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A General Equilibrium Analysis of the Impact of Eliminating US Cotton Subsidies on US and World Cotton Market

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Abstract

Industrialized developed countries are blamed for the impasse in the Doha round of world trade negotiations by refusing to deal with their supports to agricultural sector. The OECD countries together annually spend about $300 Billion on agricultural subsidies. The US, EU and Japan alone account for almost 82% of the subsidies. The US cotton subsidy, which has been ruled illegal by the WTO after a successful challenge from Brazil, Australia and four African countries, has become the target of domestic and international critics. This paper simulates the potential impacts of removing all the US cotton subsidy programs using the multiregion GTAP applied general equilibrium model. Results predict that, as a result of the removal of the subsidy, US cotton output would decrease by 26% and US domestic price rises by 31%. The US cotton export is also expected to decline by 65% and the world price of cotton is expected to rise by 5.6%. Other major cotton producers are expected to respond to the decrease in US output and exports and the higher world prices. Consequently, cotton output is expected to increase by 15% in Australia, by 10% in SSA, 5.2% in Brazil. The welfare effects indicate that, the US, Australia, SSA and Brazil are the major beneficiaries of this policy while Asian cotton importers and other subsidizing producers such as EU, the former USSR and Eastern European countries would lose from the implementation of the policy.

Key words: Cotton, US, applied general equilibrium, GTAP, subsidy

Introduction

Industrialized developed countries are blamed for the impasse in the Doha round of world trade negotiations by refusing to remove their supports to agricultural sector. The OECD countries together annually spend about $300 Billion on agricultural subsidies. The US, EU and Japan alone account for almost 82% of the subsidies. The Doha round of trade negotiations was aimed at furthering trade liberalization while giving developing nations access to the global trading system as a way to address global poverty.

In March 2005, after a successful challenge by Brazil, Australia and West and Central African States, the World Trade Organization (WTO) ruled that the US cotton subsidies are illegal, upholding an earlier ruling in September 2004 by the WTO dispute settlement panel. Brazil charged that the US cotton subsidies have increased from the $2.1 billion in 1992 to $3.2 billion in subsidies and $1.6 billion in export credit in 2004 in contravention of the WTO "peace clause" rules that shielded subsidies from actions provided that they are capped at the 1992 levels. Brazil also alleged that the US subsidies distort world cotton prices and hurt Brazilian cotton farmers.

The US defends that the payments are "decoupled" and therefore do not distort production and trade. But evidence shows that the subsidies unfairly boost US production, flood the world market with cheap cotton and drive down prices (Sumner, 2003; OXFAM, 2004). The Institute for Agriculture and Trade Policy (IATP) reports that in 2003 cotton was exported from the US at 47% below cost of production (ITAP, 2004). As a result, the US share of export market has increased from 17.3% in 1998 to 41.5% in

2003 (Oxfam, 2005). West African cotton producers have also lost almost $400 million export revenue between 2001 and 2003 as a result of US dumping, exacerbating poverty (Oxfam, 2004; Oxfam, 2005). Indeed while subsidies may be the major culprits, higher yields from bio-tech cotton, expansion of production in low cost countries and competition from synthetic fibers such as polyester have also played a significant role in the fall in world cotton prices (Pan, et al, 2004; FAO, 2005).

The cotton subsidies are also targets of criticism in the US. Although the support programs were originally designed to protect small family farms from price risks, the largest 10% farms receive 78% of the subsidies, the cost borne by tax payers. So basically it is a transfer from tax payers to rich farmers. Cotton farmers also receive more per capita and more per acre ($230 compared with $40-50 for cereals) than any other group of producers (Watkins, 2003). Moreover, the subsidies are blamed for worsening environmental damage by encouraging increased pesticide and insecticide use in cotton production.

This paper will examine the potential impact of the removal of all US cotton subsidies on the US and world cotton market as well as on industries with forward and backward linkage with cotton using the standard multi region GTAP applied general equilibrium model (Hertel, 1997). The analysis focuses on the likely impacts of the policy on cotton production, prices, exports and imports, intermediate input demand and the welfare impacts in US and other major producers.

