Analyzing Potential Effects of Preferential Liberalization in Some Asian Emerging Economies

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Abstract

BIMSTEC, a regional grouping of South and Southeast Asian countries, is heading towards an FTA for greater economic integration. The present paper examines the *ex ante* effects of the initiative by adopting SMART and GTAP models. Based on estimated export supply elasticity, the results of SMART simulation reveal that the highest net trade effect takes place for India, the biggest economy in the bloc, followed by Bangladesh for tariff elimination. The two countries also derive substantial welfare gains. The proportionate revenue loss is remarkably higher for smaller countries such as Nepal, Myanmar and Bangladesh. GTAP simulation suggests that Bangladesh incurs a net welfare loss by joining the FTA. The overall intra-bloc export is likely to increase. These imply the need for designing the compensation mechanism and technical support properly for the smaller economies to offset the possible adverse effects.

Keywords: Economic integration; Welfare; Trade effect; SMART; GTAP

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1. Introduction

The wave of globalisation gave rise to a number of regional economic arrangements, particularly after the demise of the Cold War. The second half of the twentieth century witnessed a major growth of regional economic cooperation and trading arrangements. The notion of economic regionalism rapidly became vital in international trade as well as regional diplomacy. Though the degree of integration and cooperation varied between groups, economic regionalism ranged from a simple initiative of economic cooperation to an economic union. The growing number of regional arrangements indicated a rapid regionalisation of the global economy. Notwithstanding, the debate over regionalism versus multilateralism continued (Panagariya, 1999*a*).

The body of theoretical and empirical literature suggests mixed results of regionalism in terms of trade flows and welfare effects (Panagariya, 2000; Limão, 2007). Now, the fundamental questions pertaining to regional groups are: *First*, is there any significant potential of expanding intra-group trade, which can serve as an economic incentive behind a bloc? *Second*, does a preferential liberalisation within the regional arrangement result in non-trivial mutual gains? This paper intends to respond to these queries in the context of an emerging regional bloc, Bay of Bengal Initiative for Multi-Sectoral Technical and Economic Cooperation (BIMSTEC), which combines seven geographically contiguous South and Southeast Asian countries: Bangladesh, Bhutan, India, Myanmar, Nepal, Sri Lanka and Thailand. The bloc was formed in 1997, and it is currently heading towards a Free Trade Area (FTA). The Framework Agreement for BIMSTEC FTA was signed in the sixth Ministerial Meeting in 2004 and has been finalised in the 18th Trade Negotiating Committee (TNC) Meeting in Thailand on 4 June 2009, in which the Rules of Origin (ROOs) and

Operational Certification Procedures for the ROOs are agreed. The Agreement on Cooperation and Mutual Assistance in Customs Matters for the FTA has also been finalised in the Meeting. The negotiation of agreements on services and investment is in progress as well. However, the negative lists of only Bhutan and Thailand are exchanged thus far and the rest are expected to be finalised by the end of 2009. The FTA is scheduled to commence from 1 July 2010.

[*Please Insert Table 1 about Here*]

The intra-BIMSTEC trade is currently low compared to the bloc's trade with the world. However, the magnitude of trade of member countries as well as their share in world trade increased substantially after establishing the bloc (Table 1), which indicates increasing relative importance of this bloc even before undertaking any liberalization scheme.[1] However, trade potential remains untapped due to tariff and non-tariff barriers, and to the absence of agreements on liberalization of services and investment. The economies are also incurring significant loss in terms of its volume and share in the economy due to the existing tariff structure. Kee *et al.* (2008) demonstrate that the linearly approximated deadweight losses (DWL) associated with the existing tariff structure are 0.47 (Bangladesh), 0.62 (India), 0.43 (Sri Lanka) and 0.71 percent (Thailand) of the total GDP of important member countries. The proportion of estimated DWL is much lower in more liberalized East Asian countries, such as Japan (0.02 per cent), South Korea (0.09 per cent) and Indonesia (0.11 per cent).

Empirical studies of the trade potential and the effects of a preferential liberalization in the bloc are limited. Only four studies have been conducted thus far after the formation of BIMSTEC. Warr (2005) calculates intensity, bias and complementarity indices to examine Bangladesh's potential gains for exportable and concludes that BIMSTEC countries are not

[1] Kabir and Salim (2010) reveal that export enhancement effect of BIMSTEC is 28.53 percent

'natural trading partners' and net benefits from trade-creating effects would be small for Bangladesh. Bhattacharya and Bhattacharyay (2007) find significant trade gains of BIMSTEC countries as well as of Japan in different scenarios using a gravity model. However, their approach suffers from a major drawback. The trade effect is not only related to tariff elasticity, rather a reduction of tariff rate creates an enhancing incidence on imports through three magnitudes: price elasticity of both imports and exports as well as the elasticity of substitution.

Using version 6 of the GTAP (Global Trade Analysis Project) database[2] Strutt (2008) shows that in the scenario of welfare decomposition for 2020, Bangladesh loses welfare of US$ 267 million, whereas the welfare gains for India, Sri Lanka and Thailand are US$ 1.31 billion, 276 million, and 1.30 billion respectively. As a whole, BIMSTEC's total gain is estimated to be US$ 2.74 billion. Gilbert (2008) also examines the aggregate welfare effect of BIMSTEC countries using the same GTAP database and finds similar results as those of Strutt. However, their studies are based on old database, inappropriate timing of the liberalization phases and lack of explanation on allocative efficiency effects due to BIMSTEC FTA that contradicts with the theory.

The paucity of substantial empirical investigation on the intra-BIMSTEC trade potential and possible effects of BIMSTEC trade liberalization scheme means that further study is important to examine these aspects thoroughly. It is imperative not only to comprehend the underlying economic incentives for the liberalization, but also to help devise appropriate policy instruments in order to facilitate the future integration scheme. Given this backdrop, the present paper is intended to re-examine the results of the previous studies with new data, to analyze the possible outcome based on estimated elasticity values of export supply, and to suggest policy recommendations based on the insights of the findings. It

[2] It comprises 87 regions and 57 sectors and specifically Bangladesh, India, Sri Lanka and Thailand of the BIMSTEC members separately and Myanmar, Bhutan and Nepal in the other regional groups.

adopts the Software on Market Analysis and Restrictions on Trade (SMART), a partial equilibrium simulation tool, which is based on World Integrated Trade Solution (WITS). Complementarily, it also adopts the GTAP model to capture the welfare and trade effects based on new database.

