How Will Agricultural Trade Reforms in High-Income Countries Affect the Trading Relationships of Developing Countries?

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January 2003

Abstract

The next three-year WTO round has been set in motion by recent negotiations in Doha, Qatar. Among the most contentious issues in that meeting, and probably over the course of the next round, is direct and indirect producer support for agricultural exporters in the North and forgone production, employment, and trading opportunities for farmers in the South. Our results indicate that real commitments to reduce agricultural support in high-income countries will induce substantial changes world food prices, domestic agricultural rates of return and output, and dramatic shifts in agricultural trade patterns. Total trade expands and real output, wages, and incomes in developing countries, especially among the rural poor, increase substantially. In particular, rural incomes in low and middle income countries increase by over $60B, a figure that comfortably exceeds even the most ambitious goals for increased development assistance and a substantial savings to OECD taxpayers. At the same time, EU and Japanese agricultural exports fall sharply and their imports rise. Other OECD countries see more balanced aggregate trade growth, but a number of strategic sectors are still adversely affected. These facts are likely to complicate negotiations in the Doha Round significantly.

[†] Paper presented at the OECD - World Bank Forum on Agricultural Trade Reform, Adjustment, and Poverty, in Paris, May 23-24, 2002 and the Fifth Conference on Global Economic Analysis, Taipei, June 5-7, 2002.. John Beghin is Marlin Cole Professor of Economics at Iowa State University and visiting researcher at INRA (jbeghin@card.iastate.edu). David Roland-Holst is James Irvine Professor of Economics at Mills College (dwrh@mills.edu), and Dominique van der Mensbrugghe is Senior Economist at the World Bank (dvandermensbrugg@worldbank.org). Views expressed here are those of the authors and should not be ascribed to their affiliated institutions. Without implicating them, we thank Jonathan Brooks, Josef Schmidhuber, and Wyatt Thompson for comments.

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1. Introduction

Following the Uruguay Round of the World Trade Organization (WTO) many developing countries have voiced their concerns and frustration during the agricultural agenda debate preceding the Doha Declaration of the WTO (Kennedy et al., 2001; WTO, 2001). These concerns have shaped the Doha Ministerial declaration. This frustration has at least two components. First, there is the lack of market access in high-income countries. Tariff rate quotas (TRQ) and other trade barriers block access to markets in which developing economies are competitive (Anderson et al., 2001; Martin and Winters, 1996). The lack of market access constrains trading opportunities for exporting developing members. Second, large agricultural subsidies in high-income countries via domestic farm and trade policies of high-income countries lead to depressed world market prices. Exports from some of the high-income countries are subsidized explicitly or implicitly through production subsidies.

The Doha declaration states that the agricultural negotiations should try to achieve "substantial improvements in market access; reductions of, with a view to phasing out, all forms of export subsidies; and substantial reductions in trade-distorting domestic support." (WTO 2001, paragraph 13). Despite the progress achieved with the Uruguay Round Agreement on Agriculture, a heterogeneous structure of market interventions in high-income countries distort resource allocation and trade in agriculture. European countries still rely heavily on export subsidies and domestic support, while the United States has been increasing domestic production subsidies to implicitly subsidize crop exports. Both the EU and the United States have kept a few protectionist bastions with high-tariffs (e.g., sugar and dairy). High-income Asian countries which tend to be net importing countries rely on high tariffs and/or TRQs with prohibitive out-of-quotas tariffs in many agricultural and food sectors (for example, Korea and Japan).

In this paper, we assess these claims and elucidate the empirical evidence contested between the developing members and high-income members of the WTO. Using the a dynamic global CGE model (van der Mesnbrugghe, 2001), we quantify the impact of trade and domestic agricultural distortions of high-income countries on terms of trade, welfare and trade flows of developing economies and their partners. We consider the removal of all export subsidies, tariffs and TRQ schemes, and output and input subsidies affecting production decisions in high-income countries. We look at eleven agricultural activities and six food sectors including (two meat sectors, vegetable oils, dairy products, sugar, and other food). Our country coverage includes high-income economies: Western Europe (EU-15 and EFTA countries), The United States, Canada, Australia and New Zealand, and High-Income Asia (Japan, South Korea, Taiwan, Singapore, and Hong Kong). Among developing and transition economies, we have Argentina, Brazil, China, India, Rest of East Asia, Rest of Latin America and the Caribbean, Eastern Europe and Central Asia, Sub Saharan Africa and SACU (South Africa, Botswana, Lesotho and Swaziland), and Rest of the World.