Specifically, the paper will attempt to answer the following research questions:

- What are the implications for output, prices, employment, wage rates, prices of intermediate inputs (cotton uses a large amount of chemicals) and export revenue of the removal of the subsidies?
- Although the subsidy hurts cotton exporters by depressing world prices, it benefits net cotton importers (cotton processors and textile and garment producers). So what is the impact of this policy on these industries?
- What are the welfare effects of the policy on the US and other major players in the world such as Australia, SSA, and Brazil?
- How does the general equilibrium analysis result compare with other partial equilibrium studies?

The Model

The paper uses the standard multi-region applied general equilibrium model, GTAP. The model includes demand for goods for final consumption, intermediate use and government consumption; demands for factor inputs; supplies of factors and goods; and international trade in goods and services. The model assumes perfect competition and constant returns to scale in production activities. Bilateral trade flows are handled by the Armington assumption by which products are exogenously differentiated by assumption.

Modeled regions and sectors

Cotton grows in about 100 countries in the world, but production and trade is concentrated in few countries (FAO, 2005). In 2001/2002 the US and China accounted

for 43% of total output in the world and nearly 90% of the production was in nine countries. The United States, former USSR, Australia and EU account for nearly 65% of world exports. On the other hand, EU, China, Indonesia, Mexico, Former USSR, Turkey, Thailand and Korean Republic account for 62% of world imports. Countries in Asia, which are major textile producers, accounted for more than one-third of world imports in 2001/02.

Cotton is an important commodity traded internationally as well as a major employment generator. In 2001, value-added trade in apparel was US$19.5 billion, and raw cotton trade was US$6.3 billion. The International Cotton Advisory Committee (ICAC) estimates that more than 100 million farming units globally are engaged directly in cotton production, with many more in ancillary activities. Therefore the welfare impacts of distortionary policies as well as liberalization of the sector affect a large number of people around the world. The US is typical among the large producers because of its export dependence, as its domestic mill capacity and textile production has declined over the last four decades. More than 40 per cent of total output is exported in most years (Watkins, 2003).

The model includes 10 regions which are major players in cotton production, import, export and the production of textile and wearing apparels and 9 sectors (see table 1). The model uses version 6.0 (2001) GTAP database.

The sectors included in the CGE analysis are selected to examine the effect of the policy on the sectors that are up and downstream linked to cotton production. For instance the textile industry is the major consumer of cotton and the textile sector output, in turn, is an input to garment production. Chemical, rubber and plastic group is included because it includes synthetic fibers, which are close substitutes for plant based fibers. Moreover, it is also the supplier of the large quantity of chemical inputs used in cotton production. The annual global pesticide and insecticide consumption in cotton production are estimated at 2.6 billion and 1.7 billion dollars (Panna, 2005).

Distortion in the Cotton Trade and Policy Shock

There are no any significant trade barriers in terms of import and export tariffs in cotton trade. However, some big cotton producers such as the United States and EU heavily subsidize domestic cotton production. The producer subsidy equivalent of the various cotton programs in the US is approximately 35%. The EU has the second largest subsidy at 28% (see table 2). The US cotton program has the following four important components:

- Direct payments - (previously Production Flexibility Contract). These are issued regardless of market price, based on historical acreage and payment yields, not current production. Under WTO rules, these are Green Box payments.
- Counter-cyclical payments- These are made when market prices (plus direct payments) produce an income below a stipulated level (known as the Target Price). The same payment conditions prevail as for direct payments. However, the US reports transfers under this category as Amber.

- Loan deficiency payments - In effect, these define the minimum market price (or Loan Rate) defended through government purchasing operations. For WTO purposes, these are Amber Box payments.
- Step 2 payments - In effect, this is an officially supported credit program available to users of US cotton in both domestic markets and export markets. It is registered as Amber Box domestic support.

The current version of the GTAP database doesn't fully account for US subsidy for cotton. Thus, to fully account for the US cotton subsidy but we imposed a target 35% output subsidy. In subsequent experiment the subsidy was completely eliminated. The standard GTAP general equilibrium closure was used.

