Asia-Pacific Research and Training Network on Trade

Working Paper Series, No. 6, April 2006

Modelling the Doha Round Outcome: A Critical view

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Introduction

In a series of papers published during the past few years, World Bank economists have provided detailed projections by simulating the possible outcomes of the Doha Round negotiations[1]. The projections have been obtained by using the LINKAGE Model, which is considered to be a global dynamic computable general equilibrium (CGE) model. The latest version of the LINKAGE Model, viz. LINK6, which these papers have relied on, uses the Global Trade Analysis Program (GTAP). LINK6 incorporates 87 countries/regions and 57 sectors and uses a dataset that has been updated up to 2001. This latter feature of the model, according to the authors, has helped generation of far more realistic results than those that were using the earlier versions, which had incorporated data only up to 1997.

This note attempts a critical assessment of the above-mentioned papers. At the outset, we would provide an analysis of the results that have been presented by looking at their implications for the developing countries in general and India, in particular. In the second part of the note, we would broadly allude to some of the methodological problems that are associated with the CGE models of the genre of the LINKAGE model. Our contention is that the limitations of these models, especially in terms of the assumptions on which they are based, deserve close scrutiny and that this dimension needs to be kept in view as the results obtained from studies are read.

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[1] The most quoted of these papers are by Kym Anderson, Will Martin and Dominique van der Mensbrugghe. See references for details.

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Analysis of the Results

The LINKAGE model provides a baseline projection of the world economy first to 2005 and then to 2015 assuming no other policy changes. Deviations from that baseline in 2015, due to total liberalization from 2005, are then examined[2]. The simulations for 2015 are based on alternative scenarios of trade liberalisation emerging from the current round of multilateral trade negotiations. The results have been presented based on two sets of assumptions. The first assumes full liberalisation of global merchandise trade. The projections relying on this assumption are worked out on the basis of a new source for protection data, which integrates trade preferences, specific tariffs and a partial evaluation of non-tariff barriers (NTBs). Inclusion of NTBs in the CGE models has been one of its less satisfactory aspects. This stems from the fact that attempts made thus far to quantify the impact of NTBs has been not been quite satisfactory. While the database on non-tariff measures that has been developed by UNCTAD, viz. the TRAINS database, is fraught with limitations ranging from incomplete coverage[3] and problems relating to the measurement of their differential impacts on countries[4], the Market Access Map (MAcMap) database that has been developed by ITC along with CEPII (Paris) includes only tariff quotas in its database. Considering that the NTBs (i.e. standards et al) are assuming increasing importance in a world where tariffs are steadily declining, this limitation of LINK6 needs to be highlighted.

The second set of results is based on some of the key proposals for agricultural trade reforms that are being actively discussed in the on-going negotiations. The simulations take into consideration proposals for tariff cuts along with those for treating some of the tariff lines as "sensitive" or "special products". What needs to be particularly

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[2] Anderson et al (2005).

[3] For most countries, TRAINS database covers NTBs till end of the 1990s. In case of India, the NTB-data are provided up to 1997, which is even before the removal of quantitative restrictions (QRs) that India was maintaining for balance of payments purposes.

[4] For instance, exporters from LDCs and developing countries endowed with relatively low level of technical skills would find it very difficult to conform to a technical barrier imposed by a developed country. But the same may not be true for other countries.

mentioned here is that none of two sets results take cognisance of the subsidy dimension, which, without doubt, holds the key for realising the objective of a distortion-free market for agricultural commodities.

(i)   Full Liberalisation of Global Merchandise Trade

The first major set of results that is reported in the papers pertains to the effect of the on-going trade liberalisation efforts on the real income going up to the year 2015. These estimates have been made against the benchmark which assumes a complete freeing of merchandise trade over the period 2005-2010. It has been reported that real income gains by 2015 for the global economy as a whole would be US $ 287.3 billion per year (in 2001 dollars). Of this increase, the developed countries' would have a share of US $ 201.6 billion while for the developing countries the gains would be US $ 85.7 billion. In other words, the share of the developing countries in the total gains would be a third of the total global gains. More importantly, real income gains reported for the developing countries would be 0.8 per cent of the baseline income in 2015, which is marginally higher than the corresponding figure for the developed countries (0.6 per cent). Among the developing countries, while the relatively prosperous Latin American region is expected to register real income which would be 1.0 per cent of the baseline income in 2015, for the South Asian region the corresponding figure is only 0.4 per cent.

These broad results lend themselves to two varying interpretations. The first, one which has been provided in the papers, is that the results are significantly favourable for the developing countries since their expected real income gains are considerably larger than their existing share in global production. Thus, while the developing countries' as a whole account for a quarter of the global production at present, they would be able to enjoy a third of the global gains in real income that is expected annually until the year 2015. An alternate view would be that what the results are pointing to is the increasing gulf between the relatively prosperous and poorer regions countries. In overall terms, it can be said that the disproportionately large gains for the developed countries that the papers under discussion have predicted would reinforce the status of the lesser players in the global economy as "developing" even after the so-called "development round" has been implemented. What is more, the results point to increasing differentiation between

the developing countries as the more prosperous regions are slated to record relatively larger increases in real income.

The disaggregated results provided for a small set of countries broadly reinforce the above-mentioned conclusions. India is expected to register a real income gain of only US $ 3.4 billion a year, which is 0.4 per cent of the base line income in 2015. In case of China, the corresponding figures are US $ 5.6 billion and 0.2 per cent respectively. On the other hand, countries like Thailand are expected to gain US $ 7.7 billion, while for Argentina, the real income gain could be nearly US $ 5.0 billion (see Table 1 for details).

