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Draft

Global Rice Trade Liberalisation: Implications from Some Alternative Scenarios♦

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Global Rice Trade Liberalisation: Implications from Some Alternative Scenarios

Abstract: Like many other agricultural commodities, the international rice market is highly distorted because of excessive protective measures in both developed and developing countries. This paper examines the welfare and trade impacts of the global liberalisation of rice and agricultural trade on a number of key players in the world rice market along with the four South Asian countries namely, Bangladesh, India, Pakistan and Sri Lanka. Using the Global Trade Analysis Project (GTAP) general equilibrium modelling framework, six different sets of liberalisation scenarios are simulated here, which include: (1) complete liberalisation of rice trade alone in all countries; (2) complete liberalisation of the rice sector in developed countries only; (3) partial liberalisation of the rice trade in all countries; (4) complete liberalisation of the agricultural sector as a whole in all countries; (5) partial liberalisation of all agricultural commodities in all countries; and (6) complete removal of all export subsidies on rice only. Simulation results suggest regional import prices rise in the range 4-15 percent. The global rice trade increases significantly under the complete rice and agricultural trade liberalisation scenarios, with the aggregate global welfare gains reaching $20 billion and $50 billion, respectively. While partial liberalisations lead to some modest increase in world trade and welfare gains, the impact of the complete removal of export subsidies alone, as agreed in the recently held Hong Kong Ministerial Conference of the World Trade Organisation (WTO), is unlikely to have any discernible effects. The results clearly demonstrate the highly unequal nature of the global distribution of welfare gains. While countries like Bangladesh, a net food-importing South Asian LDC, stand to suffer from welfare losses in most cases, such countries as China, India, and Thailand are set to enjoy net welfare gains.

I. Introduction

Rice is the most important food grain for half of the world's population. More than 90 percent of total global production and consumption of rice take place in Asia, where about one-third of per capita calorie intake is due to this basic food alone (Wailes, 2005).[1] In many Asian developing countries rice cultivation is dominated by small and subsistence farms and for them rice is the mainstay of their livelihood. Given its importance, self-sufficiency in rice production is often regarded as a means to achieve food security. Policy makers in rice dependent countries have to frequently intervene to support farmers against falling prices and protect consumers' purchasing power in the face of rising prices. Measures taken to attain these conflicting policy objectives have restricted international trade in rice. On the other hand, with a view to protecting producers' incomes and preserving the environmental benefits arising out of rice cultivation, high income countries such as the EU and the USA have also been providing very high protection to their farmers (Calpe, 2004), resulting in severe distortion in world production and prices, and hurting efficient producers in developing countries.

Agriculture has been at the centre stage of multilateral trade negotiations during the past 20 years. Despite having a major progress in improving the rules for trade, the overall achievement in terms of increasing market access for agricultural goods was considered to be 'disappointing' at the end of the Uruguay Round (Martin and Winters, 1996). Although under the WTO Agreement on Agriculture members committed to carrying on reforms, not much progress has so far been made in further opening-up of the markets. Nevertheless, agriculture continues to be an active area of negotiation. While the modalities for future liberalisation in the sector are being negotiated, the potential implications arising from such liberalisation have drawn a lot of attention. Several studies (e.g., Hertel *et al*., 2000; Diao *et al*., 2001; Beghin *et al.*, 2002; Elbehri and Leetmaa, 2002; van Meijl and van Tongeren, 2001; Dimaranan *et al.*, 2003; Francois *et al.*, 2003) predict that, with the elimination of export and production subsidies, prices of agricultural commodities are likely to increase. This will be beneficial to a number of developing countries that have clear comparative advantage in the sector. Liberalisation will also imply further market access opportunities for these countries as a result of reduced tariff barriers in the developed country markets. However, not all developing countries are net-exporters of agricultural products, and many of them actually depend on the world market for their supplies.[2] Consequently, agricultural trade liberalisation could adversely affect these countries.

Like many other individual commodities, agricultural trade liberalisation is likely to affect rice production and trade. Given the size of its consumers, rice will possibly have the largest welfare implications amongst all other agricultural commodities. A rise in prices following liberalisation will be, on the whole, welfare-enhancing for a net-exporter, while for a net-importer this will be translated into a terms of trade shock with adverse welfare consequences. Foreseeing the price rise as the ultimate outcome, concerns have been expressed about the food security and poverty situation in the rice dependent countries. On the contrary, it has also been argued that liberalisation measures will hurt the poor farmers in rice producing countries since falling prices of output will make it difficult for farmers to

[1] Outside Asia, the significance of rice is also very high in sub-Saharan African countries, which are net importers of rice, spending about $1.4 billion (or, 19 percent of their total grain import bill) on rice imports (Kormawa *et al*. 2005).

[2] Particularly for the least developed countries (LDCs), the ratio of food exports to food imports is around 30 per cent.

remain competitive (OXFAM, 2005). However, since tariff reduction and removal of domestic support and subsidies are two inherent components of the global rice trade liberalisation, they should be considered simultaneously in assessing the welfare consequences. While tariff reductions under the WTO rule will potentially depress prices, subsidy cuts will tend to exert an opposite effect with the net result depending on the relative strength of these two differing forces.

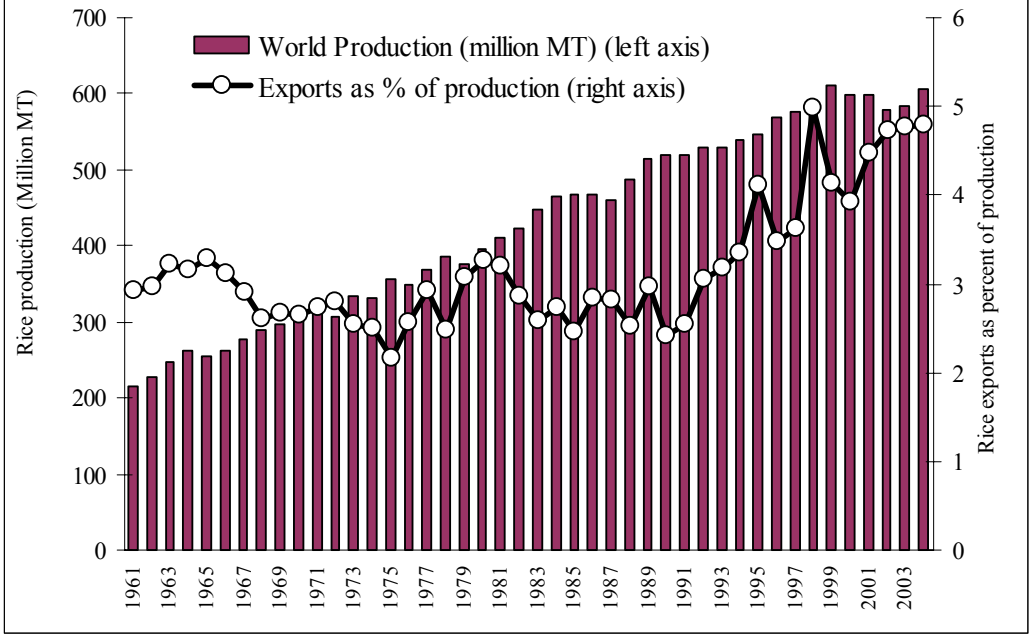
Against the above backdrop, the main objective of this paper is to examine the impact of multilateral liberalisation on a number of key players in international rice trade along with the four South Asian countries, namely Bangladesh, India, Pakistan, and Sri Lanka. The impact analysis is attempted within a global general equilibrium model – popularly known as the GTAP model – that provides the relevant trade-flows, trade-barriers, and macroeconomic data for a large number of world economies and allows for undertaking simulation exercises reflecting various trade liberalisation scenarios. The present paper considers both the withdrawal of domestic support measures, including subsidies, and tariff reductions in assessing the implications for the selected countries. In addition, the general equilibrium nature of the model also allows reallocation of resources following the trade measures thereby giving the insights about the efficiency gains. This paper is organised as follows: after this introduction in Section I, some stylised facts associated with the international rice market are reported in Section II; Section III describes the model, data, simulation specifications; Section IV presents the simulation design followed by results in Section V; Section VI concludes.

II. International Rice Market: Some Stylised Facts

International rice market is usually described in the literature as 'thin', 'volatile', 'segmented' and 'highly distorted'. It is thin as only a small proportion of global production is traded. Data from the Food and Agriculture Organisation (FAO) show that, out of a global production of 605 million metric tonnes in 2004, only 28 million metric tonnes were exported. For the past forty years the annual average export to production ratio is worked to be just above 3 percent. A momentum in rice trade is noticed since the early 1990s, which is thought to be attributable to the liberalisation measures undertaken by countries under the auspices of the WTO Agreement on Agriculture along with various regional agreements and national policy reforms (Wailes, 2004). Nevertheless, the international rice market remains thin with exports currently accounting for just about 5 percent of global production (Figure 1).[3]

[3] The comparable export to production ratios for wheat, corn, and soybeans are respectively 18, 12 and 35 percent. The very low trade volume in rice indicates that most rice dependent countries are self sufficient in rice. Rice trading is often considered as a residual option as the countries prefer to build-up their domestic reserves in periods of good harvest and to draw from these reserves whenever there is a production shortfall.

Figure 1: World Production and Exports of Rice



Production and exports of rice are also heavily concentrated in a few countries. More than half of the world rice production is due to China and India, while other Asian countries viz., Indonesia, Bangladesh, Vietnam, Thailand, Myanmar, the Philippines, Japan, South Korea, and Pakistan are also major producers. Turning to the export trade, Thailand has the biggest share of about 26 percent followed by India, the USA, Vietnam, Pakistan and China. Amongst the importers, Saudi Arabia, Nigeria, Iran, the UK, Japan, Indonesia, France, the USA, Brazil, the Philippines, etc. are prominent (Table 1).