The main contribution of the paper is threefold. First, it adopts two complementary approaches, SMART and GTAP models, in calculating *ex ante* trade effects of preferential liberalization within BIMSTEC, which is new. Second, in order to examine the Vinerian effects, the export price elasticity of the member countries has been estimated by adopting time series econometric methods. Third, it provides an explanation of paradoxical outcome of allocative efficiency in the GTAP model due to tariff removal, which is absent in the literature. Thus, the rest of the paper is organized as follows. Section 2 highlights on SMART and GTAP modeling and relevant sources of data. Possible trade, revenue and welfare effects of the FTA have been estimated by using SMART and GTAP models in Section 3. Finally, concluding remarks have been made.

2. Data and Methodology

2.1 *SMART Model*

The SMART simulation model is used in WITS, developed jointly by the United Nations Conference on Trade and Development (UNCTAD) and the World Bank. It is an interactive web-based system that uses UNCTAD's Trade Analysis and Information System (TRAINS) database, which includes a wide range of trade data classified on product categories and sub-categories. Data on tariff are available at the most detailed commodity level of national tariffs, *i.e.*, at the tariff line level, and recorded according to internationally recognized trade and tariff classifications. Our empirical estimation in the next section is based on the latest version of the system, WITS 6.0.227 and Harmonized System (HS) 6 combined database.

The WITS uses values of import demand elasticity on disaggregated commodity groups available in Stern *et al.* (1976). It, however, assumes infinite export elasticity, based on the fundamental premise of perfect competition wherein the world price is given in which a country can export whatever quantity it wishes. This assumption is plausible for analyzing trade effects of preferential liberalization of the trade blocs that enclose industrially developed countries with adequate resources to readily transfer at the export sector. However, developing countries suffer usually from resource constraints. Therefore the assumption of infinite elasticity is quite strong for the analysis of trade liberalization within BIMSTEC in which four members are LDCs and three are developing nations. On the empirical surface, studies do not support the assumption of infinite elasticity. For example, Hossain (1997) applies an ARDL model and finds the aggregate long-term supply elasticity to be 0.97, 1.14 and 0.81 for Bangladesh, India and Sri Lanka, respectively. Using an unrestricted Error Correction Model (ECM), Ahmed (2000) reveals that it is 0.65 for Bangladesh. Conversely, in various two- and three-stage least squares specifications for BIMSTEC countries, Banik (2006) observes it ranging from 0.00 to 0.04. As export elasticity is crucial for a more realistic analysis of possible effects of an FTA, it is logical to estimate the export supply elasticity and use the estimated values in the simulation process. The results of simulation can then be compared along with the infinite elasticity assumption to comprehend various possible outcomes of forming the FTA.

The following export supply function is adopted to estimate the aggregate price elasticity:

$$LEQI_t = \alpha_0 + \alpha_1 LEVI_t + \alpha_2 LWPI_t + \alpha_3 LGDP_t + \alpha_4 XRER_t + e_t \qquad (1)$$

where *L* indicates log; *EQI* and *EVI* are export quantity index and export value index, respectively; *WPI* stands for wholesale price index; *GDP* implies real GDP; *XRER* is export-weighted real effective exchange rate and *e* is the white noise error term. Here, *XRER* is an

important variable that combines nominal exchange rate, effective financial incentives, and home and foreign prices. It is thus an index of export competitiveness; depreciation in *XRER* is likely to increase export supply. It is calculated following Bahmani-Oskooee and Mirzai (2000).

For estimating the Equation (1), data is gathered over the period 1980-2006. The time series of annual average official exchange rate (local currency for one US dollar), *GDP* (in constant 2000 US dollars) and GDP deflator (year 2000 = 100) come from the World Development Indicators (WDI) online version. The WDI and the Asian Development Bank (ADB) Statistical Database provide data on *EQI* (year 2000 = 100) and *EVI* (year 2000 = 100). *WPI* data comes from WDI, ADB statistical database, Bangladesh Bureau of Statistics' (BBS) Statistical Yearbooks, and the IFS of various years.

2.2 *GTAP Model*

The GTAP model is described in Hertel (1997). In the model, all markets are assumed to be perfectly competitive. The regional government can drive wedges between prices of the producers and consumers by imposing taxes and subsidies on commodities and factors. Buyers differentiate between home-grown and imported goods, and also different sources of imports by region of origin. Investment in each region comes from a global pool of savings wherein each region contributes a fixed proportion of its income. Investment allocation is made according to the existing relative rates of return.

In the basic analysis of welfare changes, the standard GTAP model features a representative household of a region (country). Its behavior is governed by an aggregate utility function, which is specified over private household consumption, public expenditure and savings per capita. The GTAP simulations compute the welfare change as equivalent variation (*EV*) of a single region. For the GTAP multi-region model, the decomposition of the *EV* is similar to that of the single region, wherein the main differences involve additional

terms arising from the presence of import and export tariffs and the effect of changes in regional terms of trade. The other important difference is the added regional dimension of the decomposition. Thus, changes in welfare in the multi-region model are attributed to the interactions between taxes (both pre-existing and newly introduced taxes) and quantity changes taking place, expressed in the allocative efficiency gain (or loss); changes in the region's terms of trade; and changes in the relative prices of investment (capital goods) and savings (I-S effect) (Huff and Hertel, 2001). The simulation of the present paper is based on GTAP database version 7.

3. Empirical Analysis and Findings

3.1 *SMART Simulation*

The long term estimates of the export supply elasticity can be obtained by using the Fully Modified Phillips-Hansen (FMPH) OLS and the Autoregressive Distributed Lag (ARDL) model, while an error correction version of the ARDL can provide the short term estimates. Among the previous studies, Athukorala and Riedel (1994) and Rao and Singh (2007) apply the FMPH-OLS in trade modeling. The ARDL has been adopted by Bahmani-Oskooee and Kara (2005) and Chen (2008).[3]

For the unit root test, Augmented Dickey-Fuller and Phillips-Perron tests have been performed. Results reveal that the variables used in this model are $I(1)$ except LWPI of Bangladesh which is $I(0)$. This means, ARDL would be appropriate to estimate the export supply function. The next step is to undertake the bounds test to determine the optimal lag length to be used in the single equation error-correction version of the ARDL model. Before going on to ARDL model, the FMPH-OLS estimation is performed.

