number of parameters that are allowed to vary. It is, however, computationally expensive. Variance reduction techniques can therefore be usefully applied here. The two techniques used here are to run alternative simulations using common random numbers, and to adopt antithetic variates in the sampling. The former technique ensures that the same pseudo-random numbers are drawn for alternative simulations, and therefore alternatives can be compared without the risk of a skewed draw. Antithetic variates use the mean of symmetric draws from the underlying distribution as the estimator for mean predictions. Since most of the variables of interest vary monotonically with the elasticities that are treated as random variables, this technique dramatically reduces the standard errors in the preliminary tests (that is, improves the accuracy of the mean estimates). In the preliminary simulations with 500 draws, the standard errors were roughly halved relative to 1,000 fully random draws, a reduction that would require quadrupling the number of iterations under fully random draws.

parametric uncertainty.[14] This may be a reflection of an aggregation bias in the model. By aggregating the data to 16 sectors, many tariff peaks in the disaggregate data are evened out and, hence, are likely to understate potential gains from tariff reform to a degree. In the simulations, the only region to gain significantly from this move appears to be the rest of South Asia aggregate region, which is dominated by Pakistan. The large gain directly reflects the benefits of reductions in the very high bilateral tariffs imposed by India.

The policy does tend to benefit groups H3 and H4 (the landowning groups) in Bangladesh, while other groups lose. This suggests that the reform would have a positive effect on land prices and on some rural households. The poorest rural groups (H1 and H2), however, lose under the proposal, as do the urban poor (H5), so the policy does not appear to be pro-poor in Bangladesh. In India, the welfare of all households except H1 and H3 (rural self-employed and non-agricultural labour) is estimated to rise. As the poorest groups in India are H2 and H4, the policy does appear to be pro-poor. However, the fall is very large in H1, the agricultural land owning group that, while not terribly poor, is politically highly influential. For Sri Lanka, the household impacts are negligible (and for H2 and H5, not robust).

Should SAFTA be successful in implementing more significant cuts beyond the peaks, the total potential welfare gains are significantly larger for both India and Sri Lanka, although still small as a proportional of GDP. In India, SAFTA would raise the income of the poorest groups and have only a moderate negative impact on landowners (a figure that is not robust to parameter changes, in any case). However, the biggest beneficiaries are in group H7 (urban salaried workers), which is among the richest. Hence, the policy would likely raise income inequality (slightly), even as the incomes of the poor rise. In Sri Lanka, the policy, while having positive impacts overall, would have a negative impact on the rural poor.

The impact on Bangladesh is interesting. The reform has a negative impact on overall welfare, but it is robustly pro-poor in both an absolute and a relative sense. The poorest groups (H1 and H2) gain from the policy while the richest groups (H9 and H10) lose substantially. All the changes are robust. Hence, the poorest in society would see their incomes rise in both absolute and relative terms, but at the cost of overall efficiency.

Finally, consider the unilateral benchmark as a comparison point for the regional scenarios. Recall that this is small unilateral tariff reform, a 10 per cent cut. However, the overall welfare impacts are of the same order of magnitude as the larger regional cuts, a reflection of the still limited trading relations among this group. In Bangladesh, such a reform would be pro-poor in both a relative and an absolute sense for much the same reason as the regional scenario, but the aggregate impact would be a modest improvement in efficiency. For India the gains are much larger in aggregate at US$ 241 million. However, while the policy would raise the absolute incomes of the poorest groups, relative poverty may rise given the large increase in the incomes of the urban salaried. Also, the large fall in the incomes of rural landowners may be problematic, as in the first scenario. In Sri Lanka the impacts are similar, both in magnitude and in pattern, to the regional scenario, with positive impacts overall but a negative impact on the rural poor.

[14] A result can more or less be considered robust to the assumed underlying parametric uncertainty if it retains the same sign within two standard deviations of the mean.

D. Conclusion

The main contribution of this study relative to existing work is bringing the multiple representative household CGE approach to a model of the entire South Asian region, as opposed to the single country models examined earlier in the chapter, and the application to changes in transportation infrastructure. However, the project at this stage is very much still a work in progress. Hence, this chapter concludes with some policy implications as well as a few notes on key areas for further refinement.