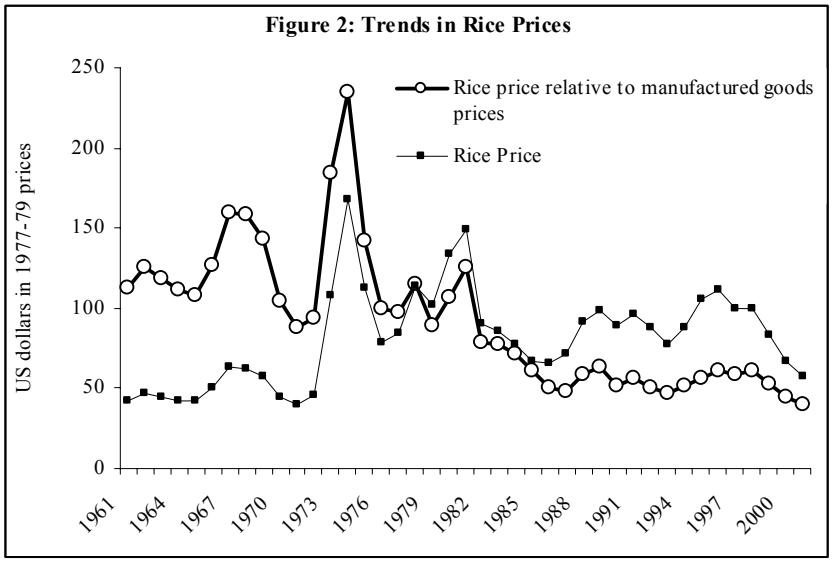
Table 1: Major Countries in International Rice Production and Trade

Production		Exports		Imports	
Country	Share (%)	Country	Share (%)	Country	Share (%)
China	29.9	Thailand	25.9	Saudi Arabia	5.70
India	21.7	India	13.7	Nigeria	3.75
Indonesia	8.8	USA	12.5	Iran	3.62
Bangladesh	6.4	Vietnam	10.2	UK	3.44
Viet Nam	5.7	Pakistan	7.5	Japan	3.36
Thailand	4.5	China	5.7	Indonesia	3.28
Myanmar	3.7	Italy	4.3	France	3.26
Philippines	2.2	Japan	2.7	USA	2.92
Brazil	1.9	Uruguay	2.3	Brazil	2.51
Japan	1.9	Egypt	2.0	Philippines	2.48
USA	1.6	Spain	2.0	Senegal	2.33
Pakistan	1.2	Argentina	1.0	China	2.09
South Korea	1.2	Myanmar	0.9	Bangladesh	1.76
Egypt	1.0	France	0.8	North Korea	1.27
Nigeria	0.5	UK	0.7	South Korea	0.66
Sri Lanka	0.5	Sri Lanka	0.02	Sri Lanka	0.29
Iran	0.4	Bangladesh	0.0	Pakistan	0.03

Note: All shares are based on the average of 2000-04. Shares of production are estimated on the basis of the volume (metric tonnes) of output produced, while shares in exports and imports are based on value terms.
Source: FAOSTAT

Since the marketed volume is very small in comparison with total production, the rice market is characterised by big swings in traded volumes and prices. Because of the thinness of the market, even a relatively small change in a major producing country can generate a significant supply shock, which is most often reflected in the price of the commodity. In addition, like many other primary commodities, the demand for which is price and income-inelastic in nature, the rice price has been subject to a long-term declining trend relative to manufactured goods (Figure 2).

Figure 2: Trends in Rice Prices



Source: Data are from Razzaque *et al*. (2004).

The rice market is also segmented by types. Market segmentation occurs due to variety, quality and degree of processing. *Indica* is the mostly consumed variety accounting for 75 percent of rice trade, while *Japonica* and *Aromatic* has a share of 12 percent each. In terms of processing, 77 percent of trade volume is milled rice, followed by parboiled rice (15 percent), husked (4 percent) and paddy (4 percent).[4] Finally, high and medium quality rice accounts for 75 percent of the total trade.[5] An important feature of rice consumption is that the degree of substitutability between types and qualities is very limited.

The rice market is possibly the most distorted amongst all cereals as both developed and developing countries use a wide variety trade policy instruments to influence its domestic production and control imports from abroad (Gulati and Narayanan, 2002). The widespread use of tariff rate quotas, high import tariffs, operation of state trading system, export subsidies, input subsidies, and producers' price support in major rice-producing countries have caused serious distortions. Imports of rice used to be banned in countries like Japan and Korea, which had partially been relaxed following the WTO Agreement on Agriculture that allowed the provision for tariff rate quotas. However, excessively high tariffs over tariff rate quotas make imports prohibitive in practice. Both Japan and Korea also use monopolised state trading system to control rice imports.

[4] Data on the share of different types of rice are due to Calpe (2004).

[5] Australia, Egypt, the EU, Thailand, the USA are the main suppliers of high quality rice. Basmati rice from India and Pakistan is also a high quality variety. India, Thailand and Vietnam are the main sources of medium quality rice supplies, while the principal sources of low quality variety are China, India, Pakistan, Thailand, and Vietnam.

The rich countries also provide rice farmers with heavy domestic support and export subsidies. Among OECD countries, the producer support estimate (PSE) for rice was estimated to be 90 percent for 2002, which was the highest among agricultural commodities (Naik, 2005). Gulati and Narayanan (2002) find that export subsidies on rice in the EU can be as high as $322 per tonne, while under different direct support systems a farmer in the US earns about $152 per tonne of rice produced. In sharp contrast to this, rice prices facing poorer developing country producers are often less than three-fourths of world prices. Most developing countries have some price support system, but prices around which the stabilization is targeted are much lower than the international prices.

While the Uruguay Round Agreement on Agriculture made some significant progress on rules of trade in agriculture by replacing the QRs with tariffs and for specifying initial commitments on reduction of tariffs and subsidies, the momentum could not be maintained under the WTO-sponsored negotiations. The global trade-weighted average tariff for medium to short grain rice is still as high as 217 percent, and on all rice is 43.3 percent (Wailes, 2004), with domestic support given to agriculture in the developed countries has not come down since the implementation of the commitments of the Uruguay Round began in 1995 (Naik, 2005). Although in the Doha Ministerial Declaration member countries vowed to achieve substantial improvements in market access through phasing out of all forms of export subsidies and substantial reductions in trade-distorting domestic support (WTO 2001, para. 13), no major breakthrough has been made after the conclusion of the Hong Kong Ministerial conference, held in December 2005. While members are still negotiating modalities for further liberalisation, consensus has been reached on abolishing all export subsidies only by 2013 (WTO 2005, para 6).[6]

Despite the lack of progress related to agricultural liberalisation in the post Uruguay Round period there is no denying that, as rice has long been one of the most protected commodities in world trade, any significant liberalisation measure in this sector will likely to have huge welfare implications. Moreover, it has been argued that even the modest liberalisation that has so far been undertaken is already profoundly affecting the global rice trade, which is reflected in relatively recent expansion in rice trade as shown in figure 1 above (Wailes, 2004). It has, therefore, become a big concern to what extent future liberalisation will affect the livelihood and food security in the poor rice-dependent developing countries.

[6] In the case of cotton export subsidies by developed countries will be abolished in 2006.

III. Methodology

With a view to exploring the possible effects of global rice and agricultural trade liberalisation, this study adopts a global computable general equilibrium (CGE) modelling framework of the Global Trade Analysis Project (GTAP) (Hertel, 1997). A global CGE modelling technique is the best possible way for the *ex ante* analysis of the economic and trade consequences of comprehensive multilateral or bilateral trade agreements (Francois and Shiells, 1994). Given the varying levels of protection on rice sector in different countries, along with the different levels of production, consumption and trade among the countries, the abolition or reduction of distortions will likely to exert varying impacts for different countries. Such impacts will occur through sectoral linkages and also through changes in income, investment and savings of various actors of different economies.

3.1. The model

The GTAP model is a comparative static, global computable general equilibrium model, and is based on neoclassical theories.[7] The GTAP model is a linearised model, and uses a common global database for the CGE analysis. The model assumes perfect competition in all markets, constant returns to scale in all production and trade activities, and profit and utility maximising behaviour of firms and households respectively. The model is solved using the software GEMPACK (Harrison and Pearson, 1996).

Household income and expenditure

In the GTAP model each region has a single representative household, termed as the regional household. The income of the regional household is generated through factor payments and tax revenues (including export and import taxes) net of subsidies. The regional household allocates expenditure over private household expenditure, government expenditure and savings according to a Cobb Douglas per capita utility function. Thus each component of final demand maintains a constant share of total regional income.[8]

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

The government consumption

The government also spends its income on domestic and imported commodities and also pays taxes. For the government, taxes consist of commodity taxes for domestically produced and

[7] Full documentation of the GTAP model and the database can be found in Hertel (1997) and also in Dimaranan and McDougall (2002).
[8] Savings enter in the static utility function as a proxy for future consumption

imported commodities. Like the private household, government consumption is a CES composition of domestically produced goods and imports.

Savings and Investment

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

Producers' income

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

Production technology

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

International trade

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

Closure

All of the experiments were carried out within a modified standard GTAP closure. In the modifications rice exports from Japan, Korea and Taiwan are held fixed. The rice exports from these countries are largely food aid and are highly unlikely to expand when domestic prices fall in the wake of trade reform. If the exports of rice from these countries are not kept fixed, lower domestic prices translate into lower export prices, and there are dramatic increases in exports from the Japan/Korea/Taiwan region. This leads to a fall in the world average price of rice, which appears to be unrealistic under a global trade reform. This adjustment in the model was incorporated by treating the exports of rice from Japan/Korea/Taiwan regions exogenous and export taxes on rice in these regions endogenous.

3.2. Data, region and commodity aggregation

This study applies version 6 of the GTAP database, which uses 2001 as the base (Dimaranan and McDougall, 2002). Data on regions and commodities are aggregated to meet the objectives of this study. The version 6 of GTAP database covers 57 commodities, 87 regions/countries, and 5 factors of production. To meet the specific research question in mind, the current study has aggregated 57 commodities into 14, and 87 regions into 19 as shown in table 2 and 3 below.

Table 2: Commodity Aggregation

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

In the GTAP database, each industry produces one commodity. So there is a one to one relation between industries and commodities. Since the focus of the present study is the global liberalisation of rice trade, two variants of rice are considered separately in the study: paddy rice and milled rice. In addition, a number of other agricultural commodities have been included in the commodity list in order to explore the implications arising from the global agricultural trade liberalisation.

In the regional aggregation (table 3) 12 countries have been treated as focus regions on the basis of their importance in rice production and trade (export or import). Among the 12 focus regions there are four South Asian countries: Bangladesh, India, Sri Lanka and Pakistan. The GTAP database 6 does not include Pakistan as a separate country, rather it is included under the category 'rest of South Asia' where data from all the South Asia countries except Bangladesh, India and Sri Lanka are lumped together. Given the relative size and significance of the economies included in 'rest of South Asia', it may not be inappropriate to use this region as a proxy for Pakistan.