From the point of view of developing countries, it is the expected movements in the terms of trade that provide the most disquieting numbers for this set of results. In what were considered as pioneering studies, Raul Prebisch and Hans Singer had pointed out in what are considered as pioneering studies that developing countries, as exporters of primary commodities, face deteriorating terms of trade while trading with the exporters of manufactured goods viz., the industrialised countries[5]. Subsequently, many studies have argued that for most of the past six decades, the terms of trade deterioration has been a major malaise for the developing countries. In fact, past studies had indicated that the developing countries would not have suffered the ignominy of the debt crisis if they had not experienced deterioration in their terms of trade. In their attempt to maintain their past levels of dollars earnings in the face of the deteriorating terms of trade, developing countries have only encouraged the development unsustainable production structures that could have serious medium to long term implications for their non-tradeables, in particular, labour and environment.

The results provided by the LINKAGE Model shows that the developing countries as a whole would suffer significant losses as a result of the changes in the terms of trade. The total loss that these countries are expected to suffer is expected to be nearly US $ 30 billion a year. This sharply contrasts with the projection for the high income

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[5]Prebisch's study was published as "The Economic Development of Latin America and its Principle Problem" and Singer's as "The Distribution of Gains between Investing and Borrowing Countries". For a more recent rendering of the issues involved, see UNCTAD (2005).

countries which should expect more than US $ 30 billion gains annually from the terms of trade changes alone.

Among the developing country groupings, the projected changes in the terms of trade bring benefit only to the Latin American region. The South Asian region should suffer the largest losses on this account, amounting to more than US $ 11 billion a year, and most of these losses would be because of the US $ 9.4 billion losses that India is projected to suffer annually[6]. The results show that India and China would be suffering the largest losses arising from the movements in the terms of trade. This implies that for the two emerging economies the projected gains in real income would come at a considerable price in terms of domestic resource use.

The gains from full liberalisation of global merchandise trade, as estimated by the LINKAGE Model occur largely due to the liberalisation of agriculture and food sectors. Almost two-thirds of the global gains are due to agricultural trade liberalisation and these gains are expected mainly because High Income Countries would liberalise their agriculture sector. While these results are more along the expected lines, the disaggregated results that capture the impact of full global trade liberalisation on agricultural and food output as well as trade, should raise plenty heckles in many low income developing countries, including India.

According to the results provided by the Model, global trade liberalisation would significantly squeeze the global agricultural output by the year 2015. Agricultural output should decrease by almost US $ 138 billion a year relative to the baseline. The members of the EU would experience sharp downturn in their output, as would be the case of Japan. From amongst the group of developing countries, India and China are expected to face decline in agricultural output; in case of the former, the decline is expected to be much larger in absolute terms. However, the group of agricultural exporters (the Cairns group countries) are likely to have a vastly different experience. Two of the major countries in this group, viz. Brazil and Argentina are expected to find their agricultural output increase annually by US $ 66 billion and US $ 12 billion respectively. Some of the

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[6] The losses that India would suffer because of adverse terms of trade would be nearly three times its real income gains following from the full liberalisation of global merchandise trade.

South East Asian countries are also expected to register gains, albeit by a relatively small amount. But while Brazil and Argentina are projected to make a collective gain of more than US 76 billion a year, the gains for the developing countries as a whole are put at US $ 67 billion. Quite obviously, thus, some countries among in the developing world are expected to suffer significant losses and this group of countries is headed India. The projected annual losses for India should be of order of US $ 24 billion a year, which is a four per cent decline in relation to the baseline. Along with India, China is also expected to be a loser, but of a much smaller magnitude (US $ 10 billion a year).

The projections made by LINK6 about the winners and losers in the agriculture sector following from the global trade liberalisation have yet another significant dimension in that the distribution of gains within the developing world is expected to be highly skewed. Thus while the middle income countries are expected to register annual increases of more than US $ 88 billion a year, the low income countries are expected to suffer annual losses of more than US $ 21 billion. These results have serious longer term implications since the projected losers in the developing world are those countries that are significantly dependent on the agricultural sector as a source of livelihoods for a majority of their populations. What the World Bank is therefore trying to tell us is that the agricultural sector in developing countries like India, which is already under tremendous squeeze, could suffer further as full global trade liberalisation takes effect.

In respect of trade in agricultural products, the projections provided by LINK6 have a few surprises. China is shown to be emerging as a major exporter of agricultural products, with a likely export growth of nearly 146 per cent over the baseline. In comparison, China's import growth is expected to be a modest 27 per cent. As for India, the country is expected to register a tremendous increase in agricultural imports – in excess of 165 per cent over the baseline. But India's exports of agricultural commodities would increase by a relatively modest 53 per cent. These figures do not bode well for a country that is expecting to improve its presence in the global market for agricultural commodities once the prevailing policy distortions are substantially eliminated at the end of the current round of negotiations.

An interesting facet of the results on the emerging scenario in agricultural trade is that some of the agricultural exporters in the South East Asian countries are not expected to do as well. For instance, Thailand should expect a large import surge but only modest gains in exports by the year 2015.

For most developing countries, the objectives of food security and protection of livelihoods remains of paramount importance in the current round of multilateral trade negotiations. Food security, as is commonly understood, is the access to food at all times and at prices that are affordable. Thus, individual countries can ensure realisation of the objective of food security by removing uncertainties in supplies and by having a reasonable control over the prices of the commodities forming the food basket. It may be argued that these twin objectives can at once be realised primarily by promoting local production of foodgrains. Furthermore, encouragement to the local production systems in developing countries would be the *sine qua non* for addressing the issue of livelihood security in the rural areas.