Simulation Results

Output and Prices

The simulation results of the removal of US cotton subsidy on output and prices are reported in table 1A and 2A in the appendix. Accordingly, the US cotton output is expected to fall by 26% ($1.9 billion). The decline in US cotton output increases the domestic price of cotton by 31%. Consequently, textile output in the US falls by 1% ($1.4 billion) and wearing apparel by 0.3% ($294 million) and the price of textile and wearing apparels are also expected to increase by 0.61% and 0.16%. However, as factors released from cotton production move to other sectors, output increases in the food, manufacturing (other than textile and wearing apparels), chemical, rubber and plastics and services.

The fall in the US cotton output would stimulate increased supply from other competitors. Consequently, cotton output is expected to increase by 15.6% ($218 million) in Australia, by 5.2% ($41 million) in Brazil, by 10.1% (195 million) in SSA and the rest of the world by 4.7% ($312 million). But it appears that the model underestimates Brazil's capacity to increase output. There is evidence that cotton in Brazil is fast expanding from the traditional southern into the central part of the country due to advances in soil management and crop varieties and the country has suitable climate for cotton production (Peabody, 2003).

Demand for Inputs

As cotton production in the US decreases, the demand for land in the cotton sector is expected to decrease by 22% and land price expected to decrease by 2.4%. Similarly, the demand for labor (unskilled and skilled) and capital are expected to decrease by 27%. The volume of skilled and unskilled labor that is displaced from cotton production is estimated at $33 million and $427 million (see table A3).

The reduction in US output and the resulting rise in world price creates opportunities for expansion of unskilled employment and capital investment in cotton production in the other regions. For instance, in SSA, the demand for land is expected to increase by 8% and the demand for unskilled labor is expected to increase by 10% or $79 million which is about 7% of the value added of cotton. Likewise, capital in cotton production is expected to increases by 10% ($23 million).

Export and Import

The elimination of US subsidies leads to a drastic decline in the US cotton export as US fob prices increase. The model predicts that the US export decreases by 65% estimated at 1.4 billion dollars. Similarly US textile and apparel export decrease by 3.2% and 0.7% (see table A5 and A6). The other large producers respond by increasing their exports to fill the void left by the US. The largest export increases come from former USSR 24% (308 million), Australia 19% ($202 million), SSA 16% ($191 million). As China and India are major producers as well importers of cotton and they have limited agricultural land, their increase in export is expected to be minimal.

Welfare Changes

The welfare decomposition is perhaps the most important output of a general equilibrium analysis. The welfare impacts of the removal of the US cotton subsidies in terms of EV of millions of 2001 US dollars are presented in table A8. It is shown that the major beneficiary from the removal of the cotton programs is the United States itself whose gains is estimated at $443 million. Next to the US, Australia gains nearly $65 million, China 44 million, Subs-Saharan Africa nearly $42 million. Even though Brazil brought the case to the WTO, the welfare gain for Brazil is estimated only at $16 million.

When we look at the decomposition into the sources of the welfare gain, for the USA, the gain comes entirely from efficiency in resource allocation and modest losses from terms of trade effects. The removal of the cotton subsidy decreases land use in cotton by 22%, valued at $447 million, which is shifted to food and agricultural production. Use of

unskilled and skilled labor each decrease by 27% which are valued at 437 and 33 million dollars in terms of volume change. Likewise capital use is expected to decrease by 27% ($480 million). Overall, an estimated $ 2 billion worth of labor and capital moves out of cotton, textile, wearing apparel and chemical industry to the food manufacturing and services sectors.

The South and South East Asian cotton importers, including India and Bangladesh and the big subsidizing producers such as EU and former USSR lose from this policy. While the losses to the importers are from terms of trade effects as world price of cotton rises, the losses to the subsidizing producers is a result of inefficient resource allocation as they lure resources from other efficient sectors and expand output in the subsidized cotton production. The gain from allocative efficiency in the US as a ratio of the value added from the cotton sector is 8.6% while only 0.62% in SSA.