Table 3: Region aggregation

Aggregated regions	Comprising regions
Bangladesh	Bangladesh
India	India
Sri Lanka	Sri Lanka
Pakistan	Rest of South Asia (comprising Pakistan, Bhutan and Nepal)
Thailand	Thailand
China	China and Hong Kong
Japan	Japan
Korea	Republic of Korea
Taiwan	Taiwan
Malaysia	Malaysia
Indonesia	Indonesia
Philippine	Philippine
Vietnam	Vietnam
Brazil	Brazil
Uruguay	Uruguay
USA	USA
Canada	Canada
EU	EU-15
ROW	Rest of the World

IV. Simulation Design

Base data and base year adjustments

In contrast to the version 5 of the GTAP database, version 6 has 2001 as the base year instead of 1997, updated national, economic and trade data, and more importantly protection data from a new source.[9] The new GTAP database has lower tariffs than the earlier versions as a result of the reform efforts between 1997 and 2001 (which includes, for example, China's progress towards WTO accession and continued implementation of the Uruguay Round Agreement) and the inclusion of bilateral trade preferences. The GTAP database has been further adjusted to incorporate the phasing out of the Multi Fibre Agreement (MFA) in 2005. It was also checked whether China's accession to WTO posed any impact on the simulation results. Due to the lack of access to any detailed information on China' commitment to WTO with respect to her tariff cuts, this paper performed this exercise by an ad hoc cut of China's tariff rates by 50 percent, and updated the database accordingly. But, it appears that the simulation results did not vary much (between with or without China's WTO accession). Therefore, in this paper we report simulation results where base-year data has been adjusted only for the MFA phase out.

Scenarios

To examine the impacts of global liberalisation of rice trade six simulation experiments were carried out (table 4). Scenario 1 considers full liberalisation of rice trade in all countries. This

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

scenario incorporates a complete removal of tariffs, export subsidies and domestic support measures on rice production and trade in all countries. In the second scenario only the developed countries liberalise rice trade, whereas the developing countries do not participate in the liberalisation process. This scenario will examine whether protection in the developed countries is the dominant factor in influencing the rice trade or not. Scenario 3 depicts a partial market opening by considering a 50 percent liberalisation of rice trade in all countries. Full liberalisation of all agricultural trade (including rice) in all countries is considered in scenario 4. Scenario 5 implements a 50 percent liberalisation of all agricultural trade in all countries. Finally, scenario 6 is designed to assess the implications of the recently concluded Hong Kong Ministerial Conference where the members agreed to eliminate only export subsidies in agriculture in all countries by 2013.

Table 4: Scenarios

Name	Explanation	Output Subsidy Removal by	Input Subsidy Removal by	Land Subsidy Removal by	Capital Subsidy Removal by	Export Subsidy Removal by	Import Tariffs Removal by
Scenario 1 (Complete Rice Trade Liberalisation)	Complete abolition of all tariffs, subsidies, domestic supports on only **rice** trade in all countries	100%	100%	100%	100%	100%	100%
Scenario 2 (Complete Rice Trade Liberalisation in the Developed Countries)	Complete abolition of all tariffs, subsidies, domestic supports on **rice** trade ***only in the developed countries, the developing countries do not participate***	100% (only in developed countries)	100% (only in developed countries)	100% (only in developed countries)	100% (only in developed countries)	100% (only in developed countries)	100% (only in developed countries)
Scenario 3 (Partial Rice Trade Liberalisation)	Partial liberalisation of tariffs, subsidies and domestic supports on **rice** trade in all countries.	50%	50%	50%	50%	50%	50%
Scenario 4 (Complete Agricultural Trade Liberalisation)	Complete liberalisation of all tariffs, subsidies, domestic supports on **all agricultural trade** in all countries	100%	100%	100%	100%	100%	100%
Scenario 5 (Partial Agricultural Trade Liberalisation)	Partial liberalisation of tariffs, subsidies and domestic supports on **all agricultural trade** in all countries.	50%	50%	50%	50%	50%	50%
Scenario 6 (Hong Kong Scenario)	Elimination of only export subsidies in agricultural trade in all countries	NA	NA	NA	NA	100%	NA

Note: NA indicates 'Not Applicable'

V. Simulation Outcomes

5.1. Changes in Rice Production

It appears from table 5 that under *scenario 1* the largest increase in the production of paddy rice is in Thailand followed by China. Both the USA and the EU experience a drastic decline in paddy rice production. Paddy rice production in India, Sri Lanka and Pakistan increases in the range 2-3 percent, while Bangladesh does not experience any increase in production. In the case of milled rice, there is a dramatic increase in production in the USA (65 percent)

followed by in China (25 percent). In contrast, the production of milled rice in the EU declines drastically. All the four South Asian countries endure slight decline in the production of milled rice. Total world production of paddy and milled rice decline by 17.2 and 8.8 percent respectively. The reason behind the drastic fall in paddy rice production in the USA and the EU and the fall in milled rice production in the EU can be explained by the fact that they are heavily protected (annex tables 1-7), and thus are inefficient. Therefore, a radical liberalisation as depicted in this scenario exposes the inefficient rice producers in the USA and the EU to open foreign competition. This then shifts the economic incentives against producing rice in these two regions.

Table 5: Percentage change in quantity of rice production

	Scenario 1		Scenario 2		Scenario 3		Scenario 4		Scenario 5		Scenario 6	
	Paddy Rice	Milled Rice	Paddy Rice	Milled Rice	Paddy Rice	Milled Rice	Paddy Rice	Milled Rice	Paddy Rice	Milled Rice	Paddy Rice	Milled Rice
BGD	0.00	-0.02	0.06	0.05	-0.02	-0.03	0.06	0.04	0.02	0.02	-0.01	-0.02
IND	1.93	-0.17	3.42	0.82	0.66	-0.36	3.39	0.10	0.87	-0.15	0.00	0.12
LKA	2.30	-1.94	2.39	1.51	0.38	-1.10	1.46	-1.31	0.27	-0.95	-0.04	0.12
PAK	2.85	-0.56	4.39	1.55	1.04	-0.68	3.88	-0.30	1.28	-0.60	0.09	0.31
THA	26.53	24.91	19.90	15.47	8.97	8.29	22.04	21.03	7.26	6.98	-0.03	0.12
CHN	19.22	10.37	18.26	9.43	1.60	1.28	22.58	12.10	1.87	1.63	0.04	0.07
INS	-1.00	-1.01	0.40	0.33	-0.57	-0.56	-1.43	-1.41	-0.67	-0.64	-0.04	-0.05
PHL	-5.72	-7.07	0.31	0.35	-2.49	-3.07	-5.84	-7.15	-2.53	-3.08	-0.06	-0.09
VNM	6.75	11.64	3.27	5.17	2.09	3.63	5.19	13.99	1.20	4.72	0.20	0.14
BZL	1.67	0.04	0.57	0.09	0.32	-0.02	7.77	0.11	3.07	0.07	0.41	0.06
USA	-51.29	64.79	-53.41	55.51	-29.62	10.37	-42.67	58.73	-24.64	8.68	-0.38	0.88
EU	-62.28	-53.24	-68.19	-54.71	-41.75	-25.14	-83.19	-54.78	-37.19	-24.75	-1.30	-6.28
World	-17.17	-8.86	-17.11	-8.41	-3.77	-2.46	-18.37	-8.81	-3.33	-2.28	0.03	-0.01

Source: Simulation results
Note: BGD = Bangladesh, IND = India, LKA = Sri Lanka, PAK = Pakistan, THA = Thailand, CHN = China, INS = Indonesia, PHL = Philippines, VNM = Vietnam, BZL = Brazil, USA = United States of America, EU = European Union

The results of *scenario 2* suggest an increase in the paddy rice production in Thailand and China by lesser extents than those under scenario 1. However, the decline in paddy rice production in the USA and the EU is higher than those under the previous scenario. In the case of milled rice, the USA again turns out to be the country with the largest increase in production. The EU experiences the largest fall in milled rice production. At the world level the changes in the production of both paddy and milled rice are almost similar to the results under scenario 1. The pattern of the changes in rice production under *scenario 3* is almost same as under scenario 1, though the magnitudes of changes are much smaller. The global paddy and milled rice production decline by 3.7 and 2.5 percent respectively. A complete liberalisation of agricultural trade under *scenario 4* leads to the highest fall in world paddy rice production (by 18.3 percent) among all the six scenarios. The world milled rice production also declines by 8.8 percent. Paddy rice production in both Thailand and China increases by more than 20 percent. In the EU, the production of paddy rice is reduced by more than 80 percent. In South Asia, both India and Pakistan experience an increase in paddy rice production by more than 3 percent. In the case of milled rice, the USA expands production by 58 percent. *Scenario 5* generates outcomes almost similar to those under scenario 3. Under *scenario 6* world paddy rice production increases by 0.03 percent and the world milled rice production declines by 0.01 percent. All focus countries experience slight changes in the production of both paddy and milled rice. It thus appears that the implementation of the Hong Kong Ministerial Declaration will have negligible effects on the level of rice production.

5.2. Changes in Rice Prices

As pointed out in the introductory section, the impact on the import price of rice followed by the liberalisation of rice trade is likely to be a net outcome of two effects of opposite direction: on the one hand, global tariff liberalisation will lower the import price, the removal of subsidies and all forms of domestic support measures will likely to increase the import price on the other. In spite of the high tariff barriers in many of the developed and developing countries (annex tables 1 and 2), the import price of rice is likely to rise after by the full liberalisation because of the predominance of enormous amount of subsidies and domestic support measures in a number of developed countries (annex tables 3, 4, 5, 6 and 7). This is what is exactly confirmed by the simulation results. When all protection is abolished, import price increases in all the regions (table 6). In fact, import prices rise in all simulation experiments. The import price of rice (both paddy and milled) increase significantly in a number of regions under the full rice trade liberalisation (scenario 1 and 4). The highest increase in the import price of paddy rice is observed in Thailand (14 percent) under scenario 1, and in India (15 percent) under scenario 4. On average, the world import price index of paddy increases by 8.6 percent in scenario 1, and 11 percent in scenario 4.