The question of whether or not developing countries would be able to address their food security concerns by promoting their domestic production systems has been addressed in the studies under discussion here. There are however, at least two sets of limitations that these results suffer from. In the first place, the results have been presented in terms of the broad groups of countries, with the exception of China. Secondly, the results for developing countries have been captured via regional groups, but not all regional groups have been included in the tables.

The results indicate that while the developing countries as a whole would be fully self-sufficient[7] in respect of food and agricultural products following full global liberalisation of merchandise trade, the developed countries would increase their dependence on the global markets for these products. As for the regional groups of developing countries, the Latin American countries would improve their position as net suppliers to the global market, as would the countries of sub-Saharan Africa. At the same time, however, the South Asian countries would face deterioration in their self-

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[7] Defined as domestic production as a percentage of domestic consumption.

sufficiency ratio, and in case of China, full liberalisation of global merchandise trade leaves their self-sufficiency ratio unaltered[8]. It may be pointed out that the projected deterioration in the self-sufficiency ratio in food and agriculture products for the South Asian region is a result of the large imbalance between the growth of imports and exports that has been estimated for India. As indicated earlier, LINK6 has estimated a large increase in India's import volumes together with a relatively modest increase in exports in the aftermath of full trade liberalisation.

The discussion in the foregoing shows quite clearly that the claims of a win-win situation arising from full liberalisation of merchandise trade which the World Bank has never ceased to make, have been challenged by the Bank-supported studies. The results indicate that liberalisation of merchandise trade would lead to greater inequities in the global economy, much of which would get reflected in the realm of trade. The inequities would be just not between the developed and the developing countries, but even between developing countries. Thus, while the relatively advanced countries in the Latin American and the East, South-East Asian region are expected to perform much better, the low income countries, and particularly those in the South Asian region would be confirmed as the laggards. The studies also point to a sharp deterioration in the terms of trade of a large majority of developing countries that could take place in the aftermath of the liberalisation episode. Changes in the terms of trade faced by the developing countries and their implications have not been given much importance in the current discourse, but it is our view that countries suffering from the adverse terms of trade movements need to remember the seminal contributions that Prebisch-Singer and other scholars had made while making us understand of the inimical consequences of this phenomenon.

What strikes as particularly significant is that liberalisation of merchandise trade are likely to have deleterious consequences for the agricultural sectors of the South Asian region. In this context, results provided for India stand out. The results indicate a decline in India's agricultural output, and as a logical corollary, India is expected to end up

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[8] The results predict a 91 per cent self-sufficiency ratio for China. This conclusion needs to be seen in the context of an earlier World Bank study which had predicted that China could attain a self-sufficiency ratio of 90 per cent in cereals, but only if it had made substantial investments in to bolster agricultural productivity. See World Bank (1997)

increasing its imports by a wide margin. The results thus portend to a major crisis that India, and some of the other low income countries, would to face should full liberalisation of merchandise trade take place.

The second set of results provides simulations using various proposals in the realm of market access that are currently being discussed as a part of the Doha Round of multilateral trade negotiations. The following discussion brings out the key features of the results.

(ii)   The Doha Round Scenarios

Based on the proposals that are on the negotiating table, eight scenarios have been provided for working out the possible outcome the Doha Round. These are:

(i)   Scenario 1: Tariff reduction using the tiered formula with three rates of reduction for developed countries (45, 70 and 75), four for developing countries (35, 40, 50 and 60) and no reduction for least developed countries.

(ii)   Scenario 2: Inclusion of "sensitive" products in Scenario 1 with developed countries being allowed to treat 2 per cent of their HS 6-digit tariff lines as "sensitive", which would be subjected to tariff reduction of 15 per cent. Developing and the least developed countries, allowed 4 per cent of HS 6- digit tariff lines as "special" products.

(iii)   Scenario 3: Inclusion of "sensitive" products in Scenario 1 with developed countries being allowed to treat 5 per cent of their HS 6-digit tariff lines as "sensitive", which would be subjected to tariff reduction of 15 per cent. Developing and the least developed countries, allowed 10 per cent of HS 6- digit tariff lines as "special" products.

(iv)   Scenario 4: Proportional cut in tariffs that brings about the same reduction in average agricultural tariffs in developed countries as a group (44 per cent) and developing countries as a group (21 per cent), as would be the case by using the tiered formula.

(v) Scenario 5: Includes in Scenario 4, 2 per cent "sensitive" products for developed countries and 4 per cent "sensitive" and "special" products for developing countries. Average tariff reduction as a result would be 16 per cent for developed countries and 9 per cent for developing countries.

(vi) Scenario 6: Adds to Scenario 5, a tariff cap of 200 per cent – resultant average cuts in agricultural tariffs, 18 per cent

(vii) Scenario 7: Includes in Scenario 1, cuts in non-agricultural tariff bindings of 50 per cent to be effected by developed countries, 33 per cent by developing countries and none by the least developed countries

(viii) Scenario 8: Developing and least developed countries take the same level of cuts in bound tariffs on non-agricultural products as do the developed countries in Scenario 7.

The results obtained under each of these scenarios have some interesting dimensions. The largest gains in real income for all countries and country groupings would be made only when there parallelism between tariff reductions in agricultural and non-agricultural products becomes a reality[9]. At the other extreme are the results obtained under Scenario 3, which provides for the inclusion of "sensitive" and "special" in the mode. The results show a decline in the real income for developing countries as a whole, with only models gains for the developed countries. The studies under discussion are therefore predicting that developing countries would be worse-off by taking recourse to the special and differential treatment.