[3] Pesaran and Shin (1999) show that both FMPH-OLS and ARDL estimators are applicable in small sample (even for n=20). However, based on Schwarz Criterion (SC) ARDL performs better than FMPH-OLS. As they notice, "The ARDL-SC procedure when combined with the Δ-method of computing the standard errors of the long-run parameters generally dominates the Phillips-Hansen estimator in small samples. This is in particular true of the size-power performance of the tests on the long-run parameter." (p.374).

To carry out cointegration analysis, the selection of the maximum order of vector autoregression (VAR) is important, because the result is sensitive to the choice of the order. Taking the order arbitrarily might thus provide the wrong conclusion about the number of the cointegrating vectors. Pesaran and Pesaran (1997, pp. 292-293) notice that there is a risk of over-parameterisation in taking higher order from various competing criteria, such as Schwarz Bayesian criterion (SBC) and Akaike information criterion (AIC), for a short time series. In the present case the order of VAR is 1 based on SBC. However, only one cointegrating relationship has been found among the variables for all countries except India. For India, however, there is one cointegrating vector for restricted intercept and no trend. We rely on the maximum eigenvalue test for Bangladesh and Sri Lanka since the results vary between maximum eigenvalue and trace tests, as Johansen and Juselius (1990) suggest that the earlier test performs better.[4]

The price elasticity of export supply has been found to be positive and significant at coefficients of are positive and significant at 1 percent level for all countries except for India in the Autoregressive Distributed Lag (ARDL) long term estimate (Table 2).[5]

[*Please Insert Table 2 About Here*]

Various estimates of the export supply elasticity for BIMSTEC countries have been used vis-à-vis an infinite elasticity for simulation of trade effects of forming an FTA within the bloc. The values of import demand elasticity are taken from Kee *et al.* (2008). This exercise provides a range of possible outcomes of trade integration in the bloc.

The trade effect of BIMSTEC FTA is reported in Table 3. The results indicate that it does not vary substantially for simulations based on estimated export elasticities, but differs notably between that of the estimated and infinite elasticity values except for Sri Lanka. The trade effect is the highest for India, and the lowest for Sri Lanka. The results, however, vary

[4] *Ibid*. The explanatory variables have not been found to be cointegrated for any of the BIMSTEC countries, which meets the requirement of the FMPH-OLS (Pesaran and Pesaran, 1997).
[5] The full results can be made available upon contact.

according to the size of the economies, trade volume, import demand elasticity and tariff regime. The import demand elasticity is the highest for India in Kee *et al* (2008) estimate, which accounts for the large amount of trade effect of the country.

The FTA would result in the highest imports of Bangladesh from India among the BIMSTEC countries, followed by Thailand, but Bangladesh's export to these countries would be much lower than imports. This implies that an FTA would further increase Bangladesh's trade deficit with these countries. India's trade effect would be the highest with Thailand followed by Myanmar, Sri Lanka and Nepal respectively. However, India's exports to Sri Lanka and Thailand would be lower than its imports from these countries. Sri Lanka's trade effect would be the highest with India, followed by Thailand. The FTA would increase imports from Thailand at an amount much higher than exports. Thailand's trade effect would be the highest with India; it would be more than 90 per cent of its total trade effect based on short- and long-term elasticity estimates.

[*Please Insert Table 3 About Here*]

The results indicate that majority of trade effects come from the terms of trade gain for all the countries in all export elasticity values. This implies that a preferential tariff elimination results in lower price of goods produced in BIMSTEC than the similar goods produced outside the bloc.[6] This increases exports of BIMSTEC members and improves their terms of trade. The simulation results, however, reject Panagariya (1999*b*), who argues that by eliminating tariff preferentially from the SAARC (South Asian Association for Regional Cooperation) countries and keeping the tariff on the ROW as it was before, Bangladesh would become net trade diverting.[7] Further, Panagariya (2003, p.1283) notes,

[6] By definition, terms of trade effect is the effect of a tariff on the relative price of a country's exports on world market compared to its imports. When a large country imposes tariff, it causes reduction of import demand and thus fall the price of the imported goods relative to its exports, and improves its terms of trade.

[7] Panagariya (1999*a*) also argues that ROOs make counteract trade diversion. By stepping ahead, Duttagupta and Panagariya (2007) demonstrate that ROOs can improve the political viability of FTAs.

> "Given that South Asia accounts for less than one per cent of world production and that tariffs in the region are high, the risk of trade diversion from preferential trade liberalisation is high. With 99 per cent of world production outside the region, the likelihood that the most efficient and competitive producers of the large majority of the products are within the region is very low. This means that the scope for trade diversion is substantial."

Here, trade creation effect is found to be much larger than diversion for all the member countries, which supports previous studies such as Calfat and Flôres (2006) and Zhao (2008). Our results confirm the international competitiveness of export items of source countries other than BIMSTEC, and indicate that the bloc's imports would not experience any major distortion due to discriminatory tariff liberalization. The results further demonstrate that India's trade creation effect is the highest among the members. The country's trade creation effect is around 15 times higher than diversion, which is 3 to 4 per cent for the other countries. This clearly indicates that BIMSTEC FTA leads the Indian consumers to significantly higher level of consumption.

The assumption of infinite elasticity makes significant changes in India's net trade effect. India's imports from the other members increase substantially. Whereas in the other elasticity scenarios Myanmar's export effect is the second largest, in this scenario Nepal's export effect substantially surpasses Myanmar's export effect by taking the second position. For the other countries, the trade effect remains almost same except the rise in the magnitude of export effect of the top partner. In this case, trade creation effect is the much higher than diversion. This indicates that the elimination of tariff for BIMSTEC members reduces the relative price of the goods produced in the group compared to similar products in the ROW. This leads to a steeper relative price of the products given the initial level of consumption, resulting in a new equilibrium level of trade wherein intra-BIMSTEC imports increase while imports from the ROW symmetrically decrease. Lowering tariff for BIMSTEC decreases domestic price of its items imported to a member country, thereby creating a revenue effect

for which a country's consumers arrive at higher level of consumption associated with increased import from BIMSTEC at the initial level of expenditure. This is the trade creation effect in the present analysis.