In terms of the overall policy message, the results of this study confirm those of Bandara and Yu (2003) in that the overall welfare effects of trade reform under the auspices of SAFTA are likely to be small. The economies of the region, while having relatively intense trading relations, tend to have similar export profiles and hence limited opportunity for mutually beneficial exchange. The impact of SAFTA is likely to be positive, if modest, for most member economies (Bangladesh, for which unilateral reform appears the superior option, being the possible exception). In terms of poverty and income inequality, the results are mixed. While regional integration is likely to be pro-poor in Bangladesh, in India it is pro-poor only in an absolute sense. Income inequality would rise. Also, in all scenarios, the impact on India's landowning class is negative, which is likely to be politically problematic.

It should be emphasized that the results in these scenarios represent business as usual in terms of government taxes and transfers. To the extent that the distribution of the gains from trade reform is under government control, it is feasible whenever the total gains are positive (that is, for all countries in the unilateral scenario and all, except Bangladesh, in the regional scenario) to redistribute those gains such that all groups in society gain. Nothing in the present modelling contradicts the basic proposition that a government can, if it wishes, redistribute income as it sees fit.

In terms of improvements, the main issue is including more and newer data. The GTAP database is the most accessible and comprehensive source of data on bilateral trade, transport margins and protection. Once the GTAP7 data are released (later in 2008), pushing the base year to 2004 for all currently included countries will be a relatively straightforward exercise. It will also be easy to bring in Pakistan, using the GTAP7 trade maps and the available Pakistan household data (Roland-Holst, 2008). It should also be possible to improve the household data for India, based on Saluja and Yadav (2006). Once Nepal is added, the residual will effectively represent Maldives and Bhutan. This will represent an improvement both in regional coverage and in the timeliness of the underlying dataset.

Annex

Annex table 1. Intra-SAFTA trade shares, 1999-2006

Region	1999	2000	2001	2002	2003	2004	2005	2006
SAFTA as destination:								
Bangladesh	8.7	9.0	8.9	9.7	11.3	9.4	9.7	8.3
India	2.0	2.5	2.7	2.8	3.3	2.7	2.6	2.4
Sri Lanka	7.1	7.6	7.8	10.4	12.7	14.3	15.1	17.7
Nepal	45.3	40.0	39.7	46.9	53.6	56.2	61.5	59.5
Pakistan	3.3	3.7	2.8	2.8	2.6	3.3	3.5	4.3
SAFTA	3.8	4.3	4.1	4.3	5.0	4.3	4.1	3.9
SAFTA as source:								
Bangladesh	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1
India	0.6	0.5	0.5	0.5	0.5	0.5	0.6	0.7
Myanmar	0.0	0.0	0.1	0.0	0.0	0.0	0.0	0.0
Sri Lanka	0.1	0.1	0.1	0.1	0.1	0.1	0.1	0.1
Nepal	0.0	0.0	0.0	0.0	0.0	0.0	0.0	0.0
Thailand	2.7	2.8	3.0	3.2	3.4	3.6	3.8	3.5

Source: COMTRADE.

Annex table 2. Intra-SAFTA trade intensity, 1999-2006

Region	1999	2000	2001	2002	2003	2004	2005	2006
SAFTA as destination:								
Bangladesh	8.5	9.0	8.7	8.9	9.3	7.5	6.9	5.9
India	2.0	2.5	2.6	2.5	2.7	2.2	1.8	1.7
Sri Lanka	7.0	7.5	7.6	9.5	10.5	11.5	10.8	12.6
Nepal	44.6	39.9	38.8	43.0	44.3	45.2	43.9	42.4
Pakistan	3.3	3.7	2.8	2.5	2.2	2.7	2.5	3.1
SAFTA	3.8	4.2	4.0	3.9	4.2	3.5	2.9	2.8
SAFTA as source:								
Bangladesh	7.5	8.2	7.8	8.3	10.2	7.7	6.0	4.8
India	2.6	3.1	2.7	2.6	2.6	2.1	1.7	1.7
Sri Lanka	6.6	6.8	7.5	9.3	11.0	10.3	11.6	10.3
Nepal	25.0	24.2	34.9	37.6	41.5	39.8	37.8	34.4
Pakistan	3.8	4.2	4.0	3.9	4.2	3.5	2.9	2.8
SAFTA	2.9	3.3	2.5	2.2	2.0	2.4	2.4	3.3

Source: COMTRADE.