In the case of milled rice, China experiences the highest increase in its import price (15 percent in scenario 1, and 17 percent in scenario 4). The world import price index of milled rice increases by 6.6 percent and 7 percent under scenario 1 and 4 respectively. Under scenario 4, the import prices of not only rice but also of all agricultural commodities increase (annex table 9). The import price increases under the scenarios of partial trade liberalisation (scenario 3 and 5) are observed to be less pronounced in comparison with the simulation results for full liberalisation. When all export subsidies are abolished (scenario 6) world import price indices for paddy and milled rice increase by only 0.198 and 0.715 percent respectively. Compared to scenarios 1 and 4, these rises in import prices are very weak. This is attributable to the fact that compared to other domestic support measures export subsides on rice is negligible.

The changes in world export price indices for paddy and milled rice are close to the changes for world import price indices – the differences are due to the presence of international trade and transport margins (Hertel and Ivanic, 2006). The price increases (for both exports and imports) in scenario 2 are different from price increases in scenario 1, which suggests that liberalisation in the developing countries also has an important influence.

Table 6: Percentage changes in regional import price and regional export price of paddy and milled rice

		BGD	IND	LKA	PAK	THA	CHN	INS	PHL	VNM	BZL	USA	EU	World*
Scenario 1	Import Price of **Paddy** Rice	4.698	10.38	6.786	7.768	4.504	5.057	10.64	14.41	4.286	2.071	5.198	10.553	8.651
	Export Price of **Paddy** Rice	0.075	7.398	1.222	4.245	23.95	4.614	-0.731	-3.934	5.424	1.485	85.49	4.367	9.243
	Import Price of **Milled** Rice	3.394	5.143	5.03	5.355	2.391	15.50	10.38	5.785	5.341	0.876	9.093	5.022	6.633
	Export Price of **Milled** Rice	0.071	8.59	0.174	5.579	19.38	1.873	-0.595	-2.782	5.418	0.4	2.497	-4.903	7.732
Scenario 2	Import Price of **Paddy** Rice	2.369	4.17	1.659	6.459	3.319	4.114	5.674	6.984	4.043	1.281	2.522	7.756	8.153
	Export Price of **Paddy** Rice	0.145	1.776	1.306	2.294	16.755	4.375	0.397	0.172	2.521	0.1	84.38	3.416	8.746
	Import Price of **Milled** Rice	0.636	2.945	0.291	0.953	1.482	10.866	6.061	3.664	2.455	0.516	5.935	3.579	3.681
	Export Price of **Milled** Rice	0.12	0.486	0.248	0.862	13.562	1.772	0.33	0.145	2.518	0.071	2.413	-5.555	4.284
Scenario 3	Import Price of **Paddy** Rice	1.434	3.619	3.102	4.818	1.204	1.832	3.42	7.51	0.363	0.564	1.964	4.253	4.042
	Export Price of **Paddy** Rice	-0.007	3.39	0.187	1.853	6.879	0.378	-0.466	-1.754	1.548	0.664	30.12	3.14	4.344
	Import Price of **Milled** Rice	1.686	1.462	2.727	2.487	0.751	4.516	3.218	1.822	1.61	0.237	3.147	0.87	2.244
	Export Price of **Milled** Rice	-0.001	4.896	0.019	2.588	5.57	0.161	-0.38	-1.241	1.546	0.165	0.982	-1.301	2.616
Scenario 4	Import Price of **Paddy** Rice	3.433	15.78	3.34	8.904	5.481	7.77	9.376	14.59	3.145	7.361	4.657	12.49	11.31
	Export Price of **Paddy** Rice	-1.841	3.602	3.384	4.001	27.28	3.328	3.458	-3.968	3.754	13.02	79.75	12.84	12.15
	Import Price of **Milled** Rice	3.2	4.824	4.173	4.624	1.868	17.80	10.12	5.746	4.811	3.573	9.598	6.049	7.217
	Export Price of **Milled** Rice	-1.313	6.615	-2.324	4.793	22.34	0.115	2.946	-2.765	3.748	7.549	4.709	-3.473	8.414
Scenario 5	Import Price of **Paddy** Rice	0.32	3.943	1.265	3.895	1.083	2.075	2.595	6.633	-0.247	1.829	1.109	2.732	3.573
	Export Price of **Paddy** Rice	-1.122	1.366	0.65	0.735	7.561	-0.303	0.357	-2.311	-0.118	3.509	25.33	-0.121	3.831
	Import Price of **Milled** Rice	1.051	1.031	1.847	1.839	0.064	5.042	2.806	1.298	0.997	0.943	3.029	0.55	2.055
	Export Price of **Milled** Rice	-0.772	3.222	-1.449	1.875	6.251	-0.733	0.339	-1.616	-0.119	2.032	1.799	-1.81	2.378
Scenario 6	Import Price of **Paddy** Rice	0.348	0.442	0.228	0.301	0.443	0.536	0.608	0.379	0.133	0.416	0.319	0.088	0.198
	Export Price of **Paddy** Rice	0.198	0.244	0.285	0.27	0.885	0.136	0.565	0.697	0.593	0.295	0.423	-0.765	0.214
	Import Price of **Milled** Rice	0.303	0.549	1.414	0.158	0.954	0.647	0.466	0.418	1.14	0.358	1.014	0.152	0.715
	Export Price of **Milled** Rice	0.128	0.104	0.331	0.155	0.719	0.089	0.468	0.504	0.592	0.186	0.099	5.486	0.837

Source: Simulation results
Note: BGD = Bangladesh, IND = India, LKA = Sri Lanka, PAK = Pakistan, THA = Thailand, CHN = China, INS = Indonesia, PHL = Philippines, VNM = Vietnam, BZL = Brazil, USA = United States of America, EU = European Union
*Calculated as a weighted average of respective price changes, excluding intra-EU trade.

5.3. Changes in Rice Trade

As a result of liberalisation, rice trade in the world increases under all scenarios except scenario 6 (table 7). The highest increase in rice trade takes place under full agricultural liberalisation (scenario 4). Partial trade liberalisation (scenarios 3 and 5) has moderate effects, as the expansion in rice trade (for both paddy and milled) is found to be in the range 13-14 percent. Our results suggest that the implementation of the Hong Kong Declaration will likely to have only a minimal effect on global rice trade.

Among the South Asian countries Bangladesh's import volume of paddy rice declines under all the six scenarios, while that of milled rice increases under all scenarios except scenario 2

and 6. When only developed countries are liberalising (scenario 2), rice imports (both paddy and milled) of all the South Asian countries decrease. For the USA and the EU, imports of rice (paddy rice in the USA and paddy and milled rice in the EU) increases as the cost of producing rice domestically rises after the liberalisation of the rice sector, leading to the substitution of domestic production with imports.

Table 7: Percentage changes in volumes of regional imports and exports of paddy and milled rice