The magnitude of the welfare effect also does not vary significantly among the scenarios created based on different elasticity estimates, although it does so in the infinite elasticity based simulation for countries except for Sri Lanka. It is more than double for Bangladesh and Thailand and on average three times for BIMSTEC in the later scenario. On the whole, India's trade and welfare effects both are much higher than other member countries. Despite being the second largest economy in the group and trading in a wide range of products, Thailand's meager welfare gain is due to its lower average applied tariff rate on highly traded items.

[*Please Insert Table 4 About Here*]

Amongst the countries of the bloc, India's increase in imports, revenue loss and welfare gain is the highest. This is because of its increase in the amount of imports from the bloc and associated changes in preferential tariff elimination on a diverse category of products. In terms of the ratio of revenue loss in total revenue, Sri Lanka's relative loss is the highest in the region followed by Bangladesh; both are the smaller economies. Although India's absolute loss is the highest, it is hovering at 6 per cent of the total revenue, which is meager. But the smaller countries in the group have to sacrifice around one-fifth of the total tariff revenue for the FTA, which is significant. Nepal's trade effect is nearly double of Myanmar's effect. Nepal's trade gain comes from all the other BIMSTEC members due to its trade relations with them, although most of the trade creation and diversion effects originate from India — the country's overwhelmingly major trade partner. Most of Myanmar's trade effect stems from Thailand, the country's major trade partner in the group.

Myanmar's possible welfare effect is much lower than that of Nepal, both in magnitude and its share in net trade effect, although Myanmar is bigger than the later in terms of the size of the economy and its total world trade. This is because the country is less integrated with the South Asian economies. It also loses lesser amount of revenue than Nepal, which is due to its less restrictive trade regime. While Nepal's revenue loss is more than half of the existing total revenue, Myanmar's loss is slightly higher than a quarter. Though meager, Bhutan's welfare effect is proportionately higher in trade effect than that of Myanmar and Nepal, although its relative revenue effect is similar to that of Bangladesh and Sri Lanka.

According to Kee *et al.* (2008), the standard deviation of the estimated import elasticity is very high for India compared to other members. This implies that the actual effects would be higher or lower than that simulated based on the average elasticity values. The results of the other members would also deviate from the effects that might be in reality. But due to lower standard deviation, the actual effects would remain closer to simulated values than that of India.

3.2 *GTAP Simulation*

The changes of relative prices of both outputs and inputs due to trade liberalization within BIMSTEC will be transmitted to the industries and input markets of the members as well as the other trading partners. A robust analysis of the possible welfare consequences of BIMSTEC FTA requires the contextualization of interactions among different sectors of the group. Partial equilibrium analysis has the advantages of analytical simplicity and capability of using disaggregated data, whereas the GTAP model allow these changes within and between sectors in output mix and factor demands.

The money-metric decomposition of the welfare effect in the standard GTAP model of BIMSTEC FTA is portrayed in Table 5. The simulation is carried out after aggregating the

data of 57 sectors into 10 broad sectors.[8] The net welfare effect is the sum of allocative efficiency, terms of trade and I-S effects, which is US$972.6 million in BIMSTEC. The results demonstrate that Bangladesh is net loser in forming BIMSTEC FTA, which amounts to US$ 213.8 million from full tariff elimination. The other countries derive net welfare gain from the preferential liberalization, although the amount varies depending on the extent of various effects. Thailand derives the highest net gain, which is US$ 582.2 million, followed by India, Sri Lanka and Myanmar. The welfare gain for Thailand is due largely to allocative efficiency improvements. For Bangladesh, the overall welfare impacts are negative, much of which can be attributed to adverse terms of trade effects.

Among the BIMSTEC members, only Bangladesh incurs terms of trade loss, which is significant. The order of terms of trade gain for the other countries is the same as net welfare gain. The results of SMART simulation demonstrate positive terms of trade gains for all the BIMSTEC members for estimated export elasticity, which range very closely for different values. The I-S effect is negative for Thailand and Bangladesh. Thailand and India derive allocative efficiency gains while the other members reveal loss.

The results are similar to those of Strutt (2008) who conducts simulations of BIMSTEC FTA based on database version 6 in a recursive dynamic model projected for the year 2020. In Gilbert (2008), Bangladesh and Sri Lanka incur welfare loss of US$126.9 million and US$14.1 million, respectively. However, the amount is bigger for Bangladesh, while Sri Lanka derives huge welfare gains in the present study. Strutt (2008) reveals a net welfare loss for Bangladesh, amounting to US$267 million, which includes losses of terms of trade, capital and equity; although a meager gain of allocative efficiency (US$3 million) is included in the net welfare effect. The other countries derive significant welfare gains from full tariff elimination within the bloc. This indicates that BIMSTEC FTA is beneficial for the

[8] The base year of the data is 2004. See, Narayan and Walmsley (2008) for details on the database.

members except Bangladesh although there is a possibility of a small efficiency gains for the country in the long run when all the sectors of the economy are taken into account.

Commodity decomposition of the allocative efficiency effect helps identify the sectors that incur loss and pull off gains. The results indicate that six broad sectors out of ten end up with loss. Bangladesh incurs huge allocative efficiency loss in textiles and wearing apparel sector, which is followed by heavy manufacturing. Indeed, the textiles sector is the major strength of Bangladesh economy, earning more than three quarters of its export receipts and employing around 2 million workers. A substantial loss in this sector implies devastating consequence of the FTA on the economy. Conversely, grains crops achieve notable gains, followed by light manufacturing and some other sectors. But these cannot offset the losses and the country ends up with significant allocative efficiency loss. India, Sri Lanka and Myanmar also go down in textiles but these are minuscule compared to that of Bangladesh.

[*Please Insert Table 5 About Here*]

On the whole, Myanmar and Sri Lanka incur some losses and India attains some gains. Thailand derives gains in almost all the sectors and substantial gains in the processed food and light manufacturing. Among the BIMSTEC members, Thailand derives the highest allocative efficiency gains. Terms of trade decomposition suggest that Bangladesh would experience even more adverse consequence in textiles and apparel sector. Crops, processed food and manufacturing are the other sectors that would be negatively affected, but the impact on heavy manufacturing would not be that adverse compared to allocative efficiency loss in that sector. The other members would derive significant term of trade gain in most of the sectors. A negative effect is observed in Thailand's extraction sector. The rest of the world would incur loss in allocative efficiency in almost all the sectors with very small gain in extraction and transport sectors. However, its loss of terms of trade would take place in all the sectors.