The major results presented for the various Doha Round scenarios need to be critically evaluated for these seem to be militating against the position that the developing countries have taken during the negotiations. Based on their assessment about the impact of trade liberalisation on their economies, developing countries have argued that

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[9] The implications of this finding should be considered carefully in light of the Hong Kong Ministerial Declaration, which in Para 24 instructed the "negotiators to ensure that there is a comparably high level of ambition in market access for Agriculture and NAMA". Although the Declaration added that "[t]his ambition is to be achieved in a balanced and proportionate manner consistent with the principle of special and differential treatment", the findings of the studies in question suggest that developing countries would be better off by foregoing their S&D options.

gradualism must be accepted as the universal basis for liberalisation efforts that are under way in the current Round of negotiations. This principle has been emphasised particularly in the area of agriculture, where the concerns for the small and marginal farmers and their lack of staying power in the market in the face of competition from the agro-business, have been raised. What has lent strength to their arguments is the fact that in several developing countries, the "big-bang" liberalisation episodes involving the agriculture has had inimical consequences on production and employment in the sector[10].

It may be pointed out that results presented in the studies do not capture the objective reality because of the inherent limitations of the methodology of the model employed. In the past few years, critics have pointed to the methodological shortcomings of the computable general equilibrium (CGE) framework upon which the LINKAGE Model is based. As would be briefly indicated in the next section, the assumptions upon which the Model is based are either unrealistic in nature or are far removed from the conditions that exist in the developing world. It must be mentioned that the limitations we would be alluding to are intrinsic to the Model, in other words, whatever "improved" versions of the present studies that the authors may present to us subsequently, the results would remain debatable.

Methodological Limitations of the LINKAGE Model

In a persuasive article Frank Ackerman[11] has given us plenty to think about the structural limitations of the CGE framework. General equilibrium theory bases itself on the two Arrow-Debreu theorems developed in the 1950s. The first postulates that assuming the existence of a competitive market economy any market equilibrium would be Pareto optimum. The second theorem stipulates that under certain conditions every Pareto-optimum is a market equilibrium given some initial conditions. There has been considerable debate centring on the Arrow-Debreu framework the nub of which is the realism of some of the assumptions. Ackerman, for instance, points out that the

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[10] Dhar (2005) gives an account of the experiences of some of the South East Asian Countries in this regard.

[11] Ackerman (1999)

assumptions such as increasing returns to scale is a common occurrence, but if this fact is incorporated in the theory, the existence of an equilibrium is no longer certain. This would, in other words, imply that a Pareto optimum need not be a market equilibrium.

The major problem with the CGE models, as has been commented upon by several of its critics, stems from the rather limited set of assumptions on which they are based. These models are primarily market simulation models incorporating idealistic behaviour of producers and consumers across markets and determining equilibrium, market-clearing prices and quantities. The limitation of considering the ideal-types could lead to problems of aggregation since aggregate demand, for instance, may not be as well-behaved as individual demand. Micro-foundations of macroeconomics can therefore be fraught with imponderables.

This general discussion sets the stage for us to look at some of the specifications which have been used to define the LINKAGE Model. As we would be indicating briefly, some of the assumptions on which the Model is based do not even remotely capture the reality, particularly in the developing countries. Sample some of the assumptions made in the Model:

(i) "All sectors are assumed to operate under cost optimisation": This assumption assumes away market imperfections that may not allow producers to manage their operations for ensuring "cost optimisation".

(ii) "Three different production archetypes are defined in the model – crops, livestock and all other goods and services. Sectors are differentiated by different input combinations and substitution elasticities within each one of the main production archetypes": Clearly the problem of aggregation, as was alluded to earlier, would occur because of this assumption. This problem would appear in a more acute manner in the case of a country, like India, which has an extremely diversified agriculture.

(iii) "The key feature of the crop production structure is the substitution between intensive cropping versus extensive cropping, i.e. between fertilizer and land": This assumption assumes away the production rigidities that exist in the agricultural sectors in the developing countries. For an overwhelmingly large

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proportion of the farm population has virtually no choice in so far as changing the nature of the crop production. Change in the relative prices of fertilizers and land could therefore not lead to any change in the production structure.

(iv)   "Land is assumed to be partially mobile across agricultural sectors": Refer to comment made in respect of point # (iii).

(v)   "Each national economy is divided into two distinct geographic zones [which] define potentially separate labour markets. A single elasticity … determines the nature of the labour market": Labour markets are far from the ideal-type that is assumed for the purposes of the model in question. In particular, the assumption of "a single elasticity" does not at all capture the complexities of the labour market as exists in developing countries.

The above-mentioned sample of assumptions made in the LINKAGE Model unerringly points to the need for interpreting the results provided by the Model with some degree of caution.

It does appear that some of the leading advocates of the CGE models are quite aware of the limitations when they suggest that the results of the models should be undergo the test of validation with observations from the real world which they have tried to capture. It has been argued that such cross-checking "has to allow for the fact that the projections from an AGE (applied general equilibrium) are conditional in that they are based on particular assumptions about values of variables exogenous to the model, and, as such, the projections could deviate from the actual outcomes if the realised values of exogenous variables differed from the assumed values". It has been further surmised that in "actual implementation, aspects of policy could differ from their assumed values"[12].

Thus, while some of the foremost protagonists of the CGE models have suggested that the results of the models should be considered after examining its validity with the real world, the authors of the studies under discussion have presented their results in a manner that the decision-makers should treat them as absolute benchmarks. In this context, it needs to be pointed out that even during the Uruguay Round negotiations, a

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[12] Kehoe, Srinivasan and Whalley (2005).

plethora of studies, again using the CGE models, projected significant gains for the developing countries that turned out to be no more than a chimera[13]. Several developing countries had, in fact, taken extensive commitments hoping for the gains that the studies had projected, but only after two years after the implementation of the Uruguay Round package had begun, they were forced to bring to the fore the fact that the anticipated gains had not materialised[14].