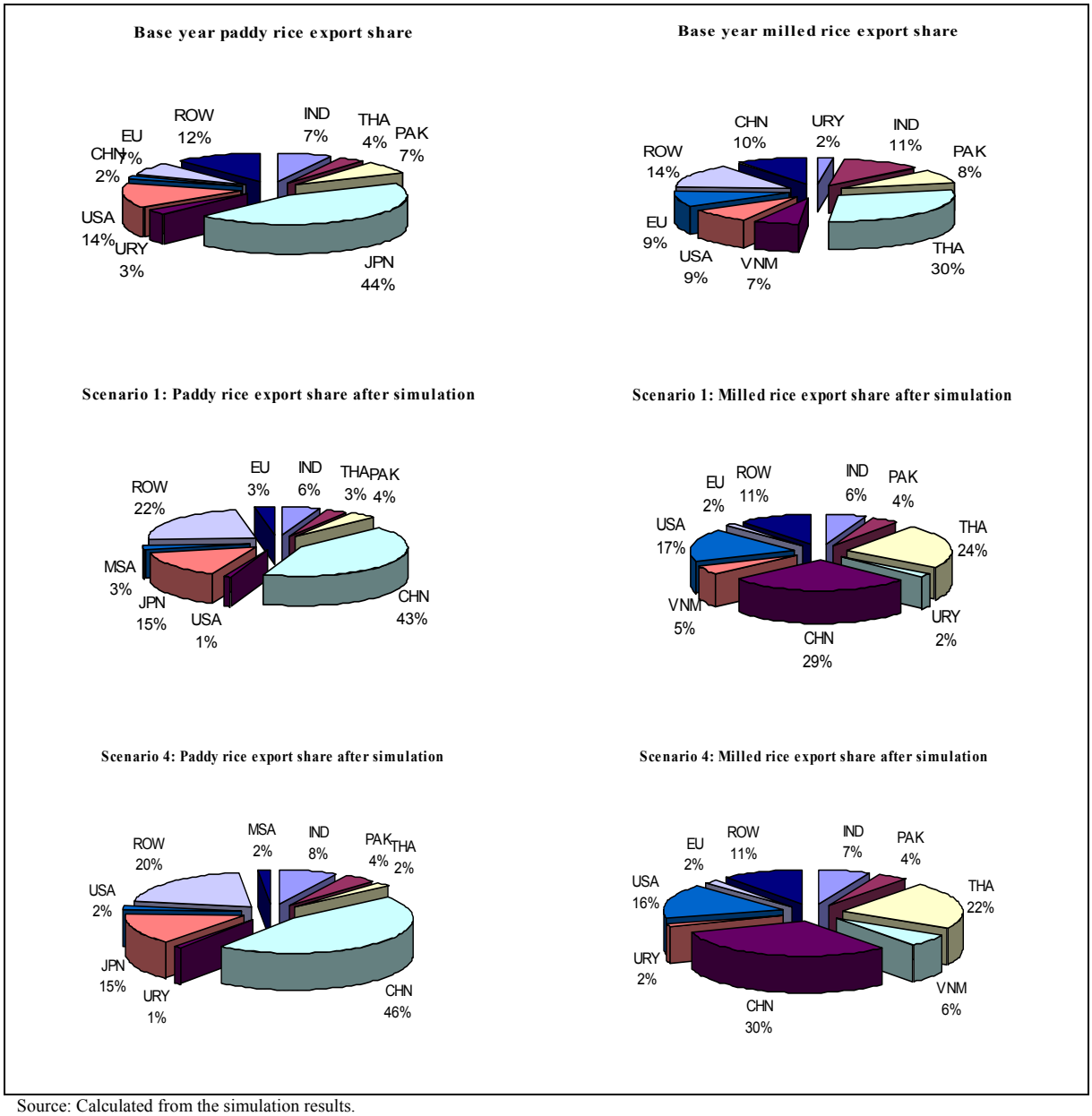
		BGD	IND	LKA	PAK	THA	CHN	INS	PHL	VNM	BZL	USA	EU	World
Scenario 1	Imports of **Paddy** Rice	-11.19	52.72	240.08	22.79	215.94	0.38	13.78	0.74	103.36	-2.25	1105.39	18.18	179.85
	Exports of **Paddy** Rice	695.60	128.95	732.66	71.37	143.66	5908.63	317.71	425.17	63.16	783.53	-74.65	-23.68	179.85
	Imports of **Milled** Rice	4.21	278.00	83.24	2.04	64.27	-25.05	31.27	113.73	35.66	-0.18	-3.79	43.82	94.83
	Exports of **Milled** Rice	141.88	8.21	294.74	2.43	59.42	469.89	-16.46	-30.96	59.89	16.17	290.23	-62.68	94.83
Scenario 2	Imports of **Paddy** Rice	-10.47	-7.32	-1.84	-19.35	101.16	1.95	-20.49	-23.86	-8.47	-5.18	1164.20	19.16	173.02
	Exports of **Paddy** Rice	566.84	184.29	528.06	84.52	231.56	5706.66	226.78	168.08	48.71	73.25	-74.99	-41.35	173.02
	Imports of **Milled** Rice	-1.31	-5.56	-0.11	-0.22	31.25	-19.27	-12.65	-8.02	0.51	-1.09	2.32	44.73	81.26
	Exports of **Milled** Rice	141.51	23.81	267.37	14.76	37.28	428.62	-23.03	-38.28	26.66	6.19	252.08	-65.12	81.26
Scenario 3	Imports of **Paddy** Rice	-1.85	24.81	72.89	-0.29	47.56	-6.02	13.83	-4.95	46.09	0.57	226.75	6.40	14.24
	Exports of **Paddy** Rice	140.54	53.43	158.53	30.71	53.43	398.47	49.25	104.36	29.87	202.06	-66.50	-60.45	14.24
	Imports of **Milled** Rice	1.90	78.28	30.96	0.97	18.12	-8.87	17.62	43.80	12.70	0.20	-0.03	2.68	13.97
	Exports of **Milled** Rice	-4.04	-3.23	62.48	-4.96	19.68	56.41	-3.01	-26.42	18.66	3.84	46.99	-42.99	13.97
Scenario 4	Imports of **Paddy** Rice	-13.93	12.40	346.27	16.45	247.85	-17.45	43.01	4.33	68.11	38.58	1030.80	21.32	189.22
	Exports of **Paddy** Rice	753.97	216.26	549.83	92.99	97.08	6632.74	296.06	416.43	116.06	332.97	-55.83	-107.00	189.22
	Imports of **Milled** Rice	1.04	264.96	77.40	1.90	77.92	-30.77	43.37	113.99	30.54	11.66	0.26	40.28	95.54
	Exports of **Milled** Rice	164.13	21.86	341.84	3.66	47.32	521.95	-27.42	-27.46	75.99	-10.92	264.25	-64.32	95.54
Scenario 5	Imports of **Paddy** Rice	-1.81	13.26	93.95	-1.25	52.40	-10.01	22.43	-1.85	28.68	11.68	189.84	4.05	13.14
	Exports of **Paddy** Rice	128.07	61.70	116.57	35.10	28.98	327.90	42.81	91.64	44.69	130.37	-55.98	-50.39	13.14
	Imports of **Milled** Rice	1.55	73.10	29.48	0.87	22.63	-11.75	20.91	44.29	9.47	3.35	2.14	2.15	13.88
	Exports of **Milled** Rice	-0.90	3.05	71.92	-3.24	15.38	61.16	-7.17	-25.12	25.86	-5.16	40.23	-42.37	13.88
Scenario 6	Imports of **Paddy** Rice	-0.76	-0.99	0.25	-0.16	2.33	-1.98	-0.24	1.59	2.87	-0.19	0.73	-3.35	0.02
	Exports of **Paddy** Rice	1.60	-2.88	-1.61	-0.85	-6.38	1.10	0.19	-5.82	-2.48	0.18	-1.67	5.68	0.02
	Imports of **Milled** Rice	-0.47	-1.15	-2.64	-0.03	-0.70	-1.19	-0.06	0.13	-1.41	-0.40	-1.94	-1.26	-0.67
	Exports of **Milled** Rice	1.56	3.20	0.38	2.89	0.24	2.71	-0.76	-0.97	0.66	2.79	2.54	-21.54	-0.67

Source: Simulation results
Note: BGD = Bangladesh, IND = India, LKA = Sri Lanka, PAK = Pakistan, THA = Thailand, CHN = China, INS = Indonesia, PHL = Philippines, VNM = Vietnam, BZL = Brazil, USA = United States of America, EU = European Union
*Calculated as a weighted average of respective volume changes, excluding intra-EU trade.

Following the liberalisation, exports of rice increase for most of the countries (table 7). However, exports of paddy rice from the USA and the EU, and those of milled rice from the EU decrease in almost all scenarios. This is because of the fact that the production shrink drastically as a result of trade liberalisation (table 5). Under full rice trade liberalisation (scenario 1, 2 and 4) rice exports from all the South Asian countries increase. However, the large increases that are found to be associated with Bangladesh and Sri Lanka (in table 7)

reflect only the very small initial export base of the countries. On the other hand, the rise in rice exports from India, Pakistan, Thailand, China, and Vietnam contribute significantly to the increase in world rice exports. Particularly, the export boom from China is likely become a more striking feature under the full liberalisation scenarios.

Figure 3: A comparison of export shares before and after trade liberalisation



Source: Calculated from the simulation results.

Note: IND = India, PAK = Pakistan, THA = Thailand, CHN = China, JAP = Japan, VNM = Vietnam, MSA = Malaysia, URY = Uruguay, USA = United States of America, EU = European Union, ROW = Rest of the World

Figure 3 shows that the liberalisation of rice and agricultural sectors dramatically changes the world rice export shares among different countries. In the case of paddy rice exports Japan and the USA had the largest share in the base year. But, under both scenarios 1 and 4, China

turns out to be the largest sharer of the pie. In the case of milled rice, again China' share increases significantly, from 10 percent in the base year to around 30 percent. For both paddy and milled rice, the shares of India and Pakistan decline under scenario 1. Under scenario 4, however, the share of India in milled rice exports increases by 1 percent.

5.4. Effects on Terms of Trade and Real GDP

Different scenarios have different impacts on the terms of trade of the countries listed in table 8. However, by large, liberalisation of only rice trade (scenario 1, 2 and 3) generates more favourable effects on the terms of trade for most of the countries than those under full agricultural trade liberalisation (scenario 4). The Hong Kong scenario has negative implications for terms of trade for all countries expect India.

In the case of only rice liberalisation, the changes in production and demand for rice exert marginal impacts on the real GDP of the focus countries. For the South Asian countries as well, the insignificant effects on their respective GDPs are detected. With the liberalisation of all agricultural products real GDP increases in all countries (scenario 4). However, the implementation of Hong Kong Declaration has virtually no impact on the real GDPs of the focus countries.

Table 8: Effects of Terms of Trade and Real GDP

	Scenario 1		Scenario 2		Scenario 3		Scenario 4		Scenario 5		Scenario 6	
	Terms of Trade	Real GDP	Terms of Trade	Real GDP	Terms of Trade	Real GDP	Terms of Trade	Real GDP	Terms of Trade	Real GDP	Terms of Trade	Real GDP
BGD	-0.01	0.00	0.02	0.00	-0.02	0.00	-1.12	0.11	-0.46	0.07	-0.10	0.00
IND	0.17	0.00	0.12	-0.01	0.06	0.00	-1.02	0.38	-0.44	0.23	0.05	-0.01
LKA	0.02	0.02	0.08	0.01	-0.02	0.01	1.48	0.15	0.41	0.09	-0.02	-0.01
PAK	0.32	0.00	0.27	0.00	0.11	0.00	-0.44	0.16	-0.36	0.13	-0.03	-0.01
THA	0.98	-0.09	0.66	-0.06	0.25	-0.03	1.50	0.43	0.44	0.27	0.02	0.00
CHN	0.22	-0.02	0.21	-0.02	0.02	0.00	-0.28	0.38	-0.13	0.22	-0.02	0.00
INS	-0.34	0.01	-0.33	-0.01	-0.03	0.01	-0.86	0.04	-0.21	0.02	-0.06	-0.01
PHL	-0.09	0.13	-0.08	-0.01	0.00	0.07	-0.67	0.15	-0.07	0.11	-0.02	-0.02
VNM	0.04	0.03	0.04	0.01	0.01	0.01	-0.34	0.60	-0.13	0.41	-0.03	-0.01
BZL	0.04	0.00	0.04	0.00	-0.01	0.00	0.13	0.10	0.04	0.03	-0.02	0.00
USA	-0.05	0.00	0.00	0.00	-0.02	0.00	0.27	0.01	0.04	0.01	-0.04	0.00
EU	-0.19	0.01	0.02	0.01	-0.08	0.01	-0.43	-0.07	-0.22	0.05	-0.03	0.01

Source: Simulation results

Note: BGD = Bangladesh, IND = India, LKA = Sri Lanka, PAK = Pakistan, THA = Thailand, CHN = China, INS = Indonesia, PHL = Philippines, VNM = Vietnam, BZL = Brazil, USA = United States of America, EU = European Union

5.5. Welfare effects

In GTAP, welfare effects are measured using the equivalent variation (EV). The regional household's equivalent variation, resulting from a shock, is equal to the difference between the expenditure required to obtain the new level of utility at initial prices and the initial expenditure. Thus, the EV uses the current prices as the base and asks what income change at the current prices would be equivalent to the proposed change in terms of its impact on utility. Table 9 suggests that the global liberalisation of only rice sector generates negative welfare effects for Bangladesh (in scenarios 1 and 3), Indonesia (in scenarios 1, 2 and 3), the

Philippines (in scenario 2), and Brazil (only in scenario 3). Japan and Korea, the two most restricted rice markets, will experience huge welfare gains. Under the scenario of full liberalisation of all agricultural goods (scenario 4), Bangladesh and the Philippines encounter high welfare losses. However, the scenario of a partial liberalisation of all agricultural goods (scenario 5) generates relatively less welfare loss for Bangladesh and the Philippines. For India, Sri Lanka and Pakistan increases in welfare is associated with the liberalisation of all agricultural goods.