Comparison of Results with PE Estimates

Few studies have looked into the impact of the removal of US cotton subsidies using dynamic econometric partial equilibrium models (Sumner, 2003; Pan et al., 2004). While the partial equilibrium models have the advantage of incorporating a lot of detail about he modeled sector, they don't take into account indirect effects of the policy as GE analysis does. For instance the FAPRI model used by Sumner (2003) breaks down the US cotton production into different production zones. It assumes different supply elasticities, ginning capacities and rates of return per hectare for the different production zones.

Comparing partial and general equilibrium results is a tricky problem. Nevertheless, it is worthwhile to see how the GE results from this study compare with earlier partial equilibrium treatment of the problem. The partial equilibrium models are dynamic econometric models and trace the path of changes from the initial year when the policy shock takes place until some terminal year. Assuming that the adjustment period for a general equilibrium model from the initial shock until equilibrium is a medium term period, the percentage changes from the PE studies reported are calculated as a change between the scenario predictions at the end of a medium term period and the base at the initial year. Comparisons are provided in tables 3 and 4 below with Sumner (2003) and Pan et al. (2004) studies.

The results of the GE GTAP model are reasonably close to the PE results except in the change in US domestic cotton price, the world price of cotton and Brazil's expansion of output. Unlike the GE, the PE models take into account Brazil's vast agricultural land, favorable climate for cotton production. The difference in the world price of cotton is especially remarkable. The predicted change in the world price from the GE model is lower than the PE studies. It appears that the predicted average annual percentage price increase of 12% for a number of years from the PE models (which cumulates to about 90% change over six year period) underestimates the response of other large producers to the removal of the subsidies. In addition, there are factors other than the US cotton subsidy such as the higher yields from biotech cotton, expansion of cotton production in low cost producing countries as well as competition from synthetic fibers have contributed to the decline of world prices in the past.

Conclusion

The paper simulated the potential impacts of removing all US cotton subsidies. The simulation results indicate that the policy results in a significant reduction in US cotton output and export and loss of employment in cotton and related sectors. However, the US makes a large welfare gain from the resulting efficient allocation of resources. Other than improving welfare, the policy, if implemented, would also improve the US's negotiating position in the coming round of negotiations. Although it is not as large as the US subsidy, the EU also large cotton subsidy which must be addressed.

The decrease in output and exports from the US is expected to be filled by big competitors such as Australia, EU, former USSR, SSA and Brazil and to a lesser extent by other producers. However, despite increase in output and exports the EU and CIS make huge welfare losses due to the expansion of a subsidized sector that saps resources from productive use in other sectors. The other losers from the policy are large Asian textile producers which benefited from the lower prices due to the subsidies. These countries are expected to suffer some welfare losses due to the change in the terms of trade to their disadvantage.

The change in the world price of cotton is expected to be smaller than most partial equilibrium models predict mainly as a result of the expansion of output in other producers.

The GTAP model results are reasonably close to the PE analysis results except in the US domestic and world price of cotton and the prediction of Brazil's response, which the GTAP models appears to underestimate, considering Brazil's potential in terms of abundance of land, higher cotton yields, suitable climate and its success in soy bean production. Moreover, Brazil must have expected large gains from the elimination of US subsidies, unless they just used the case as an opening for future litigation on developed countries' agricultural subsidies.

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Table 1: Modeled Regions and Sectors

Regions	Sectors
Australia	Food and Agriculture
China	Plant based fibers
India and Bangladesh	Wool and silk-worm cocoons
South and South East Asia	Textiles
USA	Wearing Apparel
Brazil	Leather Products
Former USSR and Eastern Europe (CIS)	Chemicals, rubber, and plastic
European Union	Manufacturing
Sub-Saharan Africa (SSA)	Services and activities NES
All other regions (ROW)	

Table 2: Domestic Output Subsidy on Cotton

Region	Percent
Australia	0.00
China	-1.94
India and Bangladesh	2.08
South and South East Asia	1.87
USA	35.00
Brazil	1.27
Former Soviet Union and Eastern Europe	0.92
EU	27.99
SSA	-2.50
ROW	1.95