Annex table 3. Intra-SAFTA complementarity, 1999-2006

Region	1999	2000	2001	2002	2003	2004	2005	2006
SAFTA as destination:								
Bangladesh	40.0	44.6	46.0	52.8	49.5	48.2	44.9	44.5
India	39.3	40.3	42.0	43.7	44.5	47.8	49.7	54.4

Sri Lanka	42.8	47.9	50.2	50.8	51.8	52.3	53.9	57.5
Nepal	46.0	49.7	39.2	45.2	47.6	48.1	50.5	55.2
Pakistan	38.6	37.5	41.0	43.1	43.4	47.6	47.7	50.2
SAFTA	46.7	48.6	49.9	52.1	52.7	55.0	54.3	58.9
SAFTA as source:								
Bangladesh	5.9	6.4	5.9	7.2	7.0	8.8	6.4	6.2
India	52.5	56.2	58.2	56.5	57.8	59.5	59.2	63.9
Sri Lanka	19.2	23.2	19.5	23.7	20.4	21.0	24.0	23.7
Nepal	20.2	20.9	21.5	26.7	23.8	23.4	26.4	26.6
Pakistan	16.6	16.8	18.4	18.4	18.8	20.7	21.8	21.7
SAFTA	46.7	48.6	49.9	52.1	52.7	55.0	54.3	58.9

Source: COMTRADE.

Annex table 4. Intra-SAFTA export similarity, 1999-2006

Region	1999	2000	2001	2002	2003	2004	2005	2006
SAFTA as destination:								
Bangladesh	37.3	37.2	36.8	33.9	31.6	31.6	29.2	28.4
India	83.5	83.7	82.6	85.0	84.3	84.2	85.1	85.3
Sri Lanka	53.7	56.3	51.6	49.1	44.6	42.4	43.8	44.7
Nepal	38.7	41.5	44.2	48.2	44.5	45.2	44.4	44.2
Pakistan	51.0	51.9	54.0	52.2	52.4	48.7	51.5	50.4
SAFTA as source:								
Bangladesh	37.3	37.2	36.8	33.9	31.6	31.6	29.2	28.4
India	83.5	83.7	82.6	85.0	84.3	84.2	85.1	85.3
Sri Lanka	53.7	56.3	51.6	49.1	44.6	42.4	43.8	44.7
Nepal	38.7	41.5	44.2	48.2	44.5	45.2	44.4	44.2
Pakistan	51.0	51.9	54.0	52.2	52.4	48.7	51.5	50.4

Source: COMTRADE.

Annex table 5. Trade-weighted average applied tariffs in 2007

	World	Bangladesh	Sri Lanka	India	Nepal	Pakistan
Bangladesh	11.3	-	17.3	10.8	4.4	15.1
Sri Lanka	6.6	6.5	-	6.1	8.6	2.0
India	10.4	17.8	21.3	-	19.2	23.1
Nepal	13.1	8.7	11.6	13.6	-	8.6
Pakistan	11.9	6.6	4.4	8.4	8.7	-

Source: COMTRADE.

Annex table 6. Poverty/income inequality profiles in South Asia

(Unit: Percentage)

	Year	Head count	Poverty gap	Squared poverty gap	Gini
US$ 1.00/day					
Bangladesh	2005	35.3	7.9	2.4	33.2
India-Rural	2005	40.2	9.4	3.1	30.5

India-Urban	2005	19.6	4.2	1.3	37.6
Nepal	2004	24.7	5.6	1.7	47.3
Pakistan	2005	9.0	1.4	0.4	31.2
Sri Lanka	2002	5.8	0.7	0.1	40.2
US$ 2.00/day					
Bangladesh	2005	81.5	35.6	18.5	33.2
India-Rural	2005	87.7	39.8	21.0	30.5
India-Urban	2005	61.5	23.1	11.1	37.6
Nepal	2004	64.8	26.4	13.2	47.3
Pakistan	2005	59.5	18.3	7.4	31.2
Sri Lanka	2002	41.5	12.1	4.6	40.2

Source: World Bank, 2007.