The loss of allocative efficiency due to BIMSTEC FTA is contradictory with the theory, as the tariff elimination is supposed to bring about positive efficiency effect. However, the negative aggregate as well as sectoral efficiency loss can be explained by the magnitude and interaction of pre-existing sectoral subsidies with the quantity change in imports and exports after removal of import duties within the bloc. The sign of the effect would depend on whether the quantity change in exports that receive domestic subsidies surpasses the effect in quantity change in imports due to removal of tariff liberalization. Specifically, following the derivation of decomposition of the multi-region *EV* in Huff and Hertel (2001, p.16), the allocative efficiency effect will be negative if

$$\sum[TR_i \sum\{XTX_{i,r,s}*(qxs_{i,r,s} - n_r)\}] > \sum[TR_i \sum\{MTX_{i,s,r}*(qxs_{i,s,r} - n_r)\}] \qquad (2)$$

where *XTX* and *MTX* indicate export tax/subsidy and import tax, respectively. TR_i indicates traded commodities, $qxs_{i,r,s}$ and $qxs_{i,s,r}$ imply the source and destination of intermediate inputs, respectively, which follows the CES in production process; *n* stands for the change in population; and *i*, *r* and *s* are discussed above. Thus, the left-hand side of the inequality captures the quantity change in exports, and the right-hand side implies that of imports.

Bangladesh's allocative efficiency loss of over US$ 95 million could be caused by the pre-existing trade protection in the economy, most of which is accounted for by the textiles and wearing appeal sector (Table 5). It can be argued that the substantial output subsidy provided in this sector leads to this loss since the BIMSTEC FTA requires only the tariff removal, not the elimination of subsidy to export-oriented sectors.[9] Therefore, the increase in exports and decrease in imports through Equation (2) would provide negative estimates for the allocative efficiency effects related to exports and imports, provided that the export subsidy rate and quantity of exports are large relative to the import tax rate and quantity of imports. Thus, the loss of allocative efficiency can be attributed to the structure of subsidies

[9] In the GTAP database, the subsidy variables for BIMSTEC countries are: (i) percentage *ad valorem* rate of output subsidies in region *r*; (ii) percentage *ad valorem* rate of export subsidies; (iii) MFA export subsidy equivalent; (iv) ordinary export subsidy; and (v) ordinary output subsidy.

prevailing in Bangladesh, Myanmar and Sri Lanka that leads to higher performance of exports than that of imports, thereby providing overall negative effect.

[*Please Insert Table 6 About Here*]

The country level changes in sector-wise exports are interesting (Table 6). Bangladesh's exports to Sri Lanka and Thailand would increase in most of the sectors, and majority of the sectors would increase exports to India and Myanmar. Textiles and apparel sector, which would face substantial allocative efficiency and terms of trade loss, would experience notable increase in exports except to Sri Lanka. Exports of heavy manufacturing would also increase substantially except to Myanmar. Overall, BIMSTEC FTA would open up a significant export market for Bangladesh in India and a reasonably prospective market in the other countries.

India's exports to Sri Lanka would increase in all the sectors, while decrease marginally in few sectors like construction, transport and other services to Myanmar, Bangladesh and Thailand. Its extraction exports are likely to increase substantially to Bangladesh, Sri Lanka and Thailand, and exports of textile products would rise significantly to Bangladesh, Myanmar and Thailand. Conversely, Myanmar's exports to Bangladesh demonstrate notable reduction in the sectors that include agriculture, extraction, textiles, manufacturing and services. Its exports to India and Sri Lanka would also decrease in five to six sectors but significant loss would take place in livestock. Exports of only two sectors, light and heavy manufacturing, would increase to all the countries with significant proportion to Bangladesh and India. Sri Lanka would incur insignificant loss of exports to Bangladesh and India in service sectors. In addition to these sectors, its loss of exports to Thailand would extend to livestock. The country's notable decrease in exports to Myanmar would take place in livestock and extraction sectors. On the other hand, Thailand would come up with meager

loss in exports to Bangladesh and India in services, to Myanmar in services and livestock, and to Sri Lanka in no sector.

In general, Thailand appears to be the most promising export market for Bangladesh, India and Sri Lanka, especially for potentially spectacular growth in exports of extraction. These countries are also potentially good export market for Thailand; that is the possible gains are of both the ways. Thailand has good prospects in grain exports to Myanmar and has the possibility to expand exports in extraction and manufacturing. Myanmar also has good prospects in enhancing exports in processed food and manufacturing to Bangladesh, and in grains and extraction in addition to these two sectors to India. Its textiles sector has a good prospect in the Thai market. Excluding Bangladesh, the countries would also incur loss in exports to rest of the world in all the sectors. The losses would be very small for Thailand and India in all the sectors, but significant in grains crops and meat for Myanmar and extraction for Sri Lanka. Bangladesh's exports of extraction sector would also be affected significantly.

Finally, the results can be compared with that of the other two studies conducted in the context of BIMSTEC. In Strutt (2008), the net welfare effect of all BIMSTEC members are higher than that of the present study, with a higher negative net welfare effect for Bangladesh. This is perhaps because it includes Japan, one of the biggest economies in the world, in the FTA and reports the cumulative effect of 11 years in the simulation. In Gilbert (2008), the result is a bit different, with net welfare loss for both Bangladesh and Sri Lanka, but the result is almost similar to the present study. However, this study exclusively focuses on BIMSTEC as well as examines the effect of BIMSTEC FTA on Myanmar, which is an improvement over the previous studies that exclude this important member.

4. Concluding Remarks

The present paper adopts partial equilibrium and CGE models to analyze the possible trade, welfare and revenue effects of a preferential liberalization in BIMSTEC through

forming an FTA within the bloc. The SMART model is a widely used single market simulation tool to analyze Vinerian effects of FTAs. The major limitation of the model is that it assumes infinite price elasticity of exports, although some recent studies confirm it to be around one. Therefore, export elasticity has been estimated for the countries by adopting FMPH-OLS and the ARDL models. The likely trade effects are calculated based on various estimated elasticity values as well as with infinite elasticity to comprehend a range of the effects of BIMSTEC FTA.