Our paper is part of the new literature analyzing agricultural negotiations issues in the Doha Round of the WTO (Burfisher, 2001; Diao, Roe and Somwaru, 2002; Francois, 2000; Hoekman and Anderson, 2000; and World Bank, 2001). The contribution of our paper resides in its focus on policies in high-income countries and the quantification of their effects on the relative competitiveness of North and South, for a large set of commodities and food industries. These policies affect the developing world's terms of trade in agricultural markets, its trade patterns, and welfare for a large set of products and food industries. In light of the policy asymmetries among countries noted above, how can agricultural trade patterns, as well as induced income and employment effects, be expected to evolve in the course of further

globalization? In particular, will WTO action against export subsidies confer an international competitive advantage on U.S. agriculture, and what would be the consequences for the United States and its trading partners? We evaluate two major scenarios, elucidating the detailed adjustments that would take place in trade, world prices, national welfare and rural income, and domestic economic structure.

We find that the world welfare cost of agricultural distortions in high-income countries amounts to about $82 billion annually at 1997 prices, while the developing world would gain about $26 billion per year at 1997 prices from the removal of the same distortions. OECD agricultural policies are a huge tax on developing country agriculture. Rural value added could increase by more than $60 billion (per annum, not cumulatively) in low and middle-income countries. This figure, incidentally, exceeds the most ambitious target for increased aggregate development assistance by over 20%. Ironically, realizing poverty alleviation in this way would occasion substantial savings for OECD taxpayers. Reduced OECD support would raise world food prices, causing real wages in developing countries to rise across the board and increase more than capital returns. In other words, removal of OECD agricultural protection is pro-poor on average, with the possible caveat that wage gains among urban poor would be offset by rising food prices.

Though world food prices rise, the changes in terms of trade are positive for all developing regions on aggregate. Terms of trade effects induced by domestic programs are substantial, especially for meat products. Further, there will be a significant re-orientation of agricultural trade because the current structure of production and trade is highly distorted. Trade in agriculture would increase by 17 percent at the global level, with agricultural and food exports increasing by 24 percent for low and middle-income countries. This gives the latter an

opportunity to purchase needed manufactured imports and capital goods.

In the next section, we provide a brief overview of global agricultural support patterns. This is followed by the results section of the paper, including policy scenarios, estimates, and interpretation. Section 4 is devoted to concluding remarks. The model documentation is available in van der Mensbrugghe (2001) and therefore not reproduced here.

2. Agricultural and Trade Policies in High Income Countries

This section provides stylized facts on current domestic and border distortions in key high-income countries as they relate to our aggregation in the model, namely, Australia and New Zealand, Canada, the European Union and EFTA countries, High-Income Asia (Japan, South Korea, Taiwan, Singapore, and Hong Kong), and the United States. We focus on distortions relevant to agriculture and food industries. Although the GTAP database used in the model refers to 1998, we provide a characterization of current policies based on the most recent data published by the OECD (OECD 2001) and the most recent country notifications to the WTO.