Annex table 7. Household categories in the model by region

Category	Definition	Percentage of population	Percentage of income
India			
H1	Rural self-employed agricultural	24.2	24.2
H2	Rural agricultural labour	22.1	9.2
H3	Rural non-agricultural labour	13.9	12.8
H4	Other rural	14.8	11.5
H5	Urban agricultural	1.2	1.2
H6	Urban self-employed non-agricultural	5.4	11.4
H7	Urban salaried	12.9	20.9
H8	Urban casual labour	2.8	2.7
H9	Other urban	2.4	6.2
Bangladesh			
H1	Agricultural landless	1.5	0.7
H2	Agricultural marginal land	17.3	7.7
H3	Agricultural small land	17.4	10.2
H4	Agricultural large land	7.7	7.6
H5	Non-agricultural poor	16.3	14.6
H6	Non-agricultural rich	7.3	7.5
H7	Urban illiterate	10.6	5.8
H8	Urban low educated	7.2	5.4
H9	Urban medium educated	6.1	14.5
H10	Urban highly educated	8.6	26.2
Sri Lanka			
H1	Urban low income		20.4
H2	Rural low income		31.8
H3	Estate low income		7.2
H4	Urban high income		22.7
H5	Rural high income		17.9

*Source*s: Pradhan and Sahoo, 2006; Fontana and Wobst, 2001; and Naranpanawa, 2005.

Annex table 8. Estimated welfare impact of trade reform scenarios

(Unit: US$ million)

	Removing peaks				Regional tariff cut				Unilateral tariff cut			
	Bangladesh	**India**	**Sri Lanka**	**Rest of South Asia**	**Bangladesh**	**India**	**Sri Lanka**	**Rest of South Asia**	**Bangladesh**	**India**	**Sri Lanka**	**Rest of South Asia**
H1	-0.2	-145.7	1.2		0.5	-6.1	5.5		0.8	-168.9	3.8	
H2	-1.8	21.2	-1.6		6.6	15.9	-12.9		10.4	29.5	-16.8	
H3	4.6	-3.5	0.9		10.1	19.7	2.7		13.4	10.8	1.6	
H4	10.9	20.6	-1.1		9.0	20.5	6.7		9.7	40.6	6.2	
H5	-3.3	0.5	-0.6		1.7	1.9	5.8		9.6	0.5	5.7	
H6	-2.0	27.8			-0.9	39.4			5.2	94.5		
H7	-1.7	41.9			-5.7	57.5			-1.8	197.4		
H8	-1.0	8.4			1.1	7.3			5.1	17.2		
H9	-5.4	12.5			-36.8	11.4			-22.4	10.0		
H10	-6.7				-33.6				-11.1			
Total	-6.6	-16.5	-1.2	147.7	-48.0	167.6	7.9	150.2	19.0	231.6	0.5	22.3

Source: Model simulations.

References

Acharya, S. and S. Cohen, 2008. "Trade liberalisation and household welfare in Nepal", *Journal of Policy Modeling*, vol. 30, No. 6; pp.1057-1060 (forthcoming, November-December 2008).

Amed, V. and C. O'Donoghue, 2008. "Welfare impact of external balance in Pakistan: CGE-microsimulation analysis", paper presented at the Eleventh Annual Conference on Global Economic Analysis, 6-8 June 2005, Helsinki.

Annabi, N., B. Khondker, S. Raihan, J. Cockburn and B. Decaluwe, 2006. "Implications of WTO Agreements and unilateral trade policy reforms for poverty in Bangladesh: Short vs. long-run impacts", in T. Hertel and L. A. Winters (eds.) (2006), *Poverty Impacts of a WTO Agreement*, World Bank, Washington D.C.