The results of SMART model demonstrate that there is a high trade potential even for comparatively price-inelastic export supply function, which means that trade and welfare gains might be even higher for BIMSTEC countries. The analysis indicates that the trade effects would be higher for the bigger economies, although the losers would be smaller countries in terms of revenue loss. This has a powerful policy implication for proper design of the compensation mechanism and technical support for the smaller economies so as to offset negative effects. Based on the standard GTAP model, the CGE analysis reveals that Bangladesh is the only member which would incur a net welfare loss by joining the BIMSTEC FTA. The paper also tries to explain the negative allocative efficiency effect, which is absent in the existing literature. Sector-specific allocative efficiency and terms of trade losses are also observed which include Bangladesh's substantial loss in its textiles and wearing apparel sector. The real outcome would, however, depend on the trajectory of the liberalization and investment promotion within the scheme, as well as the future dynamics of regional and global economy. Since the bloc's welfare effect is positive in the GTAP analysis, and trade and welfare effects are positive in SMART analysis, an FTA would bring about an overall positive impact on the bloc with some country-specific adverse effects.

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TABLES

Table 1: Intra-BIMSTEC Trade Flows (US$ million)

IMPORTS

From / To	Bangladesh		Bhutan		India		Myanmar		Nepal		Sri Lanka		Thailand		BIMSTEC		BIMSTEC % of World	
	1997	2007	1997	2007	1997	2007	1997	2007	1997	2007	1997	2007	1997	2007	1997	2007	1997	2007
Bangladesh	--	--	4.14	10.43	795.62	2,646.58	2.66	29.66	10.99	15.67	9.25	13.45	86.00	442.02	908.64	3,157.81	12.74	17.09
Bhutan			--	--														
India	53.65	211.05	18.50	129.44	--	--	212.30	757.76	87.43	768.52	33.95	566.81	224.28	2,930.53	630.10	5,364.11	1.54	2.15
Myanmar	0.42	6.35			50.16	186.85	--	--	0.00	0.00	0.00	0.56	0.00	1,054.64	50.57	1,248.40	1.77	22.62
Nepal	7.70	4.93			435.80	1,838.55	0.00	0.00	--	--	1.60	0.20	28.60	41.87	473.70	1,885.55	28.88	60.37
Sri Lanka	2.00	10.92			560.00	2,610.14	6.00	5.49	5.00	0.08	--	--	153.00	230.81	726.00	2,857.44	13.74	25.28
Thailand	14.02	14.37			594.00	2,085.01	0.00	2,315.38	0.04	0.73	30.23	36.61	--	--	638.29	4,452.09	1.00	3.15
BIMSTEC	77.78	247.62	22.64	139.86	2,435.58	9,367.13	220.96	3,108.30	103.45	784.99	75.02	617.63	491.88	4,699.86	3,427.30	18,965.39	2.81	4.42

EXPORTS

To / From	Bangladesh		Bhutan		India		Myanmar		Nepal		Sri Lanka		Thailand		BIMSTEC		BIMSTEC % of World	
	1997	2007	1997	2007	1997	2007	1997	2007	1997	2007	1997	2007	1997	2007	1997	2007	1997	2007
Bangladesh	--	--	0.33	4.85	37.22	209.71	0.38	5.77	0.93	4.48	3.91	10.15	10.77	12.70	53.54	247.67	1.48	1.95
Bhutan			--	--														
India	807.13	2,405.98	15.48	146.48	--	--	48.28	169.86	168.93	1,671.41	486.25	2,372.86	369.78	1,895.47	1,895.83	8,662.06	5.48	5.66
Myanmar	2.41	26.97			168.62	688.87	--	--	0.00	0.00	5.45	4.99	0.00	2,104.89	176.49	2,825.72	15.59	59.44
Nepal	8.70	14.25			91.60	698.65			--	--	0.10	0.07	0.00	0.66	100.40	713.63	25.30	70.76
Sri Lanka	11.00	22.75			44.00	515.28	0.00	0.51	2.00	0.18	--	--	34.00	44.70	91.00	583.42	1.97	7.54
Thailand	127.04	511.00			294.48	2,664.12	0.00	958.76	19.41	38.06	147.76	273.55	--	--	588.69	4,445.49	0.99	2.92
BIMSTEC	956.28	2,980.95	15.81	151.33	635.92	4,776.64	48.65	1,134.91	191.27	1,714.14	643.47	2,661.62	414.55	4,058.42	2,905.95	17,478.00	2.80	5.27

Note: The total value of exports and imports shows discrepancy, which is due to exclusion of transport and other costs of trade from the exports data.
Source: IMF. *Direction of Trade Statistics* (online).

Table 2: Export Supply Elasticity of BIMSTEC Countries

	Bangladesh	India	Sri Lanka	Thailand
FMPH-OLS	0.806***	0.573***	0.397***	0.666***
	(0.077)	(0.112)	(0.073)	(0.133)
ARDL	0.859***	0.509*	0.700***	0.956***
	(0.040)	(0.287)	(0.122)	(0.091)
ARDL-ECM	1.070***	0.653***	0.464***	0.955***
	(0.090)	(0.121)	(0.081)	(0.127)

Note: *** and * indicate that the estimated coefficient is statistically significant at 1 and 10 percent level, respectively.

Table 3: Decomposition of Trade Effect (US$ million) for Different Export Price Elasticity