2.1. Australia and New Zealand

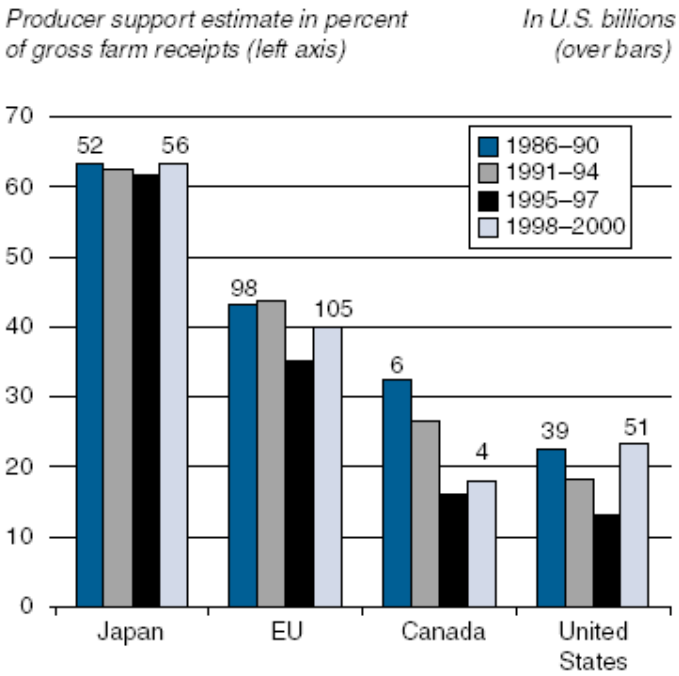
Australia and New Zealand have few distorting policies. Agricultural producers in these two countries are the least supported among OECD countries. The total producer subsidy equivalent (PSE) for Australian agriculture was 6 percent in 2000. The corresponding PSE for New Zealand was 0 percent in 2000 (OECD 2001).

Until recently the Australian dairy industry used to be heavily distorted. The dairy program, which set milk prices and a system of production quotas, was the last sector price support scheme in Australian agriculture. It was eliminated in 2000. An adjustment program replaces it and is financed by a levy on consumers for 8 years. Australia still has state-trading entities in charge of exports for wheat, barley, rice, and sugar. State trading does not seem to

distort price signals for consumers or producers (OECD 2001).

2.2. Canada

As shown in figure 1, Canadian agriculture is moderately protected in aggregate with a PSE of 19 percent in 2000. A few sectors are heavily protected however, such as dairy, which constitutes about 40 percent of the support received by Canadian agriculture in 2000 as measured by the OECD PSE (OECD 2001). The Canadian dairy program combines price supports with production quotas to increase domestic prices. In recent years the production quotas have been binding and the price supports have been redundant. TRQ schemes at the border limit dairy imports with prohibitive out-of-quota tariffs, which allow raising prices internally. The other sectors being supported are oilseeds and meat production but at a much lower level than dairy.



Source: OECD.

Figure 1. Producer Support Estimates in Some OECD Countries

Canada has been moving away from commodity-specific policy toward an income-safety net approach to farm subsidies. With the exception of dairy, producer prices for most commodities

are just slightly above the corresponding world prices.

2.3. The European Union

As suggested in Figure 1, European agriculture is heavily subsidized using various combinations of import restrictions, price support, area payments, and export subsidies. The most protected industries are sugar, dairy, and beef; Sugar and dairy receive price supports constrained by production quotas, while import restrictions and export subsidies complement domestic support and facilitate exports of excess production. Cattle and beef producers enjoy price supports, headage premia based a fixed number of animals, TRQs on imports and export subsidies, and aid for private storage. Pigmeat production benefits from the same kind of assistance and protection, although the EU does export substantial quantities of high-quality pork without subsidies. Grain production benefits from export subsidies, receives price support and area payments, but faces a set-aside requirement associated with the latter. Oilseeds receive area payments associated with a set-a-side, but do not have an intervention price.

Although the EU remains a major distorting force in world agricultural markets, the Common Agricultural Policy (CAP) has evolved dramatically since 1992 with a series of reforms culminating with the Berlin Accord on the Agenda 2000. The reforms have modified the sources of income support using lower price support which was offset by compensatory payments that are linked to historical production and impose set-aside requirements (crops), and headage payments combined with fixed production quotas (livestock, dairy). Area payments to oilseed producers are being progressively reduced to the level for cereals by the 2002/03 marketing year. The base rate for compulsory set-aside is 10 percent through the 2006/07 marketing year.

These CAP reforms and the devaluation of the euro vis-à-vis the U.S. dollar have helped

decrease the support level of European farmers as measured by the PSE (about 38 percent of aggregate farm income in 2000). Agricultural and food export subsidies amounted to US$ 2.6 billions (ECU 2.763 billions) in 2000-01 according to official notifications (WTO, various), a sharp decline from the 1999-2000 level of ECU 5.6 billions. The total direct payments amounted to about ECU 20 billions in 1998-99, and the AMS for Europe was in excess of ECU 46 billions for 1998-99, the most recent notification to the WTO (WTO, various).