Source: GTAP database

Table 3: Comparison of Predicted PE and GE Changes in the US Cotton Market

	GE- GTAP	PE (Sumner, 2003)
Cotton land	-21.87%	-27.20%
Output	-25.52%	-31.80%
Prices	30.77%	89.94%
Export	-64.71%	-41.30%
World price	5.42%	54.50%

Table 4: Comparison of Predicted PE and GE Output Responses from Other Producers

Region	GE-GTAP	PE (Pan et al., 2004)
Australia	15.31%	10.74%
SSA	10.14%	11.48%
Brazil	5.21%	131%
Former USSR	10.61%	14.77%

Appendix

Table A1: Change in the Volume of Output

Sector	Australia	China	India and Bang.	South and S. East Asia	USA	Brazil	CIS	EU	SSA	ROW
Food and	-0.12	0	-0.01	-0.01	0.06	-0.01	-0.01	0.01	-0.04	-0.02
Agriculture	**-61.7**	**-3.30**	**-29.0**	**-86.4**	**595.3**	**-11.5**	**-47.2**	**65.0**	**-53.9**	**-105.6**
Plant based fibers	15.31	0.95	1.83	6.77	-25.52	5.21	10.61	12.2	10.14	4.58
	214.5	**64.5**	**118.0**	**176.2**	**-1866.0**	**39.8**	**491.8**	**142.4**	**191.7**	**306.3**
Wool, silk-worm	-0.6	0.38	0.01	0.13	0.39	0.4	0.18	0.66	0.01	0.22
cocoons	**-12.7**	**13.4**	**0.3**	**1.0**	**0.5**	**0.2**	**3.69**	**2.5**	**0.2**	**11.2**
Textile	0.11	0.26	-0.29	-0.19	-0.92	0.14	0.31	0.42	0.05	0.42
	3.3	**395.4**	**-122.8**	**-260.0**	**-1335.1**	**16.5**	**255.6**	**539.1**	**4.6**	**235.8**
Wearing apparels	-0.05	0.04	-0.45	-0.04	-0.26	0.01	0.03	0.11	-0.03	0.05
	-1.4	**24.3**	**-47.2**	**-42.1**	**-285.5**	**0.4**	**15.4**	**105.3**	**-1.2**	**23.2**
Leather products	-0.22	-0.05	0.03	0	0.01	-0.03	0.01	0.03	-0.08	-0.02
	-1.9	**-29.9**	**1.4**	**0.4**	**1.2**	**-1.5**	**1.8**	**16.7**	**-2.2**	**-3.8**
Chemical, rubber	-0.05	-0.02	-0.01	-0.01	-0.02	-0.02	-0.01	-0.01	-0.02	-0.02
and plastic	**-9.9**	**-37.7**	**-6.4**	**-38.3**	**-138.1**	**-6.9**	**-33.4**	**-97.7**	**-4.6**	**-22.9**
Manufacturing	-0.14	-0.03	0	0	0.07	-0.04	-0.03	-0.02	-0.11	-0.04
	-173.8	**-422.3**	**1.0**	**55.5**	**2440.5**	**-83.9**	**-495.9**	**-623.4**	**-176.0**	**-313.5**
Services	0	0	-0.01	0	0.01	0	0	0	-0.01	0
	-11.3	**-7.6**	**-38.5**	**-31.9**	**1075.6**	**4.9**	**-8.8**	**-116.7**	**-32.3**	**-68.5**