By way of conclusions

This note provided a critical view of the studies based on the LINKAGE Model, a variant of the CGE models that have project the possible outcomes of the Doha Round of multilateral trade negotiations. These studies have provided detailed estimates of the likely gains/losses for individual countries/groups of countries in 2015, the projected end-date for the implementation of the commitments which WTO Members would take at the end of the current round of negotiations.

The aggregative results presented in the studies indicate that of the annual gains in real income which would result from full liberalisation merchandise trade in all WTO Member countries, the share of the developing countries would be a third. According to the authors of the studies in question, developing countries should consider the projected gains as a favourable outcome since their current share in global production is around 25 per cent of the total. But what these results also imply is that the wedge between the developed and the developing countries would get wider following a disproportionately large increase in the gains for the former.

The detailed results for individual countries/groups of countries only provide more evidence of a widening gap between the more prosperous and the less prosperous regions of the world. In the developing world, the likely gainers are the more advanced middle income countries, while the low income countries, including India, would not be faring well. The more disturbing of the results is the projected deterioration of the terms

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[13] See for instance, Goldin and Mensbrugghe (1993).

[14] These issues were first raised by developing countries as the so-called "implementation issues" in the Second Ministerial Conference held in Geneva in 1998.

of trade, particularly of countries like India and China, in the aftermath of full liberalisation of global merchandise trade. We have tried to argue that these detailed results rather than the aggregative numbers that need to looked at carefully.

We have also tried to allude to the fact that there is a more fundamental problem with these studies. The CGE models are usually based on highly limiting assumptions that are far from the reality prevailing in developing countries, in particular. In the note, we have provided a sample of the assumptions on which the models are based and have pointed to their divergence from the reality. It is to be noted that some of the leading advocates for the CGE models have indicated that the results obtained from the models must be cross-checked with the real-life conditions in order to ascertain their reliability. Such an exercise is of course impossible in respect of the results that the studies in question have provided. However, what can be pointed out is that CGE models of an earlier generation had projected substantial gains for the developing countries following from the implementation of the Uruguay Round package. It would have been in the fitness of things if the authors of the papers under discussion had presented their results in the backdrop of the past frailties of their models.

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Table 1: Impacts on real income from full liberalization of global merchandise trade, by country/region, 2015

(relative to the baseline, in 2001 dollars)			
Countries/Regions	**Real income gain ($billion)**	**Gain due just to change in terms of trade ($billion)**	**as % of baseline income in 2015**
Australia and New Zealand	6.1	3.5	1
EU 25 and EFTA	65.2	0.5	0.6
United States	16.2	10.7	0.1
Canada	3.8	-0.3	0.4
Japan	54.6	7.5	1.1
Korea and Taiwan	44.6	0.4	3.5
Hong Kong and Singapore	11.2	7.9	2.6
Argentina	4.9	1.2	1.2
Bangladesh	0.1	-1.1	0.2
Brazil	9.9	4.6	1.5
China	5.6	-8.3	0.2
India	3.4	-9.4	0.4
Indonesia	1.9	0.2	0.7
Thailand	7.7	0.7	3.8
Vietnam	3	-0.2	5.2
Russia	2.7	-2.7	0.6
Mexico	3.6	-3.6	0.4
South Africa	1.3	0	0.9
Turkey	3.3	0.2	1.3
Rest of South Asia	1	-0.8	0.5
Rest of East Asia	5.3	-0.9	1.9
Rest of LAC	10.3	0	1.2
Rest of ECA	1	-1.6	0.3
Middle East and North Africa	14	-6.4	1.2
Selected Sub-Saharan Africa	1	0.5	1.5
Rest of Sub-Saharan Africa	2.5	-2.3	1.1
Rest of world	3.4	0.1	1.5
High-income countries	**201.6**	**30.3**	**0.6**
Developing countries—WTO definition	**141.5**	**-21.4**	**1.2**
Developing countries	**85.7**	**-29.7**	**0.8**
Middle-income countries	69.5	-16.7	0.8
Low-income countries	16.2	-12.9	0.8
East Asia and the Pacific	23.5	-8.5	0.7
South Asia	4.5	-11.2	0.4
Europe and Central Asia	7	-4	0.7
Middle East and North Africa	14	-6.4	1.2
Sub-Saharan Africa	4.8	-1.8	1.1
Latin America and the Caribbean	28.7	2.2	1
World total	**287.3**	**0.6**	**0.7**

Table 2: Regional and sectoral source of gains from full liberalization of global merchandise trade, developing and high-income countries, 2015

Countries/Regions	(relative to baseline scenario) a					
	Gains by region in $ billion			Percent of global gain		
	Developing	High-income	World	Developing	High-income	World
Developing countries						
Agriculture, food	28	19	47	33	9	17
Textiles, clothing	9	14	23	10	7	8
Other merchandise	6	52	58	7	26	20
All sectors	43	85	128	50	42	45
High-income countries						
Agriculture, food	26	109	135	30	54	47
Textiles, clothing	13	2	15	15	1	5
Other merchandise	4	5	9	5	2	3
All sectors	43	116	159	50	57	55
All countries liberalize:						
Agriculture, food	54	128	182	63	64	63
Textiles, clothing	22	16	38	25	8	14
Other merchandise	10	57	67	12	28	23
All sectors	86	201	287	100	100	100

a Small interaction effects are distributed proportionately and numbers are rounded to sum to 100 percent.