EFTA countries subsidize and protect their agriculture even more than the EU-15 countries do. They rely on trade restrictions, domestic subsidies, and export subsidies to get rid of production surpluses (Norway). Their aggregate PSE was 63 percent for Iceland, 66 percent for Norway, and 71 percent for Switzerland in 2000.

2.4. High Income Asia

The High Income Asia aggregate is made of net-importing countries, which are characterized by restrictive trade policies, which are used to support domestic agriculture. WTO commitments achieved under the Uruguay round have opened some of these markets, such as feed markets (corn, and soybean). Nevertheless, food grain markets and in particular rice, dairy and meat markets remain virtually closed. Minimum imports for these products under TRQs are anemic because of prohibitive tariff on out-of-quota imports. The Korean government uses price supports, which are sustained by trade restrictions and limited government purchases (less than 5 percent of production for rice, soybeans and corn) and direct payments. The trade restrictions include a quota on rice (a WTO exemption until 2004, and TRQs on most other commodities). State trading in beef has been abolished in 2001. Korea is virtually self-sufficient in rice. The Korean government also provides a few direct payments for environmental practices, and some input subsidies (fertilizers and interest subsidies). Self-sufficiency remains a policy objective,

particularly in the rice sector, because of the cultural content of this good (Beghin, Bureau, and Parks, 2001). The PSE for Korean agriculture was 73 percent in 2000, the highest among OECD countries.

The objectives of Japan's agricultural policies have much in common with those of Korea. Food self-sufficiency is an official policy with a target of 45 percent for total calorie intake. This policy targets has been affecting most commodities including rice, dairy, and meat production. Support to agriculture is done through administrative prices and state purchases, trade protection and production limits. The government buys about 10 percent of rice production for "strategic" reserves. TRQs are in place for meat and all major grains including rice. The import quota on rice was abolished in 1999. Under minimum access requirements dictated by the URAA, a state trading agency controls rice imports, about half of which is re-exported as food aid. Another State trading agency control dairy imports and administer dairy prices. There are supply controls for dairy via production quotas, and for rice via compulsory diversion to other crops. Rice farmers receive direct compensation when market prices fall below some historical average level. Production subsidies are also received for calves and dairy manufacturing (OECD, 2001). Special safeguard duties are frequently used to increase the border protection of various food industries. As shown in Figure 1, the overall PSE of Japanese agriculture was 63 percent for the 1998-2000 period. Producer prices were about three times world prices in 2000 (OECD, 2001).

Taiwan has large livestock and meat production industries, mostly geared to export pork to Japan. This trade collapsed because of several foot-and-mouth disease breakouts since 1997. Taiwan has had high trade barriers on pork and beef, which became TRQs schemes with WTO membership in January 2002. Feed grains and protein crops enter the country with low duties

since Taiwan does not produce enough feed domestically. No PSE information is available for Taiwan. Hong-Kong and Singapore have no agriculture production.

2.5. The United States

The United States has a myriad of policies affecting agriculture. We focus on the main key policy instruments relevant to our trade liberalization analysis. Since 1997, the United States has been following an opposite route to the EU, increasing farm support levels to most commodities including exportable crops through three major instruments. First, decoupled payments, the "production flexibility contracts" of the 1996 farm bill, subsidize farming activities although they have no production requirements, but inflate land prices. These payments are linked to historical production and land use for contract crops (corn, wheat, rice, cotton, sorghum, barley, and oats). Second, program crops (contract crops, oilseeds, sugar, and tobacco) benefit from producer price subsidies known as marketing assistance loans and/or loan deficiency payments, essentially the difference between the market price and the loan rate which acts as a price floor. Finally, "counter-cyclical" emergency payments under the "market loss assistance" program have been taking place since 1998 for contract crops, dairy and soybeans. Loan deficiency payments are contentious because they are directly linked to output and are trade distorting. They depress world prices. Like the EU the United States has a few well-established bastions of protectionism relying on restrictive TRQs (sugar, dairy, and peanuts) and countervailing duties (lamb). In 2000, dairy had a PSE of 50 percent, which was the highest PSE among all U.S. commodities in 2000. TRQs are in place for virtually all dairy products, raw and refined sugar, peanut-based products, and some meat products.