It becomes evident that countries initially with high domestic support measures, viz. Japan, Korea, the USA and the EU are the major gainers from trade liberalisation. It also appears that the net rice exporting countries, such India, Pakistan, Thailand, and China also post positive welfare gains from trade liberalisation. In GTAP framework the sources of welfare gains can be examined by decomposing welfare gains into its various components.

In the GTAP model the simulated welfare gains can be attributable mainly to (i) allocative efficiency, (ii) terms of trade (TOT) effect, and (iii) I-S effect. Allocative efficiency refers to the efficient industry-wise allocation of scarce resources to produce the optimal combination of outputs. The terms of trade (TOT) effect refers to the relative movement in prices of countries exports and imports. The TOT effect increases with a relative increase in the price of exports as compared to that of imports. TOT changes occur as producers and consumers adjust their purchasing and sale patterns in response to a policy change. Finally, the investment–savings (I-S) effects refer to impacts of changes in the price of investment (capital goods) and savings.

It appears from table 9 that the countries initially with high distorting agricultural trade regime gain significant allocative efficiency after liberalisation. Liberalisation leads to reallocation of resources from the inefficient sectors to the more efficient sectors. For efficient rice producing countries like China and Thailand, welfare effects are dominated by terms of trade gains.

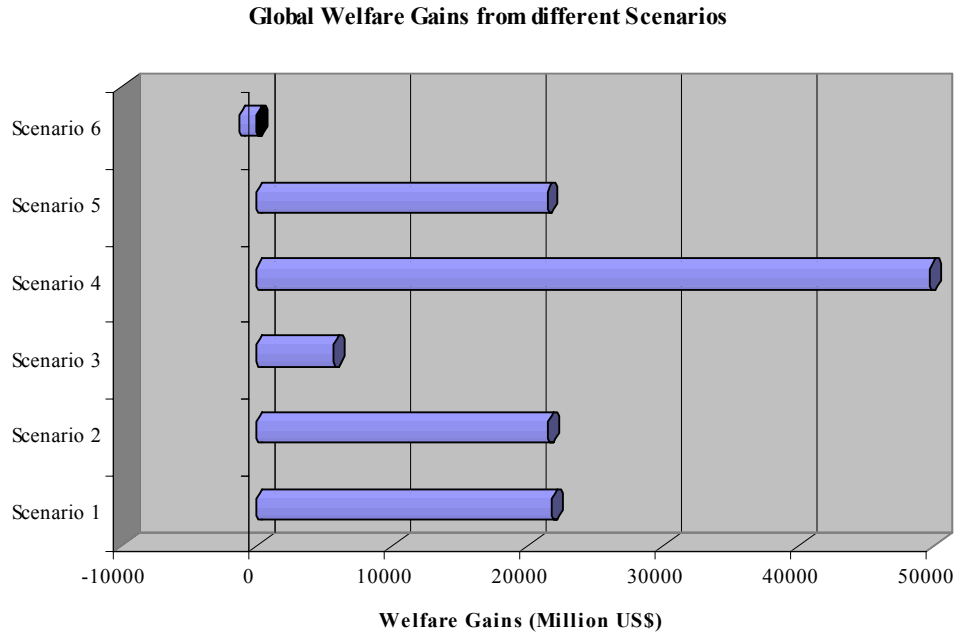
The global welfare increases under all scenarios expect scenario 6 (figure 4). The maximum welfare gain is achieved under a complete liberalisation of all agricultural trade (scenario 4). The Hong Kong scenario generates net loss in global welfare. Only India has positive welfare gains in South Asia. Also, large welfare gains are achieved in the EU under this scenario.

Table 9: Decomposing the changes in welfare ($ million)

		BGD	IND	LKA	PAK	THA	CHN	JAP	KOR	TAI	MAL	INS	PHL	VNM	BZL	URG	USA	CAN	EU	ROW
Simulation 1	Allocative Efficiency	-1.2	0	3.4	3.7	-98.1	-188.8	17723.5	3510.7	-2.3	-0.1	9.6	94.8	8.7	4.4	6.6	200.3	2.5	498.1	26.5
	Terms of Trade	-2	105	1.6	47	784.3	823	-1605.2	-173.8	47.5	48.1	-27.3	-74.6	72	10.8	21.6	315.7	-22	-151.7	-228.3
	IS Effect	0.4	-3.1	-0.1	0.2	-8.8	-163.7	171.6	44.5	4.3	21.9	4.1	-11.7	12.7	-1.6	4.5	-22.9	-1.7	-28.3	-21.5
	Total welfare Effect	-2.8	101.9	4.9	50.9	677.3	470.5	16289.8	3381.4	49.5	69.9	-13.6	8.5	93.4	13.6	32.7	493.1	-21.2	318.2	-223.2
Simulation 2	Allocative Efficiency	-1	-37.1	0.7	-1.8	-69.6	-175	17751.1	3479.7	-0.1	2.2	-7.9	-9.4	2.3	4.9	4.4	211.5	1.9	520.6	-165
	Terms of Trade	0.6	77.6	5.1	39.5	529.2	781.4	-1570	-163.4	45.1	52.8	-2.3	8.4	30.5	7.1	13.6	254.6	-17.5	-150.8	52.2
	IS Effect	0.8	-3.4	-0.1	0.8	-4.7	-157.6	170.1	42.4	3.5	19.4	0.6	-0.4	4.6	-1.5	3	-20.8	-2.4	-28.7	-24.8
	Total welfare Effect	0.4	37.1	5.7	38.4	454.8	448.8	16351.2	3358.7	48.4	74.4	-9.6	-1.4	37.3	10.5	21	445.3	-18	341.2	-137.5
Simulation 3	Allocative Efficiency	-0.4	5.8	1.7	1.6	-31.5	-12.6	4036.8	1093.1	-1.4	-1.3	6.9	50.1	3.2	0.3	1.4	182.6	1	357.9	45.3
	Terms of Trade	-1.6	39.3	-1	16.7	203.7	65.8	-127.4	0.5	7.6	-3.9	-11.9	-31.9	19.5	-1.3	4.7	34.7	-6.9	-55.4	-151.5
	IS Effect	-0.1	-0.1	0	0.1	-3.3	-14.5	16	3.8	0.4	2.2	1.4	-4.6	4	-0.3	0.9	-7.2	0.6	-0.2	0.7
	Total welfare Effect	-2.1	45	0.7	18.3	168.9	38.7	3925.4	1097.4	6.6	-3	-3.5	13.7	26.6	-1.2	7	210.1	-5.2	302.3	-105.5
Simulation 4	Allocative Efficiency	48.5	1822.5	23.1	136.4	489.5	4511.2	20266.4	9597	163.5	1076.3	60.1	104.7	194.5	513.8	49.9	871.2	337.5	8673.7	696.3
	Terms of Trade	-86.3	-687.5	95.5	-66.6	1170.4	-1252.1	-4285.5	-1356.5	-510.8	92.6	174.5	-168	-18.1	3362.2	140.5	6445.9	843	-5807.3	1763.6
	IS Effect	-18.7	-9.4	-0.6	-7.5	-59.5	-30.1	445.3	70.1	82.5	-37.5	-30.6	-27.3	-82.4	209	33.1	-342.3	-31.2	21.7	-188.8
	Total welfare Effect	-56.5	1125.6	118.1	62.4	1600.3	3229.1	16426.2	8310.6	-264.9	1131.3	204	-90.6	94	4085	223.5	6974.8	1149.3	3083.4	2271.2
Simulation 5	Allocative Efficiency	30.1	1108.6	14.3	112.8	307.9	2639.4	5519.6	3488.4	101.8	428.4	32.9	78.7	133.1	162.9	16.2	972.9	295.6	3930.3	2083.1
	Terms of Trade	-33.9	-281	26.2	-54.5	350.6	-539.9	-1033.5	-142.7	-181.3	46.7	31.4	-89.2	-52.3	837.3	36.8	1837.2	149.4	-968.8	50.5
	IS Effect	-7.1	0.3	-0.1	-2.7	-38.2	-15.9	115.3	-12.9	16.5	-40.7	-14	-10.4	-31.3	47	9.2	55.1	-13	-12.8	-44.6
	Total welfare Effect	-11	827.9	40.4	55.6	620.4	2083.5	4601.4	3332.8	-63	434.4	50.3	-20.9	49.5	1047.2	62.2	2865.2	432	2948.6	2089
Simulation 6	Allocative Efficiency	-1.5	-21.7	-0.8	-4.9	-1.1	-40	-218.7	3.1	-2.9	4.3	-7	-13.2	-2.9	1.9	1.3	-219.9	-102.6	1067.8	-1681.9
	Terms of Trade	-9.7	30.2	-1.4	-5.4	22.7	-79.1	-278.6	-45.9	-42.6	-27.2	-22	-12.8	4.2	55.9	7	140.4	24.1	1742	-1500.1
	IS Effect	-0.9	-2	0	-0.2	3.9	20.2	8.3	10.5	7.2	17.6	3	1	-1.4	1.2	1.5	-72.6	-2.4	16.3	-11.2
	Total welfare Effect	-12.1	6.4	-2.2	-10.6	25.4	-98.9	-489.1	-32.4	-38.3	-5.3	-25.9	-25	-0.1	59	9.8	-152.1	-81	2826.1	-3193.1

Note: BGD = Bangladesh, IND = India, LKA = Sri Lanka, PAK = Pakistan, THA = Thailand, CHN = China, JAP = Japan, KOR = Rep. of Korea, TAI = Taiwan, MAL = Malaysia, INS = Indonesia, PHL = Philippines, VNM = Vietnam, BZL = Brazil, URG = Uruguay, USA = United States of America, CAN = Canada, EU = European Union, ROW = Rest of the World

Figure 4:



VI. Conclusions

The aim of this paper has been to examine the impact of different liberalisation scenarios associated with the global rice and agricultural trade on different countries, using the GTAP general equilibrium modelling based simulation framework. The simulation results reveal that the liberalisation of the rice sector alone, as well as all agricultural products, cause regional import prices of rice to rise. Therefore, the increase in the import price of rice is likely to have profound welfare and poverty implications for the people of the countries that are heavily dependent on rice. On the other hand, export prices of rice also increase for many of the countries. The global rice trade increases significantly under the complete rice and agricultural trade liberalisation scenarios. While partial liberalisation leads to some modest increase in world trade and welfare gains, the impact of the complete removal of export subsidies alone, as agreed in the Hong Kong Ministerial Conference in 2005, is unlikely to have any discernible effect on global rice trade. The simulation results clearly demonstrate that the global distribution of welfare gains from rice and agriculture liberalisation is going to be highly unequal. Amongst others, while countries like Bangladesh, a net food-importing South Asian LDC, stand to suffer from welfare losses in most cases, such countries as China, India, and Thailand are set to enjoy net welfare gains.