Table 3: Impacts of full global trade liberalization on agricultural and food output and trade, by country/region, 2015

Countries/Regions	$billion			Percent change relative to baseline		
(relative to the baseline)						
	Exports	Imports	Output	Exports	Imports	Output
Australia and New Zealand	18	1.4	27.9	38	23	20.5
EU 25 and EFTA	21.7	103.5	-185.8	-10.8	39.3	-12.3
United States	18.4	16.5	30.7	11.6	25.6	0
Canada	14.6	6.9	7.2	40.2	54.3	4.8
Japan	2.8	34.7	-91.7	60.4	169.7	-18.4
Korea and Taiwan	33.2	12.3	-0.4	600.2	189.8	20.2
Hong Kong and Singapore	7	1.5	7.4	115.2	7.6	35.4
Argentina	10.4	0.7	12.2	44.2	36.9	11.5
Bangladesh	0.8	0.4	-2.5	60.9	15.6	0.8
Brazil	38	2.8	66.4	120.6	48.4	34
China	15.1	24.1	-9.9	145.6	27.3	-0.9
India	5.1	13.4	-23.8	53.2	165.4	-3.7
Indonesia	3.6	1.9	4.5	32.2	23.5	2.4
Thailand	5.6	5.2	5.3	29.2	57.2	4.7
Vietnam	1.2	3.3	-2.1	13.9	170.4	-13.3
Russia	0.7	4.4	-7.8	15.4	22.3	-5.4
Mexico	11.9	6.7	6.2	66	52.9	2.2
South Africa	2.4	1.1	1.4	55.9	40.2	4.9
Turkey	4.3	4.3	-0.1	109.4	140.3	0.5
Rest of South Asia	2.9	3.7	-1.5	57.1	83.3	-1.8
Rest of East Asia and the Pacific	9.4	5.8	7.4	61.7	50.7	6.8
Rest of LAC	36	9.6	37	68.1	42.3	11.7
Rest of ECA	9.2	10.9	-22.2	106	90.5	-1.6
Middle East and North Africa	13.2	17.5	-7.8	64.1	43.1	-1.2
Selected SSA countries	4.5	1.3	5.3	50	74.4	9.2
Rest of Sub-Saharan Africa	9.5	8.1	-4.1	45.4	79.2	-0.6
Rest of world	8.2	5.8	2.9	168.3	123.3	4.4
High-income countries	**115.8**	**176.7**	**-204.7**	**15.7**	**65.5**	**-5.3**
Developing countries	**191.9**	**131**	**66.8**	**67.4**	**51.5**	**2.2**
Middle-income countries	156.1	93.1	88.2	72.7	41.9	3.2
Low-income countries	35.8	37.9	-21.4	52.3	99.3	-1
East Asia and the Pacific	34.8	40.4	5.2	54.4	35.5	0.1
South Asia	8.9	17.5	-27.8	55.1	122.9	-3
Europe and Central Asia	14.2	19.6	-30	79.7	62.6	-1.9
Middle East and North Africa	13.2	17.5	-7.8	64.1	43.1	-1.2
Sub-Saharan Africa	16.4	10.5	2.6	47.7	71.6	2.1
Latin America and the Caribbean	96.3	19.8	121.8	75.7	46.1	13.8
World total (excluding intra-EU trade)	**307.7**	**307.7**	**-137.8**	**36.3**	**59.8**	**-1.3**

Table 4: Impact of global liberalization on self sufficiency in food and agricultural products, selected regions, 2015

Countries/Regions	High-income countries		Developing countries		Sub-Saharan Africa		Latin America & Caribbean		South Asia		China	
	Baseline	Global lib'n	Baseline	Global lib'n	Baseline	Global lib'n	Baseline	Global lib'n	Baseline	Global lib'n	Baseline	Global lib'n
Rice	97	49	99	101	91	78	97	98	102	102	100	108
Wheat	137	118	89	91	53	35	90	119	98	98	90	92
Other grains	103	99	90	84	101	102	104	103	99	99	76	32
Oilseeds	119	55	75	90	158	279	184	247	100	102	1	1
Sugar	92	47	100	113	109	116	126	173	99	99	45	27
Plant-based fibers	117	78	95	104	385	694	94	109	87	92	93	95
Vegetables and fruits	83	72	103	105	137	141	146	183	95	88	97	97
Other crops	83	85	110	106	167	174	140	132	104	104	11	10
Livestock	103	104	98	98	103	103	103	102	99	99	94	94
Other natural resources	91	91	102	102	125	125	128	127	95	95	92	92
Fossil fuels	81	81	119	120	147	154	116	115	66	57	85	82
Processed meats	99	89	98	109	96	136	105	132	98	101	89	85
Vegetable oils, fats	96	91	98	99	85	72	111	106	65	25	96	90
Dairy products	103	100	88	92	74	78	92	94	97	97	60	57
Other food, beverages & tobacco	97	99	101	96	100	93	106	106	111	108	97	96
Textiles	91	91	99	98	75	62	85	79	130	134	99	98
Wearing apparel	63	55	153	162	78	62	92	80	513	765	225	255
Leather products	58	53	136	138	85	59	107	87	170	186	156	164
Chemicals, rubber, plastics	103	104	89	87	70	66	79	74	91	89	92	89
Iron, steel	99	100	97	96	94	93	100	92	95	92	93	92
Motor vehicles, parts	101	102	87	82	58	68	101	99	94	84	88	79
Capital goods	101	100	93	93	45	45	81	79	79	79	104	106
Other manufacturing	95	95	105	104	115	108	98	92	97	94	111	112
Agriculture and food	98	93	99	100	108	111	111	120	99	96	91	91
Agriculture	97	84	98	100	118	123	121	134	99	98	88	88
Processed foods	98	97	99	98	98	97	105	111	98	87	96	94
Textile and wearing apparel	74	70	114	116	77	61	92	81	149	163	125	129
Other manufacturing	98	98	98	97	92	91	93	89	88	85	101	101