The United States resorts to small explicit exports subsidies for dairy products (US$ 78 millions in 1999) and for poultry although the latter is marginal according to WTO notifications

(WTO, various). The United States also subsidizes exports via export credit guarantees, which help foreign countries to buy U.S. products. This subsidy covers shipments of about US$ 3 billion/year. U.S. farmers also enjoy heavily subsidized crop and revenue insurance. The net subsidy of this insurance program was in excess of US$ 1 billion in 2000.

The aggregate PSE for U.S. agriculture was 22 percent in 2000 right at the OECD average. The aggregate PSE has been rising, reaching 51 billions annually for 1998-2000 (see Figure 1). The Aggregate Measure of Support (AMS), which is used by the WTO to monitor commitments to reduce distorting assistance to agriculture, has been increasing dramatically compared to 1996-97 levels. Abstracting from de minimis and counting the marketing loss assistance as amber box payments, The total U.S. AMS for 2000 was above US$ 21 billion, exceeding the U.S. WTO commitment of 19.1 US$ billion for 2000 (Hart and Babcock).

3. Policy Coverage in GTAP and Scenarios

The GTAP database (release 5.3) provides a realistic description and parameterization of actual agricultural and trade policies, which rely to a large extent on the agricultural policy information collected by the OECD (OECD 2001). The database maps domestic policies into four categories (output subsidies, input subsidies, payments to land, and payments to capital). The GTAP database also accounts for agricultural trade distortions (import tariffs, export subsidies). TRQ schemes are not explicitly accounted for, although tariffs estimates reflect trade-weighed averages over in-quota and out-of-quota tariffs.

Some shortcomings constrain the accuracy of our analysis. The database refers to 1998 and hence lags on important developments that have taken place since, such as the entry of China and Taiwan into the WTO. As a result the GTAP database significantly overstates China's tariffs on oilseeds and grains, which do not reflect the current situation. A similar problem arises with

the EU because new policies have been put in place in 2000 with the Berlin Accord on Agenda 2000. The latter increases direct payments and reduces crop intervention prices. Finally, in the case of U.S. policy, the GTAP database maps production flexibility contract payments received by a subset of crops into subsidies to land devoted to these crops. The general view is that these subsidies benefit all crops because farms grow a mix of crops and these payments do not require any specific crop to be grown. These payments are also coupled because of expectations of future programs, and insurance and wealth effects under risk (Adams et al. 2001; Hennessy 1998).

The GTAP data do not distinguish raw and refined sugar uniformly across countries, leading to much raw sugar being accounted for as refined sugar, especially in trade data. Hence, the refined sugar sector provides information for the aggregate sugar industry (raw and refined) whereas the results for the raw sugar sector should be discounted.

These shortcomings are significant but not radical enough to invalidate our policy analysis exercise. Production and trade flows would be different under a more accurate policy description but the key messages emerging from our analysis remain unaltered. To assess the global consequences of liberalizing agricultural markets, we developed a variety of scenarios with the dynamic CGE model (van der Mensbrugghe, 2001).

Initial simulation results with the model were based on a calibrated, Business as Usual baseline and two counterfactual policy scenarios. The latter scenarios were designed to reflect liberalization of the various forms of agricultural support with respect to both domestic and external markets. For the first scenario we consider the removal of all domestic agricultural distortions (output subsidies, input subsidies, payments to land, and payments to capital) and trade distortions (import tariffs, and export subsidies). In the second scenario we only consider

the removal of border distortions;. These two capture the effects of domestic and external liberalization, individually and collectively, and should indicate the efficiency losses associated with both kinds of market bias. Results for the other scenarios are available from the authors.

The simulations assume that liberalizations are phased in with stepwise between 2005 and 2010. In each of these years, one-sixth of the relevant benchmark policy is eliminated, while the simulations provide identical results between 1997 and 2004. The model is allowed to settle down for five years after the final year of phase-in. Policy reductions are only implemented in the high-income regions defined as Australia and New Zealand, Canada, the European Union and EFTA countries, High-Income Asia, and the United States. In the case of tariffs, only positive tariffs are reduced. In the case of all other instruments, they are only reduced when they are negative, i.e. are acting as subsidies.