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Annex Table 1. Bilateral import tariff on paddy rice (%)

	BGD	IND	LKA	PAK	THA	CHN	JPN	ROK	TAI	MSA	INS	PHIL	VNM	BRZL	URY	USA	CAN	EU	ROW
BGD	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	24	0
IND	5	0	35	14.3	14.3	0	0	0	0	0	15.7	25	0	0	0	3.1	0	49.7	0.8
LKA	0	0	0	14.1	0	0	0	0	0	0	0	0	0	0	0	6	0	72.4	1.5
PAK	2.5	0	35	0	0	0	0	0	0	0	16.7	0	0	0	0	3.1	0	49.8	0.2
THA	0	0	0	0	0	1	0	1000	0	0	19.6	0	0	13.7	0	6	0	95.2	1.2
CHN	0	0	0	0	0	0	1000	1000	0	0	12.9	0	15	0	0	6	0	43.2	8.5
JPN	5	0	0	0	0	0	0	0	0	0	14.2	0	0	0	0	4.2	0	93.8	0.1
ROK	2.5	0	0	0	0	0	0	0	0	0	25.5	0	0	0	0	9.9	0	89.2	9.1
TAI	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
MSA	0	0	0	0	0	0	1000	0	0	0	28.5	0	0	0	0	8.4	0	0	0
INS	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	53.9	0
PHIL	0	0	0	0	0	0	0	0	0	0	11.6	0	0	0	0	0	0	39.5	4.3
VNM	2.5	0	0	0	0	0	0	0	0	0	11.3	0	0	0	0	0	0	23.3	6.6
BRZL	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	6	0	96.4	22.3
URY	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	69.1	17.7
USA	0	80	0	0	0	1	804	1000	0	0	14.2	50	0	8.7	0	0	0	73.6	10
CAN	0	0	0	0	0	0	1000	0	0	0	0	0	0	0	0	0	0	78.2	8.4
EU	0	143	0	9	0	0	898	0	0	0	0	37.3	0	13.3	9.6	4.5	0	0	13.2
ROW	0.1	5.8	13.7	0	0	0.5	620	0	0	0	6.1	0.6	0	0	0.3	3.4	0	37.7	6.6

Note: BGD = Bangladesh, IND = India, LKA = Sri Lanka, PAK = Pakistan, THA = Thailand, CHN = China, JAP = Japan, KOR = Rep. of Korea, TAI = Taiwan, MAL = Malaysia, INS = Indonesia, PHL = Philippines, VNM = Vietnam, BZL = Brazil, URG = Uruguay, USA = United States of America, CAN = Canada, EU = European Union, ROW = Rest of the World

Annex Table 2. Bilateral import tariff on milled rice (%)

	BGD	IND	LKA	PAK	THA	CHN	JPN	ROK	TAI	MSA	INS	PHIL	VNM	BRZL	URY	USA	CAN	EU	ROW
BGD	0	0	0	0	0	0	913.4	0	0	0	0	0	0	0	0	5.3	0	4.4	0
IND	5	0	35	3.3	20	1	826.9	1000	0	0	16.6	50	30	17	0	2.1	0	106.2	10.7
LKA	0	0	0	0.2	0	1	0	1000	0	0	0	0	0	0	0	9.2	0	162.5	2.1
PAK	5	80	35	0	20	1	826.9	1000	0	0	16.5	0	0	14.3	0	2.1	0	105.6	5.3
THA	5	73.7	35	7.6	0	1	1000	1000	0	0	28.4	50	30	17	0	3.6	0	154.7	22.9
CHN	5	70	0	0	0	0	1000	1000	0	0	25.8	50	0	0	0	9.2	0	156.5	10.6
JPN	5	0	35	10	18	0	0	1000	0	0	13.1	50	0	0	0	7.5	0	82.4	9.8
ROK	5	0	0	0	0	1	872.9	0	0	0	15.7	0	0	0	0	7.5	0	45.3	0.8
TAI	0	0	0	0	0	1	0	0	0	0	0	50	0	0	0	7.5	0	21.7	17.5
MSA	0	0	0	0	0	0	0	0	0	0	24.3	0	0	0	0	8.6	0	0	0.3
INS	0	0	0	0	0	1	0	0	0	0	0	50	0	0	0	3.6	0	45.7	2.9
PHIL	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2.8	0	0	1.3
VNM	5	0	0	0	0	0	832	1000	0	0	17.5	50	0	0	0	7.2	0	54.4	9.9
BRZL	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	9.2	0	19.7	8.1
URY	0	0	0	0	0	0	1000	0	0	0	0	0	0	0	0	3	0	90.8	10.7
USA	0	70	0	10	18.4	1	780.5	1000	0	0	13.2	50	30	16.8	0	0	0	93.8	10.3
CAN	0	0	0	0	0	0	0	0	0	0	13.1	0	0	0	0	0	0	94.6	7
EU	0	17	34.8	1.7	5.2	0.2	379.6	12.3	0	0	9.3	14.2	14.9	13.9	7	6.5	0	0	7.7
ROW	5	20.2	29.2	0.2	9.8	0.7	691.7	39.1	0	0	24.3	8.9	3.6	0	0	4.7	0	38.8	6.7

Note: BGD = Bangladesh, IND = India, LKA = Sri Lanka, PAK = Pakistan, THA = Thailand, CHN = China, JAP = Japan, KOR = Rep. of Korea, TAI = Taiwan, MAL = Malaysia, INS = Indonesia, PHL = Philippines, VNM = Vietnam, BZL = Brazil, URG = Uruguay, USA = United States of America, CAN = Canada, EU = European Union, ROW = Rest of the World

Annex Table 3. Output Subsidies (taxes) as percentage of the value of total output

	BGD	IND	LKA	PAK	JPN	BRZL	USA	CAN	EU
Paddy Rice	0	6.385	0	2.662	5.638	1.222	85.691	-0.238	-0.304
Milled Rice	1.61	10.424	0.002	10.262	0.016	1.526	3.624	0.542	0.284
Wheat	0.166	3.518	1.922	3.503	1.518	1.27	6.65	5.606	0.212
Other Cereal	-1.172	2.858	0.114	1.992	0.393	0.063	3.873	0.178	1.314
Commercial crop	-0.078	6.385	0	3.968	-0.035	-2.784	0	-0.057	-0.026
Milk and Dairy	-1.225	-0.129	1.975	0.241	3.528	1.164	2.747	0.707	0.249
Other food	-4.898	-2.554	-0.001	-2.179	-14.085	-2.866	0	-0.456	-2.192
Live Stock	-0.956	-0.24	1.976	-0.069	1.321	1.292	0.039	0.983	0.084
Other Agriculture	-1.341	2.279	1.159	1.797	-3.694	1.279	2.758	-1.068	3.097

Note: A positive (negative) sign refers to a subsidy (tax).

Annex Table 4. Ad valorem taxes on domestic purchases by paddy rice production (%)

	Japan	Korea	USA	EU
Paddy Rice	-4.9	-4.4	-5.6	-5.9
Milled Rice	0	0	0	0
Wheat	0	-4.4	0	0
Other Cereal	0	0	0	0
Commercial crop	-4.6	-4.2	0	-0.1
Milk and Dairy	-4.9	-4.4	-5.6	0
Other food	-4.9	-1	0	-1.2
Live Stock	-4.9	-4.4	0	0
Other Agriculture	-4.9	-4.4	0	-5.4
Mineral	0	0	-5.6	-5.3
Textile	-4.9	-4.4	-5.6	-3
Wearing Apparel	-4.9	-4.4	0	-2.2
Other Manufacturing	3.2	-3.7	-4.2	31.8
Services	-4.8	-4	-5.6	-1.9

Note: A negative (positive) sign refers to a subsidy (tax).

Annex Table 5. Ad valorem taxes on domestic purchases by milled rice production (%)

	Japan	Korea	USA	EU
Paddy Rice	0.0	-4.4	0.0	0.0
Milled Rice	0.0	0.0	0.0	0.0
Wheat	0.0	0.0	0.0	0.0
Other Cereal	0.0	0.0	0.0	0.0
Commercial crop	0.0	-2.4	0.0	-0.6
Milk and Dairy	-6.0	0.0	-5.4	-2.8
Other food	0.0	0.0	0.0	0.0
Live Stock	-3.0	-0.2	-4.3	-4.5
Other Agriculture	0.0	-3.3	0.0	-1.3
Mineral	0.0	0.0	0.0	0.0
Textile	0.0	0.0	0.0	0.0
Wearing Apparel	0.0	0.0	0.0	0.0
Other Manufacturing	0.0	0.0	0.0	0.0
Services	0.0	0.0	0.0	0.0
Paddy Rice	0.0	0.0	0.0	0.0

Note: A negative (positive) sign refers to a subsidy (tax).

Annex Table 6. Ad Valorem taxes on import purchase by paddy rice production

	Japan	Korea	USA	EU
Paddy Rice	0	-4.37	-5.6	-2.62
Milled Rice	0	0	0	-4.02
Wheat	0	0	0	-1.14
Other Cereal	0	0	0	-1.88
Commercial crop	0	0	0	-0.2
Milk and Dairy	0	0	0	0
Other food	-4.36	0	0	-5.18
Live Stock	0	0	0	-1.1
Other Agriculture	0	-4.35	0	-4.53
Mineral	0	0	-5.6	13.86
Textile	-4.86	-4.37	-5.6	-3.1
Wearing Apparel	-4.86	-4.37	0	-2.6
Other Manufacturing	-3.75	-4.22	-4.6	-3.7
Services	-4.85	-4.36	-5.32	-1.88

Note: A negative (positive) sign refers to a subsidy (tax).