Self sufficiency is defined as domestic production as a percentage of domestic consumption

Table 5: Change in real income in alternative Doha scenarios, 2015 (Dollar change in 2001 $billion compared to baseline scenario)

Countries/Regions	Scen. 1	Scen. 2	Scen. 3	Scen. 4	Scen. 5	Scen. 6	Scen. 7	Scen. 8
Australia and New Zealand	2	1.1	1.1	2.2	1.2	1.2	2.4	2.8
EU 25 and EFTA	29.5	10.7	9.1	28.2	10.7	10.9	31.4	35.7
United States	3	2.3	2	3.4	2.5	2.1	4.9	6.6
Canada	1.4	0.5	0.3	1.2	0.4	0.4	0.9	1
Japan	18.9	1.8	1.3	15.1	1.4	12.9	23.7	25.4
Korea and Taiwan	10.9	1.7	1.6	7.3	1.7	15.9	15	22.6
Hong Kong and Singapore	-0.1	-0.1	-0.1	-0.1	-0.2	-0.2	1.5	2.2
Argentina	1.3	1	1	1.4	1.1	1	1.3	1.6
Bangladesh	0	0	0	0	0	0	-0.1	-0.1
Brazil	3.3	1.1	0.9	3.2	1.1	1.1	3.6	3.9
China	-0.5	-1.5	-1.6	-0.4	-1.4	-1.1	1.7	1.6
India	0.2	0.2	0.2	0.1	0.2	0.2	2.2	3.5
Indonesia	0.1	0.2	0.2	0.2	0.2	0	1	1.2
Thailand	0.9	0.6	0.3	1	0.8	0.8	2	2.7
Vietnam	-0.1	0	0	-0.1	-0.1	-0.1	-0.5	-0.6
Russia	-0.3	-0.7	-0.8	-0.1	-0.7	-0.7	0.8	1.5
Mexico	-0.2	-0.3	-0.3	-0.2	-0.3	-0.3	-0.9	-0.2
South Africa	0.1	0.3	0.1	0.1	0.2	0.3	0.4	0.7
Turkey	0.6	0	0	0.5	0.1	0	0.7	1.4
Rest of South Asia	0.2	0.1	0.1	0.2	0.1	0.2	0.3	0.7
Rest of East Asia	0.1	0	0	0.1	0.1	1	0.3	0.6
Rest of LAC	3.7	0.5	0.5	3.7	0.5	0.4	3.9	4
Rest of ECA	-0.2	-0.3	-0.3	-0.2	-0.2	-0.2	-0.6	-0.7
Middle East and North Africa	-0.8	-1.2	-1.5	-0.9	-1.2	-1.2	-0.6	0.1
Selected SSA Countries	0.1	0	0	0.1	0	0	0.1	0.2
Rest of Sub-Saharan Africa	0	-0.3	-0.3	0	-0.3	-0.3	-0.1	0.3
Rest of world	0.4	0	0	0.3	0	0	0.6	0.6
High-income countries	**65.6**	**18.1**	**15.2**	**57.2**	**17.8**	**43.2**	**79.9**	**96.4**
Developing countries	**9**	**-0.4**	**-1.7**	**9.1**	**0.1**	**1.1**	**16.1**	**22.9**
Middle-income	8	-0.5	-1.9	8.3	0	1	12.5	17.1
Low-income countries	1	0.1	0.1	0.8	0.2	0	3.6	5.9
East Asia and the Pacific	0.5	-0.8	-1.2	0.9	-0.4	0.6	4.5	5.5
South Asia	0.4	0.3	0.3	0.3	0.3	0.4	2.5	4.2
Europe and Central Asia	0.1	-0.9	-1.1	0.2	-0.9	-0.9	0.8	2.1
Middle East and North Africa	-0.8	-1.2	-1.5	-0.9	-1.2	-1.2	-0.6	0.1
Sub-Saharan Africa	0.3	0	-0.2	0.3	-0.2	-0.1	0.4	1.2
Latin America and the Caribbean	8.1	2.3	2	8	2.5	2.1	7.9	9.2
World total	**74.5**	**17.7**	**13.4**	**66.3**	**17.9**	**44.3**	**96.1**	**119.3**

Table 6: Change in real income in alternative Doha scenarios, 2015 Percentage change (in 2001 $billion compared to baseline scenario)