	FMPH-OLS				ARDL			
	Trade Effect	Trade Diversion	Trade Creation	Terms of Trade	Trade Effect	Trade Diversion	Trade Creation	Terms of Trade
				BANGLADESH				
India	203.631	16.286	74.593	112.752	206.897	17.135	78.467	111.295
Myanmar	3.664	0.086	1.549	2.029	3.723	0.090	1.630	2.002
Nepal	0.010	0.001	0.003	0.005	0.010	0.001	0.003	0.006
Sri Lanka	2.606	0.278	0.885	1.443	2.648	0.293	0.931	1.424
Thailand	45.643	4.619	15.751	25.273	46.378	4.861	16.569	24.948
Total	255.554	21.27	92.781	141.502	259.656	22.38	97.6	139.675
% of GDP	0.374				0.374			
				INDIA				
Bangladesh	55.508	0.967	19.253	35.288	53.519	0.863	17.190	35.467
Bhutan	46.328	1.192	15.684	29.452	44.667	1.064	14.003	29.601
Myanmar	198.088	1.497	70.660	125.928	190.992	1.336	63.087	126.569
Nepal	80.382	1.464	27.817	51.101	77.503	1.307	24.836	51.360
Sri Lanka	126.439	2.507	43.551	80.381	121.910	2.238	38.884	80.789
Thailand	371.597	11.679	123.683	236.234	358.290	10.427	110.428	237.435
Total	878.342	19.306	300.648	558.384	846.881	17.235	268.428	561.221
% of GDP	0.075				0.075			
				SRI LANKA				
Bangladesh	0.685	0.031	0.164	0.490	0.729	0.048	0.252	0.429
India	97.291	6.988	20.660	69.643	103.479	10.780	31.829	60.870
Myanmar	0.897	0.089	0.166	0.642	0.955	0.138	0.256	0.562
Nepal	0.02	0.002	0.003	0.015	0.022	0.004	0.005	0.013
Thailand	18.786	2.04	3.298	13.447	19.999	3.153	5.081	11.764
Total	117.679	9.15	24.291	84.237	125.184	14.123	37.423	73.638
% of GDP	0.364				0.364			
				THAILAND				
Bangladesh	3.792	0.370	1.145	2.276	4.177	0.499	1.543	2.136
Bhutan	0.458	0.046	0.137	0.275	0.504	0.062	0.185	0.258
India	136.652	13.600	41.028	82.024	150.540	18.321	55.256	76.963
Myanmar	9.066	0.556	3.068	5.442	9.987	0.749	4.132	5.106
Nepal	0.076	0.008	0.022	0.046	0.084	0.011	0.030	0.043
Sri Lanka	2.036	0.201	0.613	1.222	2.244	0.271	0.826	1.147
Total	152.08	14.781	46.013	91.285	167.536	19.913	61.972	85.653
% of GDP	0.064				0.064			
	Infinite Elasticity				ARDL-ECM			
				BANGLADESH				
India	456.332	82.814	373.518		219.103	20.311	92.945	105.847
Myanmar	8.188	0.429	7.759		3.942	0.107	1.931	1.904
Nepal	0.022	0.007	0.015		0.011	0.002	0.004	0.005
Sri Lanka	5.873	1.442	4.430		2.804	0.347	1.102	1.355
Thailand	102.751	23.879	78.872		49.124	5.766	19.626	23.731
Total	573.166	108.571	464.594		274.984	26.533	115.608	132.842
% of GDP	0.838				0.838			

[Cont'd Table 2]

			INDIA				
Bangladesh	454.097	29.279	424.817	57.966	1.095	21.803	35.067
Bhutan	376.855	30.801	346.054	48.381	1.351	17.761	29.268
Myanmar	1,593.465	34.383	1,559.081	206.850	1.695	80.019	125.136
Nepal	647.153	33.384	613.769	83.939	1.658	31.501	50.780
Sri Lanka	1022.111	61.170	960.941	132.036	2.840	49.320	79.876
Thailand	2,990.924	261.910	2,729.014	388.042	13.227	140.065	234.750
Total	7,084.605	450.927	6,633.676	917.214	21.866	340.469	554.877
% of GDP	0.602			0.602			
			SRI LANKA				
Bangladesh	1.038	0.174	0.864	0.696	0.035	0.185	0.475
India	146.341	37.212	109.129	98.808	7.917	23.399	67.492
Myanmar	1.364	0.488	0.876	0.911	0.101	0.188	0.623
Nepal	0.031	0.013	0.018	0.021	0.003	0.004	0.014
Thailand	28.476	11.053	17.422	19.083	2.312	3.736	13.035
Total	177.250	48.940	128.309	119.519	10.368	27.512	81.639
% of GDP	0.548			0.548			
			THAILAND				
Bangladesh	10.064	2.486	7.578	4.176	0.499	1.541	2.136
Bhutan	1.216	0.309	0.907	0.504	0.062	0.184	0.258
India	362.808	91.382	271.426	150.495	18.305	55.210	76.980
Myanmar	23.975	3.678	20.297	9.984	0.749	4.129	5.107
Nepal	0.202	0.057	0.145.727	0.084	0.011	0.030	0.043
Sri Lanka	5.420	1.365	4.055	2.243	0.271	0.825	1.147
Total	403.685	99.277	304.263	167.486	19.897	61.919	85.671
% of GDP	0.171			0.171			
			MYANMAR				
India	9.186	1.806	7.380				
Thailand	64.226	13.045	51.181				
Total	73.412	14.851	58.560				
% of GDP	..						
			NEPAL				
Bangladesh	0.543	0.165	0.378				
Bhutan	0.051	0.005	0.046				
India	123.574	18.212	105.362				
Myanmar	0.095	0.036	0.059				
Sri Lanka	0.636	0.249	0.387				
Thailand	10.191	4.139	6.051				
Total	135.090	22.806	112.283				
% of GDP	1.314						
			BHUTAN				
Thailand	1.781	0.148	1.633				
Total	1.633	0	1.633				
% of GDP	0.155						

Source: SMART simulation.

Table 4: Welfare and Revenue Loss Effects (US$ million)

	ARDL-ECM	FMPH-OLS	ARDL	Infinite Elasticity
		WELFARE[1]		
Bangladesh	28.289	26.360	26.768	56.768
	(12.65)	(12.68)	(12.67)	(12.22)
India	162.038	155.361	149.947	1,115.718
	(18.80)	(18.82)	(18.84)	(16.82)
Sri Lanka	10.825	10.665	11.316	15.733
	(12.47)	(12.48)	(12.45)	(12.26)
Thailand	13.189	11.996	13.193	30.968
	(10.41)	(10.42)	(10.41)	(10.17)
Myanmar				2.672
				(4.56)
Nepal				12.111
				(10.79)
Bhutan				0.263
				(16.11)
BIMSTEC	214.341	204.382	201.224	1,234.23
	(16.50)	(16.57)	(16.43)	(16.19)
		REVENUE LOSS[2]		
Bangladesh	178.068	177.397	177.539	188.567
	(17.51)	(17.44)	(17.46)	(18.54)
India	705.661	705.061	704.576	820.182
	(5.33)	(5.32)	(5.32)	(6.19)
Sri Lanka	94.580	94.480	94.887	97.830
	(19.23)	(19.21)	(19.29)	(19.89)
Thailand	97.271	96.834	97.272	104.349
	(2.00)	(1.99)	(2.00)	(2.15)
Myanmar				30.070
				(27.38)
Nepal				102.892
				(54.91)
Bhutan				0.451
				(18.77)
BIMSTEC	1,075.579	1,073.772	1,074.275	1,344.34
	(5.49)	(5.48)	(5.48)	(6.18)

Notes: [1]Numbers in the parentheses are the share of the welfare in net trade effect (per cent). [2]Numbers in the parentheses are the share of the revenue loss in total revenue (percent).
Source: SMART simulation.