Bandara, J. S. and W. Yu, 2003. "How desirable is the South Asian Free Trade Area? A quantitative economic assessment", *World Economy*, vol. 26, No. 9; pp.1293-1323.

Chen, S. and M. Ravallion, 2004. "How have the world's poorest fared since the early 1980s?" *World Bank Research Observer*, vol. 19, No. 2; pp.141-169.

Cockburn, J., 2002. "Trade liberalisation and poverty in Nepal: A computable general equilibrium micro simulation analysis", Centre for the Study of African Economies, WPS/2002-11. Department of Economics, Oxford University. Oxford University Press.

Fontana, M. and P. Wobst, 2001. "A gendered 1993-94 Social Accounting Matrix for Bangladesh", International Food Policy Research Institute TMD discussion paper No. 24. Washington, D.C.

Gilbert, J., forthcoming. "Agricultural Trade Reform and Poverty in the Asia-Pacific: A Survey and Some New Results", *Asia-Pacific Development Journal.*

Gilbert, J., 2007. "Agricultural trade reform under Doha and poverty in India", (mimeograph). ESCAP, Bangkok.

Gilbert, J. and T. Wahl, 2003. "Labor market distortions and China's WTO accession package: An applied general equilibrium assessment", *Journal of Comparative Economics*, vol. 31, No. 4; pp. 774-794.

———, 2002. "Applied general equilibrium assessments of trade liberalization in China", *World Economy*, vol. 25, No. 5; pp. 697-731.

Hertel, T. and J. Reimer, 2005. "Predicting the poverty impacts of trade reform", *Journal of International Trade and Economic Development*, vol. 14, No. 4; pp. 377-405.

Hertel, T. and L. A. Winters, 2005. "Estimating the poverty impacts of a prospective Doha Development Agenda", *World Economy*, vol. 28, No. 8; pp. 1057-1071.

Lloyd, P. J. and D. MacLaren, 2004. "Gains and losses from regional trading agreements: A survey", *Economic Record*, vol. 80, No. 251; pp. 445-497.

Naranpanawa, R. M. A. K. B., 2005. "Trade liberalization and poverty in a Computable General Equilibrium (CGE) model: The Sri Lankan case", PhD dissertation, Griffith University, Queensland, Australia.

Panda, M. and A. Ganesh-Kumar, 2008. "Trade liberalization, poverty and food security in India", paper presented at the Eleventh Annual Conference on Global Economic Analysis, 6-8 June 2005, Helsinki.

Pigato, M., C. Farah, K. Itakura, K. Jun, W. Martin, K. Murrell and T. G. Srinivasan, 1997. *South Asia's Integration into the World Economy*, World Bank, Washington, D.C.

Polaski, S., M. K. Panda, A. Ganesh-Kumar, S. McDonald and Scott; S. Robins, 2008. "Policy dilemmas in India: The impact of changes in agricultural prices on rural and urban poverty", paper presented at the Eleventh Annual Conference on Global Economic Analysis, 6-8 June 2005, Helsinki.

Pradhan, B. K. and A. Sahoo, 2006. "The impact of trade liberalization on household welfare and poverty in India", Policy and Economic Research Network-MPIA working paper No. 2006-01.

Robinson, S. and K. Thierfelder, 2002. "Trade liberalisation and regional integration: The search for large numbers", *Australian Journal of Agricultural and Resource Economics*, vol. 46, No. 4; pp. 585-604.

Roland-Holst, D., 2008. "Social Accounting Matrix for Pakistan, 2004-5" Documentation for submission to GTAP, University of California – Berkeley.

Saluja, M. R. and B. Yadav, 2006. "Social Accounting Matrix for India, 2003-04", India Development Foundation, Haryana, India.

Scollay, R. and J. Gilbert, 2000. "Measuring the gains from APEC trade liberalisation: An overview of CGE assessments", *World Economy*, vol. 23, No. 2; pp. 175-193.

World Bank, 2007. *World Development Indicators*. Washington, D.C.

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