Source: Author's simulation

Figures in bold are volume changes in millions of 2001US$

Table A2: Change in the Market Price of Commodities

Commodity	Australia	China	India and Bangladesh	Sasia	USA	Brazil	CIS	EU	SSA	ROW
Land	1.87	0.08	0.22	0.26	-2.43	0.27	0.25	0.1	0.68	0.18
Unskilled Labor	0.09	0.03	0.01	0.01	-0.03	0.03	0.02	0.02	0.09	0.04
Skilled Labor	0.06	0.02	-0.01	0.01	-0.02	0.03	0.02	0.02	0.04	0.03
Capital	0.06	0.02	0	0.01	-0.03	0.04	0.02	0.02	0.03	0.03
Natural Resources	-0.07	-0.01	0	0.01	0.04	-0.01	-0.01	0	-0.06	-0.02
Food and agriculture	0.13	0.03	0.05	0.03	-0.06	0.04	0.04	0.02	0.08	0.05
Plant based fibers	1.72	0.14	0.61	1.95	31.66	0.48	0.74	0.57	0.78	0.47
Wool, silk-worm cocoons	0.22	0.08	0.06	0.08	-0.04	0.1	0.05	0.08	0.1	0.07
Textile	0.1	0.07	0.25	0.21	0.62	0.06	0.1	0.04	0.13	0.06
Wearing apparels	0.09	0.06	0.15	0.08	0.17	0.05	0.06	0.03	0.08	0.06
Leather products	0.07	0.04	0.02	0.03	0.02	0.03	0.03	0.02	0.05	0.03
Chemical, rubber and plastic	0.06	0.03	0.02	0.01	-0.01	0.03	0.02	0.02	0.04	0.03
Other manufacturing	0.05	0.02	0.01	0.01	-0.02	0.03	0.02	0.02	0.04	0.02
Services	0.06	0.02	0.01	0.01	-0.03	0.03	0.02	0.02	0.05	0.03
Capital goods	0.05	0.02	0.01	0.01	-0.02	0.03	0.02	0.02	0.04	0.03

Source: Author’s simulation

Table A3: Change in the Demand for Factor Endowments and Intermediate Inputs in the USA

Endowments	Food	Plant based fibers	Wool, silk-worm cocoons	Textile	Wearing apparels	Leather products	Chem., rubber and plastic	Manufa-cturing	Services	Capital goods
Land	0.98	-22.25	0.7	0.94	1.25	1.37	1.36	1.33	1.42	1.23
	395.6	**-447.3**	**0.0**	**0**	**0**	**0**	**0**	**0**	**0**	**0**
Unskilled labor	-0.01	-27.22	0.28	-0.95	-0.26	0.01	-0.02	0.08	0.01	0.02
	-6.1	**-437.2**	**0.0**	**-232.4**	**-52.4**	**0.3**	**-10.9**	**382.7**	**356.0**	**0**
Skilled labor	-0.01	-27.22	0.28	-0.96	-0.28	-0.01	-0.03	0.06	0	0.01
	-3.8	**-33.4**	**0**	**-51.2**	**-15.3**	**-0.0**	**-17.9**	**186.9**	**-65.3**	**0**
Capital	-0.01	-27.22	0.28	-0.95	-0.27	0.01	-0.02	0.08	0.01	0.02
	-11.6	**-479.6**	**0.0**	**-145.0**	**-17.7**	**0.2**	**-22.7**	**324.3**	**352.1**	**0**

Source: Author's simulation

Note: Figures in bold are volume changes in millions of 2001 US$

Table A4: Change in World Price Index

Sector	% Change
Food	0.02
Plant based fibers	5.56
Wool	0.09
Textile	0.2
Wearing apparels	0.08
Leather	0.03
Chemical, rubber and plastic	0.01
Manufacturing	0.01
Services	0