Annex Table 7. Ad Valorem taxes on import purchase by milled rice production

	USA	EU
Paddy Rice	0	-0.5
Milled Rice	0	0
Wheat	0	-3.1
Other Cereal	0	-5
Commercial crop	0	-0.2
Milk and Dairy	-5.4	-4.7
Other food	0	0
Live Stock	-4.3	-5.2
Other Agriculture	0	-1.3
Mineral	0	0
Textile	0	0
Wearing Apparel	0	0
Other Manufacturing	0	0
Services	0	0

Note: A negative (positive) sign refers to a subsidy (tax).

Annex Table 8. Tax on primary factors in paddy rice production

	Japan	Korea	USA	EU
Land	3.3	-4.3	-38.7	-77.5
Capital	-9	-9.4	2.4	-8.4

Note: A negative (positive) sign refers to a subsidy (tax).

Annex Table 9. Percentage changes in regional import prices of commodities (Scenario 4)

	BGD	IND	LKA	PAK	THA	CHN	INS	PHL	VNM	BZL	USA	EU
Paddy Rice	3.43	15.8	3.34	8.9	5.48	7.77	9.376	14.6	3.1	7.36	4.66	12.5
Milled Rice	3.2	4.82	4.17	4.62	1.87	17.8	10.12	5.75	4.8	3.57	9.6	6.05
Wheat	11.6	5.72	17.8	16.8	14.3	16.5	10.74	18.3	8.7	6.6	14.4	55.1
Other Cereal	4.75	7.12	1.67	11.7	22.1	17.5	10.26	10.5	2.7	7.73	21.8	92.3
Commercial crop	3.33	3.66	2.53	4.28	4.71	5.81	3.758	4.08	3.7	4.03	3.51	8.4
Milk and Dairy	5.84	7.89	5.96	4.66	6.02	6.07	5.929	6.03	6.1	5.86	5.94	5.87
Other food	0.95	0	-0	-1.2	-0.2	-0.4	-0.35	0.19	0.4	2.24	1.31	3.79
Live Stock	3.83	8.24	3.1	5.89	4.46	4.88	1.464	5.45	1.8	11.8	6.41	19.3
Other Agriculture	2.47	2.25	2.58	2.31	2.47	3.72	2.717	3.14	2.6	2.53	3.26	4.53
Mineral	-0.1	-0.1	-0.1	-0.1	-0.1	-0.1	-0.09	-0.1	-0	-0.1	-0.1	-0.1
Textile	-0.5	-0.4	-0.4	-0.1	-0.4	-0.3	-0.28	-0.2	-0.5	0.09	-0.2	-0.29
Wearing Apparel	-0.1	0.01	-0.2	0.1	-0.1	0.3	-0.08	0.12	0.1	0.09	0.06	-0.04
Other Manufacturing	0.04	0.09	0.01	0.14	0.01	0.05	0.073	0.04	0.1	0.1	0.13	-0.11
Services	0.16	0.09	0.12	0.07	0.09	0.25	0.065	0.1	0	0.04	0.04	0.09

Note: BGD = Bangladesh, IND = India, LKA = Sri Lanka, PAK = Pakistan, THA = Thailand, CHN = China, INS = Indonesia, PHL = Philippines, VNM = Vietnam, BZL = Brazil, USA = United States of America, EU = European Union

Annex Table 10. Percentage changes in regional export prices of commodities (Scenario 4)

	BGD	IND	LKA	PAK	THA	CHN	INS	PHL	VNM	BZL	USA	EU
Paddy Rice	-1.8	3.6	3.38	4	27.3	3.33	3.458	-4	3.8	13	79.8	12.8
Milled Rice	-1.3	6.62	-2.3	4.79	22.3	0.12	2.946	-2.8	3.7	7.55	4.71	-3.47
Wheat	1.45	8.5	13.9	10.6	14.1	0.25	8.028	3.74	-6.7	10.4	26.6	104
Other Cereal	-1	0.12	4.73	3.5	14.6	0.27	5.992	-2	2.3	14.2	19.7	155
Commercial crop	-2.9	-1.2	2.54	2.51	9.74	-1.7	4.133	-1.6	-0.1	9.58	6.88	10.7
Milk and Dairy	-2.3	-3.1	2.8	0.05	2.52	-1.6	2.252	-2.5	-9.5	13.8	9.67	17.7
Other food	-1.2	-1.5	1.43	-0.1	0.3	-3.4	1.593	-0.3	-1	7.08	1.35	5.21
Live Stock	-2.2	-2.3	3.87	0.28	8.85	-1.3	3.945	-1.7	1.6	13.7	4.56	31.9
Other Agriculture	-0.6	0.87	9.82	1.29	9.06	1.16	3.158	4.26	2.6	11.9	3.33	6.45
Mineral	-0.1	0.02	-0	-0.1	-0.1	0.13	-0.11	-0	-0.1	-0.2	-0.1	-0.08
Textile	-0.6	-1.3	0.21	-0.6	0.43	-0.8	0.471	0.15	-0.6	4.44	0.46	-0.37
Wearing Apparel	-0.5	-1.3	0.25	-0.5	0.8	-0.1	0.517	-0.1	-0.4	4.61	0.37	-0.43
Other Manufacturing	-0.4	-0.9	0.57	-0.4	0.75	0.28	0.526	-0	-0.3	3.97	0.39	-0.37
Services	-0.4	-1.1	0.84	-0.5	1.27	0.4	0.638	-0.2	-0.7	5.03	0.44	-0.48

Note: BGD = Bangladesh, IND = India, LKA = Sri Lanka, PAK = Pakistan, THA = Thailand, CHN = China, INS = Indonesia, PHL = Philippines, VNM = Vietnam, BZL = Brazil, USA = United States of America, EU = European Union

Annex Table 11. Percentage changes in volume of regional imports of commodities (Scenario 4)

	BGD	IND	LKA	PAK	THA	CHN	INS	PHL	VNM	BZL	USA	EU
Paddy Rice	-14	12.4	346	16.5	248	-17	43.01	4.33	68	38.6	1031	21.3
Milled Rice	1.04	265	77.4	1.9	77.9	-31	43.37	114	31	11.7	0.26	40.3
Wheat	-17	709	-1.3	63.8	8.5	-43	5.581	0.17	-11	14.3	54.6	95.1
Other Cereal	-2	27	-0.3	-1.5	51.5	21.9	-2.81	13.6	2.7	24.1	-1.7	20.2
Commercial crop	24.8	102	26.4	18.2	51.7	202	8.536	-2.5	25	32.9	14.7	11.1
Milk and Dairy	-27	-35	-10	-16	-13	-25	-5.61	-23	-6.4	43.6	13	26.5
Other food	31.7	176	34	86.1	89.2	32.3	26.02	18.6	66	42.8	6.41	10.8
Live Stock	16	-2.7	5.28	2.29	0.04	3.88	11.85	-1.7	2.3	19.4	-1.1	9.65
Other Agriculture	3.6	23.5	54.4	32	16	10.9	-0.32	10.5	18	52.2	4.05	2.55
Mineral	0.91	2.1	-2	0.81	-3.1	0.85	-1.92	0.7	0.1	-7.8	-0.4	1.02
Textile	1.78	-1.6	-0.2	0.33	0.63	-0.7	-0.41	1.08	1.8	11.1	1.52	0.28
Wearing Apparel	-1.2	-3.9	-0.8	-1.5	4.65	-0.7	-0.26	-0.8	-0.5	17.7	0.8	-0.68
Other Manufacturing	-0.7	-2	0.25	-1.1	-0.6	0.69	-0.32	0.38	-0.2	7.98	0.64	-0.26
Services	-1.3	-1.7	0.57	-0.9	2.31	0.69	0.711	-0.4	-1.3	9.63	0.83	-0.98

Note: BGD = Bangladesh, IND = India, LKA = Sri Lanka, PAK = Pakistan, THA = Thailand, CHN = China, INS = Indonesia, PHL = Philippines, VNM = Vietnam, BZL = Brazil, USA = United States of America, EU = European Union

Annex Table 12. Percentage changes in volume of regional exports of commodities (Scenario 4)

	BGD	IND	LKA	PAK	THA	CHN	INS	PHL	VNM	BZL	USA	EU
Paddy Rice	754	216	550	93	97.1	6633	296.1	416	116.06	333	-56	-107
Milled Rice	164	21.9	342	3.66	47.3	522	-27.4	-27	75.989	-11	264	-64.3
Wheat	6554	43.2	-27	45.8	49.5	178	7.698	227	1441	-26	-24	-113
Other Cereal	154	65.5	87.5	79.2	-7.4	51.1	41.86	154	24.481	70	12.2	-36.1
Commercial crop	34.9	56.6	42.8	215	1.12	132	40.78	-0.8	22.42	69.7	37.2	-17.9
Milk and Dairy	74.6	93.4	29.3	50	29	70.3	32.18	86.7	223.04	-40	-22	-105
Other food	6.61	22.9	-1.5	21.4	46.4	26.2	38.4	25.3	0.997	75.2	46.4	-7.39
Live Stock	20	51.9	25.6	51.2	-2.9	42.6	47.83	42.7	24.786	-1.4	7.45	-31.3
Other Agriculture	37.8	27.5	19.6	32.3	-2.3	32.1	4.894	71.8	15.596	14.4	12.8	-10.9
Mineral	0.86	-1.1	-0.8	-0.8	-0.8	-2.5	0.57	-0.1	-0.024	1.3	-0.8	0.26
Textile	3	8.45	-2.3	3.04	-4.2	4.54	-4.58	-2.1	1.959	-27	-3.9	1.31
Wearing Apparel	4.07	9.72	-1.2	3.88	-5.4	0.74	-3.46	1.22	2.448	-26	-2.1	2.91
Other Manufacturing	3.26	7.34	-3.6	2.88	-4.5	-1.2	-2.93	0.81	1.683	-23	-2	2.55
Services	2.41	4.45	-2.6	2.45	-4.1	-1	-1.8	1.07	2.852	-16	-1.3	2.11

Note: BGD = Bangladesh, IND = India, LKA = Sri Lanka, PAK = Pakistan, THA = Thailand, CHN = China, INS = Indonesia, PHL = Philippines, VNM = Vietnam, BZL = Brazil, USA = United States of America, EU = European Union