Table 5: Commodity Decomposition of Welfare Effects (US$ million)

	Bangladesh	India	Myanmar	Sri Lanka	Thailand	ROW
ALLOCATIVE EFFICIENCY						
Grains Crops	22	10.6	9.8	0.8	2.9	-34.1
Animal and Meat	-0.4	1	0.1	0	0.4	-6.6
Extraction	-5.3	9.7	1	-4.8	53.5	0.3
Processed Food	-1.3	-5.1	0.1	0.1	10.3	-40.9
Textiles & Wearing Apparel	-74.3	-7.8	-9.4	-3	5.8	-88.1
Light Manufacturing	5.5	10.2	-1.9	-1.1	24.3	-48.6
Heavy Manufacturing	-44.6	-5.6	4.3	-4.6	9.1	-70.8
Construction Services	1.1	6.4	3.5	-0.1	18	-70.8
Transport & Communication	-0.3	1.1	-4.3	-0.9	-5.5	2.9
Other Services	2.5	-2	-5.3	0.1	-6.6	-15.3
Total	-95.1	18.5	-2.1	-13.5	112.2	-372.0
TERMS OF TRADE						

Grains Crops	-6.7	6.8	11.5	41	18.2	-64.3
Animal and Meat	0	3.6	0.1	1.1	3.9	-8.9
Extraction	4.4	14.4	4.2	13.4	-10.8	-30.3
Processed Food	-4.1	18.4	5.4	13	39.2	-73.2
Textiles & Wearing Apparel	-115.1	59.2	43.1	3.2	44.5	-38.9
Light Manufacturing	-1.7	65.6	1	3.1	91.1	-160
Heavy Manufacturing	-2.7	55.2	12	1.5	206.1	-270.6
Construction Services	0	1.2	0.6	0	2	-3.9
Transport & Communication	1	33.1	28	2.2	99.5	-163.8
Other Services	5.7	61.3	11.1	1.9	46.4	-127.6
Total	-119.2	318.8	117	80.4	540.1	-813.9
INVESTMENT-SAVINGS	0.5	57.8	25.6	1.7	-70.1	-0.2
WELFARE EFFECT	-213.8	395.1	140.5	68.6	582.2	
% of GDP	-0.313	0.034	..	0.212	0.246	

Source: GTAP simulation.

Table 6: Changes in intra-BIMSTEC exports (percent)

	BANGLADESH					INDIA				
	India	Sri Lanka	Myanmar	Thailand	ROW	Bangladesh	Sri Lanka	Myanmar	Thailand	ROW
Grains Crops	127.13	23.17	26.37	36.05	3.92	70.1	108.78	18.87	59.06	-2.64
Animal and Meat	148.87	11.35	30	43.27	8.45	19.78	267.47	88.08	129.76	-3.77
Extraction	-12.64	-20.53	-23.57	18,260.17	-23.61	300.42	231.91	24.79	1,304.2	-3.03
Processed Food	173.86	57.77	52.22	640.08	2.81	48.85	83	25.38	93.81	-1.94
Textiles & Wearing Apparel	189.87	12.86	182.17	579.76	9.45	235.2	4.04	89.59	262.67	-2.64
Light Manufacturing	139.88	63.55	31.89	17.55	0.84	210.96	54.57	18.53	23.21	-1.89
Heavy Manufacturing	106.99	120.41	9.3	112.85	1.47	127.49	38.15	8.2	67.65	-1.46
Construction Services	-1.77	5.21	-1.28	-0.97	-2.85	0.93	6.34	-0.22	0.1	-1.8
Transport & Communication	-0.97	3.97	-0.3	0.16	-1.71	-1.04	4.07	-0.19	0.25	-1.6
Other Services	-1.56	2.88	-1.63	-0.62	-2.18	-1.26	3.31	-1.22	-0.21	-1.77

	MYANMAR					SRI LANKA				
	Bangladesh	India	Sri Lanka	Thailand	ROW	Bangladesh	India	Myanmar	Thailand	ROW
Grains Crops	-18.26	123.14	41.25	10.1	-38.02	76.76	428.52	28.56	79.18	-6.95
Animal and Meat	-43.46	-37.62	-39.39	-14.75	-39.58	217.1	1558.21	-34.75	-12.84	-13.92
Extraction	-28.04	63.39	-6.66	-11.73	-11.59	465.12	159.64	-28.98	4,548.83	-28.29
Processed Food	107.11	119.85	-1.14	-11.48	-26.7	116.12	302.56	-5.31	502.48	-4.32
Textiles & Wearing Apparel	-24.69	-7.38	-8.21	66.77	-4.37	349.98	148.5	136.29	473.44	-9.94
Light Manufacturing	68.62	97.22	30.49	5.35	-10.49	193.1	145.72	389.73	8.97	-1.74
Heavy Manufacturing	144.08	201.94	46.03	12.28	-12.21	132.17	161.27	40.66	69.72	-6.99
Construction Services	0.21	-1.42	5.58	-0.62	-2.51	-8.39	-9.86	-9.42	-9.13	-10.85
Transport & Communication	-5.46	-5.28	-0.57	-4.22	-5.99	-9.95	-9.77	-9.16	-8.77	-10.45
Other Services	-7.54	-7.44	-3.26	-6.56	-8.02	-10.29	-10.19	-10.25	-9.33	-10.75

	THAILAND				
	Bangladesh	India	Sri Lanka	Myanmar	ROW
Grains Crops	133.31	371.86	146.97	114.57	-1.76
Animal and Meat	128.45	489.13	355.51	-11.76	-3.99
Extraction	49.55	220.45	74.17	18.86	-5.92
Processed Food	146.82	605.33	79.53	21.71	-1.83
Textiles & Wearing Apparel	271.83	165.31	4.16	31.89	-3.87
Light Manufacturing	217.11	147.44	75.92	36.88	-3.04
Heavy Manufacturing	221.44	127.26	68.3	14.48	-2.29
Construction Services	-0.49	-2.08	4.88	-1.59	-3.15
Transport & Communication	-2.65	-2.45	2.4	-1.79	-3.18
Other Services	-2.87	-2.76	1.63	-2.82	-3.36

Source: GTAP simulation.