4. Simulation Results

Table 1 presents the aggregate effects of the two scenarios. In the first column, aggregate income changes are given in 1997 billions of US$. More precisely, this is measured as the change in the expenditure function at baseline and post-shock prices, i.e. it is a measure of Hicksian equivalent variation. The second column provides the levels of EV income change as a percent of baseline expenditures. As is usual with neoclassical growth models, aggregate shifts in production possibilities are limited by resource constraints, but it is noteworthy that, under both domestic and international agricultural liberalization, EV income increases for every country except China. On current trends, by 2015, the latter country will be facing some constraints on agricultural supply and slightly higher levels of imported food dependence, which remain modest however. Higher world prices negatively affect imports of food items such as dairy and grains.

Table 1: Real income impacts from agricultural reform in high-income regions

(Impact in 2015 compared to baseline)

	Removal of all protection	*Removal of border protection*	*Removal of all protection*	*Removal of border protection*
	$1997 bn		**percent**	
United States	5.0	4.3	0.05	0.04
Western Europe	17.0	21.4	0.17	0.21
High income Asia	22.1	25.8	0.34	0.40
Canada	4.2	3.0	0.55	0.39
Australia and New Zealand	7.7	6.2	1.23	0.98
Argentina	3.6	2.0	0.79	0.44
Brazil	3.2	1.8	0.32	0.17
China	-0.7	1.5	-0.04	0.07
India	1.6	1.1	0.23	0.16
Rest of East Asia	0.6	0.5	0.07	0.06
Rest of Latin America and the Caribbean	9.2	8.2	0.72	0.65
Eastern Europe and Central Asia	3.2	2.2	0.22	0.15
Sub Saharan Africa x SACU	1.8	1.6	0.57	0.52
Rest of the World	3.6	3.4	0.22	0.20
Low- and middle-income countries	26.0	22.3	0.27	0.23
High-income countries	56.1	60.6	0.20	0.21
World total	82.1	82.9	0.21	0.22
Cairns group	28.5	21.6	0.57	0.43

Source: Authors from model simulations.

Clearly, removing price distortions confers efficiency on most of the economies under consideration, and the result is output expansion in nearly every country. Small aggregate changes, dictated by resource constraints in the basic model, are not the most important message of this analysis, however. Whether the aggregate move up a little or more substantially, there are very dramatic adjustments taking place under the smooth veneer of the aggregate production possibilities frontier.

In particular, as relative prices shift in response to removal of preferential agricultural price distortions, factor returns in these sectors adjust dramatically and resources are pulled toward other activities. At the same time, removal of support takes a subsidy burden off the international price system, as OECD agricultural prices must rise to offset the loss of government support. This in turn will raise rates of return for farmers with support below the prior levels, especially those with no support in developing countries, and the lowest rural incomes can rise sharply.

To get a more precise impression of these agricultural linkages effects, consider the sectoral output adjustments presented in Table 2 below. Here we express sectoral output changes in 2015 as a percent of their corresponding baseline levels, the counterfactual being the first scenario (removal of all agricultural support). For the economies with relatively high prior protection, the adjustments can be relatively dramatic. While the rice sector is relatively small in the United States and ANZ, removal of rice support in Japan and other high-income Asia triggers significant competitive responses from these countries. As one might reasonably expect, heavily subsidized (raw and refined) sugar output contracts sharply in the United States and EU. The main beneficiaries are Latin American farmers.

Table 2: Change in output from full removal of agricultural protection in high-income regions

(percent change from baseline in 2015)