Source: Author's simulation

Table A5: Change in the Volume of Exports

Sector	Australia	China	India and Bang.	South and S. East Asia	USA	Brazil	CIS	EU	SSA	ROW
Food and	-0.50	-0.04	-0.11	-0.03	0.39	-0.07	-0.13	0.02	-0.21	-0.10
Agriculture	**-70.3**	**-6.0**	**-8.0**	**-12.7**	**215.2**	**-10.4**	**-56.7**	**31.7**	**-32.6**	**-58.7**
Plant based fibers	18.81	27.07	19.72	15.84	-64.71	21.45	24.06	16.23	16.32	20.62
	201.7	**25.2**	**23.6**	**33.2**	**-1421.0**	**37.8**	**308.2**	**137.2**	**191.7**	**194.2**
Wool, silk-worm	-0.84	0.46	0.90	0.74	2.27	0.44	0.88	0.78	0.50	0.88
cocoons	**-13.7**	**1.2**	**0.2**	**0.3**	**0.2**	**0.2**	**0.6**	**1.5**	**0.3**	**4.7**
Textile	0.55	0.74	-0.65	-0.24	-3.22	0.86	0.71	0.69	0.20	0.82
	2.1	**162.2**	**-58.9**	**-130.4**	**-394.4**	**7.6**	**101.0**	**404.7**	**3.7**	**130.2**
Wearing apparels	-0.12	0.08	-0.52	0.00	-0.71	0.19	0.05	0.21	-0.06	0.09
	-0.3	**24.0**	**-46.1**	**-0.8**	**-35.4**	**0.5**	**9.4**	**65.8**	**-0.9**	**18.6**
Leather products	-0.33	-0.07	0.06	0.00	0.09	-0.05	-0.03	0.04	-0.17	-0.05
	-1.2	**-21.6**	**1.3**	**0.4**	**1.8**	**-1.3**	**-1.4**	**11.8**	**-1.0**	**-18**
Chemical, rubber	-0.26	-0.10	-0.01	-0.01	0.20	-0.07	-0.10	-0.02	-0.10	-0.07
and plastic	**-8.3**	**-24.1**	**-0.3**	**-6.1**	**186.8**	**-2.9**	**-53.6**	**-88.8**	**-4.3**	**-23.8**
Manufacturing	-0.27	-0.09	0.02	0.00	0.22	-0.12	-0.06	-0.03	-0.18	-0.08
	-97.0	**-206.1**	**4.3**	**23.2**	**1067.0**	**-40.8**	**-295.6**	**-473.5**	**-118.2**	**-224.5**
Services	-0.20	-0.05	0.01	0.00	0.15	-0.07	-0.03	-0.03	-0.13	-0.07
	-28.4	**-10.7**	**2.3**	**6.5**	**347.6**	**-6.6**	**-33.0**	**-148.5**	**-19.5**	**-64.9**

Source: Author's simulation

Note: Figures in bold are volume changes in 2001US$ millions

Table A6: Change in Imports (Percent and Volume Changes)

Sector	Australia	China	India and Bangladesh	South and Southeast Asia	USA	Brazil	CIS	EU	SSA	ROW
Food and agriculture	0.22	0.03	0.02	0.01	-0.19	0.01	0.08	0.00	0.08	0.04
	7.0	**8.1**	**1.6**	**16.4**	**-106.6**	**0.6**	**46.3**	**-6.9**	**11.8**	**25.1**
Plant based fibers	1.03	-9.08	-10.34	-5.33	77.63	-0.56	-9.71	0.89	0.08	-10.56
	0.1	**-21.3**	**-110.3**	**-159.0**	**75.5**	**-0.8**	**-149.2**	**14.3**	**0.1**	**-108.3**
Wool, silk worm cocoons	0.54	-0.23	-0.44	-0.31	-0.71	0.13	-0.38	0.08	-0.25	0.04
	0.2	**-1.9**	**-1.8**	**-1.5**	**-0.4**	**0**	**-0.6**	**0.9**	**-0.0**	**0.0**
Textile	-0.10	-0.32	0.09	0.09	1.14	-0.22	-0.28	0.04	0.01	-0.14
	-1.9	**-66.4**	**3.8**	**31.2**	**378.2**	**-2.9**	**-57.0**	**15.8**	**0.1**	**-34.3**
Wearing apparels	0.05	-0.06	0.20	0.02	0.12	-0.05	-0.04	-0.03	0.02	-0.05
	1.0	**-2.00**	**0.4**	**4.3**	**68.2**	**-0.1**	**-3.2**	**-20.5**	**0.4**	**-4.8**
Leather products	0.04	0.00	-0.03	-0.02	-0.06	-0.01	0.02	0.00	0.03	0.01
	0.3	**0.1**	**-0.1**	**-3.4**	**-16.1**	**-0.0**	**1.4**	**0.2**	**0.3**	**0.6**
Chemical, rubber and plastic	0.11	0.04	-0.03	-0.01	-0.17	0.04	0.04	0.01	0.17	0.07
	10.5	**18.3**	**-2.9**	**-9.4**	**-174.1**	**4.8**	**36.6**	**26.8**	**21.8**	**44.1**
Other manufacturing	0.06	0.02	-0.02	0.00	-0.08	0.04	0.02	0.00	0.01	0.02
	27.1	**30.2**	**-12.1**	**-1.9**	**-666.9**	**19.0**	**89.0**	**40.8**	**8.1**	**53.8**
Services	0.11	0.02	-0.02	0.00	-0.08	0.03	0.02	0.02	0.06	0.04
	14.1	**9.0**	**-2.0**	**0.6**	**-143.5**	**5.4**	**20.0**	**94.3**	**13.0**	**35.0**