Countries/Regions	Scen. 1	Scen. 2	Scen. 3	Scen. 4	Scen. 5	Scen. 6	Scen. 7	Scen. 8
Australia and New Zealand	0.35	0.2	0.18	0.38	0.22	0.2	0.42	0.48
EU 25 and EFTA	0.29	0.11	0.09	0.28	0.11	0.11	0.31	0.36
United States	0.02	0.02	0.01	0.02	0.02	0.01	0.03	0.05
Canada	0.15	0.05	0.03	0.13	0.05	0.05	0.1	0.11
Japan	0.38	0.04	0.03	0.3	0.03	0.26	0.48	0.51
Korea and Taiwan	0.86	0.13	0.13	0.58	0.14	1.26	1.19	1.79
Hong Kong and]Singapore	-0.02	-0.03	-0.03	-0.02	-0.04	-0.04	0.35	0.52
Argentina	0.32	0.26	0.25	0.34	0.27	0.26	0.34	0.39
Bangladesh	-0.06	-0.03	-0.02	-0.06	-0.03	-0.04	-0.1	-0.09
Brazil	0.5	0.16	0.13	0.49	0.17	0.17	0.55	0.59
China	-0.02	-0.06	-0.06	-0.01	-0.05	-0.04	0.07	0.06
India	0.02	0.03	0.02	0.02	0.03	0.02	0.25	0.4
Indonesia	0.05	0.07	0.07	0.08	0.09	0.01	0.37	0.44
Thailand	0.43	0.29	0.15	0.49	0.38	0.38	0.99	1.33
Vietnam	-0.2	-0.09	-0.06	-0.22	-0.11	-0.16	-0.83	-0.97
Russia	-0.06	-0.16	-0.17	-0.03	-0.15	-0.15	0.16	0.31
Mexico	-0.02	-0.04	-0.04	-0.02	-0.04	-0.04	-0.11	-0.02
South Africa	0.06	0.17	0.05	0.09	0.11	0.17	0.25	0.49
Rest of South Asia	0.13	0.05	0.05	0.11	0.06	0.14	0.17	0.39
Rest of East Asia	0.02	0.01	0.01	0.05	0.04	0.36	0.09	0.22
Rest of LAC	0.44	0.06	0.06	0.43	0.06	0.04	0.46	0.47
Rest of ECA	-0.06	-0.09	-0.09	-0.06	-0.09	-0.08	-0.22	-0.26
Middle East and North Africa	-0.07	-0.1	-0.13	-0.07	-0.1	-0.1	-0.05	0.01
Rest of Sub-Saharan Africa	0.02	-0.13	-0.13	0.01	-0.14	-0.14	-0.02	0.13
Rest of world	0.19	0	0	0.14	0	0.02	0.26	0.28
High-income countries	**0.2**	**0.06**	**0.05**	**0.18**	**0.05**	**0.13**	**0.25**	**0.3**
Developing countries	**0.09**	**0**	**-0.02**	**0.09**	**0**	**0.01**	**0.16**	**0.22**
Middle-income	0.1	-0.01	-0.02	0.1	0	0.01	0.15	0.21
Low-income countries	0.05	0.01	0.01	0.04	0.01	0	0.18	0.3
East Asia and the Pacific	0.01	-0.02	-0.03	0.03	-0.01	0.02	0.13	0.16
South Asia	0.03	0.03	0.02	0.02	0.03	0.03	0.21	0.36
Europe and Central Asia	0.01	-0.09	-0.11	0.02	-0.09	-0.09	0.08	0.21
Middle East and North Africa	-0.07	-0.1	-0.13	-0.07	-0.1	-0.1	-0.05	0.01
Sub-Saharan Africa	0.06	-0.01	-0.05	0.06	-0.04	-0.02	0.1	0.27
Latin America and the Caribbean	0.29	0.08	0.07	0.29	0.09	0.08	0.29	0.33
World total	**0.18**	**0.04**	**0.03**	**0.16**	**0.04**	**0.1**	**0.23**	**0.28**

Table 7: Share of agricultural and food production exported under different scenario, 2001 and 2015 (percent)

Countries/Regions	Baseline 2001	Baseline	Full global lib'n 2015	Scen. 7
Australia and New Zealand	33.3	37.2	42.7	39.5
EU 25 and EFTA	16.7	17.3	17.6	16.6
EU 25 and EFTA (excluding intra- EU25)	4	5.1	7.7	5
United States	6.3	7.9	9.2	8.1
Canada	24.5	29.5	40	32.5
Japan	0.9	1.2	2.3	1.5
Korea and Taiwan	4.4	4.8	26.5	8.6
Hong Kong and Singapore	26	30	47.8	30.8
Argentina	21.6	25.2	32.5	26.9
Bangladesh	1.7	3.6	5.7	3.5
Brazil	15.3	17.3	28.9	21.7
China	3.3	0.9	2.2	1
India	3.5	3	4.7	3.3
Indonesia	11.9	10	12.9	9.9
Thailand	30.2	28.2	34.6	30.1
Vietnam	23.9	26.9	35.3	26.7
Russia	6.1	5.5	6.7	6
Mexico	5.6	7.8	13.2	8.5
South Africa	16	12.7	18.8	13.5
Turkey	9.6	6	12.4	7
Rest of South Asia	6	6.2	9.9	6.6
Rest of East Asia	16.1	14.6	22.1	14.9
Rest of LAC	13.9	18.1	27.1	20.7
Rest of ECA	2.4	1.7	3.7	1.9
Middle East and North Africa	5.2	6.7	11.2	7.2
Selected SSA Countries	13.2	18.1	25.4	19.2
Rest of Sub-Saharan Africa	11.2	15.8	23.3	16.5
Rest of world	6.6	7	17.7	8.7
High-income countries	**5.8**	**7.5**	**11.6**	**8.2**
Developing countries	**7.5**	**6.9**	**11.6**	**7.8**
Middle-income countries	7.6	6.6	11.4	7.6
Low-income countries	7.3	7.9	12.4	8.4
East Asia and the Pacific	7.2	4.1	6.5	4.3
South Asia	3.8	3.6	5.7	3.9
Europe and Central Asia	3.7	2.7	5	3
Middle East and North Africa	5.2	6.7	11.2	7.2
Sub-Saharan Africa	12.5	15.8	23.1	16.6
Latin America and the Caribbean	12.7	15.9	24.8	18.5
World total	**9.5**	**9.5**	**13.2**	**10**
World total (excl. intra-EU25)	6.6	7.2	11.6	8

Source (for Tables 1 to 7: Anderson et. al. (2006)