Source: Author's simulation

Note: Figures in bold are volume changes in millions of 2001 US$

Table A7. Percentage Change in Factor Input Demand in the US and SSA

	Food and Ag	Plant based fibers	Wool and silk cocoons	Textile	Wearing apparels	Leather products	Chem., rubber and plastic	Manuf.	Services	Capital goods
USA										
	0.95	-21.87	0.69	0.92	1.22	1.34	1.33	1.30	1.39	1.20
Land	**386.7**	**-436.2**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**
Unskilled	-0.01	-26.76	0.28	-0.92	-0.26	0.01	-0.01	0.08	0.01	0.02
Labor	**-5.9**	**-426.6**	**0.0**	**-225.5**	**-50.8**	**0.3**	**-10.5**	**373.3**	**345.7**	**0.0**
	-0.01	-26.76	0.28	-0.94	-0.27	-0.01	-0.03	0.06	0.00	0.01
Skilled Labor	**-3.7**	**-32.6**	**0.0**	**-49.7**	**-14.9**	**-0.0**	**-17.3**	**182.4**	**-64.2**	**0.0**
	-0.01	-26.76	0.28	-0.92	-0.26	0.01	-0.02	0.07	0.01	0.02
Capital	**-11.3**	**-468.0**	**0.0**	**-140.7**	**-17.2**	**0.2**	**-21.8**	**316.4**	**342.4**	**0.0**
SSA										
	-0.25	8.22	-0.09	-0.31	-0.35	-0.37	-0.35	-0.38	-0.36	-0.33
Land	**-12.4**	**12.0**	**-0.1**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**	**0.0**
Unskilled	-0.04	10.43	0.03	0.02	-0.07	-0.11	-0.06	-0.16	-0.06	-0.08
Labor	**-11.3**	**78.7**	**0.1**	**0.3**	**-0.3**	**-0.4**	**-1.5**	**-36.0**	**-29.6**	**0.0**
	0.00	10.44	0.04	0.07	-0.01	-0.05	0.00	-0.11	0.01	-0.03
Skilled Labor		**-0.1**	**0.7**	**0.0**	**0.2**	**-0.0**	**-0.0**	**-0.0**	**-3.8**	**3.0**
	0.00	10.45	0.04	0.08	0.00	-0.05	0.00	-0.10	0.02	-0.03
Capital	**-0.3**	**22.8**	**0.1**	**1.1**	**-0.0**	**-0.2**	**0.1**	**-33.6**	**10.0**	**0.0**

Source: Author's simulation

Note: Figures in bold are volume changes in 2001US$ millions

Table A8: Change in Welfare Millions US$

Region	Allocative efficiency	Terms of trade effects	IS effects	Total
Australia	0.7	61.6	1.3	63.7
China	13.8	10.1	18.9	42.9
India and Bangladesh	-13.5	-26.2	2.5	-37.2
South and South East Asia	-22.9	-146.2	57.7	-111.3
USA	448.4	118.4	-140.9	425.9
Brazil	1.2	12.5	1.7	15.4
CIS	-21.1	-49.6	15.2	-55.6
EU	-60.5	12.2	35.5	-12.9
SSA	7.2	33.2	0.8	41.1
ROW	-14.8	-26.1	7.2	-33.6
Total	338.4	-0.0	-0.0	338.3

Source: Author's simulation