	United States	*Western Europe*	*High income Asia*	*Canada*	*Australia and New Zealand*	*Argentina*	*Brazil*	*China*	*India*	*Rest of East Asia*	*Rest of Latin America and the Caribbean*	*Eastern Europe and Central Asia*	*Sub Saharan Africa x SACU*	*Rest of the World*	*Low- and middle-income countries*	*High-income countries*	***World total***	*Cairns group*
Paddy rice	473.5	-71.4	-63.7	..	1285.7	-1.4	0.6	0.9	8.6	-1.4	6.1	0.6	-0.6	0.2	1.9	-32.3	-3.5	6.0
Wheat	4.2	-44.0	-77.1	43.3	12.0	3.8	5.2	3.8	0.4	28.7	22.0	12.7	7.0	8.5	7.0	-15.1	0.5	17.9
Other cereal grains	-0.1	-51.2	-60.8	-0.9	-6.4	30.9	2.7	5.9	0.0	1.8	10.6	19.7	6.4	8.7	8.5	-13.2	0.4	9.0
Vegetable and fruits	4.6	-11.3	-5.0	-2.4	-5.2	-0.9	0.1	-0.2	0.6	0.3	3.1	2.7	1.9	3.1	1.1	-4.3	0.0	0.9
Oil seeds	-9.9	-31.2	-44.3	17.9	10.2	-2.7	13.2	3.4	0.3	5.0	11.2	8.6	25.8	2.4	5.1	-11.5	1.0	9.1
Raw sugar	-45.4	-43.3	-58.6	23.5	-2.2	0.4	3.8	0.6	-0.1	2.3	18.8	7.7	36.7	3.8	6.1	-42.1	-1.5	6.7
Plant based fibers	1.9	19.1	104.0	..	-18.6	-3.3	0.0	0.4	0.1	0.7	-1.6	0.8	-2.4	0.1	-0.2	-1.9	-0.4	-3.4
Other crops	-10.7	1.6	-12.0	-3.3	10.0	-6.9	2.4	0.3	0.6	2.4	4.7	5.6	-0.7	1.3	1.7	-5.1	-0.7	3.6
Bovine cattle etc	5.3	-39.8	-27.2	12.7	30.9	38.5	11.3	0.1	0.4	2.6	9.3	34.6	3.5	9.7	9.5	-11.0	-1.4	13.7
Other livestock	1.3	-15.6	-2.4	-14.8	-7.6	-4.6	4.2	-0.2	-0.2	0.7	31.2	5.7	-1.7	2.7	2.9	-8.9	-0.4	9.3
Raw milk	1.0	-15.7	-40.9	-12.1	73.3	14.7	0.2	0.0	0.3	4.5	9.3	12.0	2.5	4.7	5.7	-8.6	-0.7	13.5
Fossil fuels	0.6	3.2	2.4	0.8	-6.1	-5.9	-1.3	0.2	-0.3	1.2	-3.2	-0.9	-3.3	-0.4	-0.9	0.7	-0.5	-1.8
Other natural resources	0.3	1.8	1.7	-0.3	-5.5	-2.1	-1.2	0.1	0.1	0.5	-1.3	-0.9	-0.4	-0.4	-0.3	0.4	0.0	-1.3
Bovine meat products	3.1	-36.4	-8.8	9.8	57.2	40.0	12.3	0.2	11.3	2.2	9.2	10.2	39.5	11.1	12.8	-10.1	-1.4	20.1
Other meat products	2.4	-18.5	-20.5	-10.5	3.7	-0.1	3.5	2.0	..	8.7	49.8	8.6	1.2	11.3	14.3	-11.4	-1.1	19.6
Vegetable oils and fats	-3.2	-7.0	45.5	-1.7	-5.6	-3.5	2.4	-2.2	-0.5	4.1	0.7	3.8	1.1	2.6	0.6	-1.2	-0.1	0.7
Dairy products	1.1	-16.1	-50.5	-16.6	82.0	0.6	0.4	2.2	-0.3	9.7	9.7	41.7	16.4	15.8	15.2	-9.4	-2.4	15.7
Refined sugar	-45.6	-65.4	-59.0	32.0	-2.2	0.4	5.3	2.3	4.7	2.6	26.0	8.5	73.2	9.3	13.2	-54.2	-4.5	11.8
Oth ProcFood, Bev, Tob	-0.4	-0.7	3.5	-1.9	-4.0	-1.0	-0.2	-0.7	-3.2	-1.7	-0.8	-0.5	-1.2	-0.7	-0.9	0.4	-0.1	-1.2
Text, Leath, and Apparel	0.3	2.7	1.6	-0.4	-7.2	-1.2	-0.4	-0.3	-1.0	0.3	-2.1	-2.0	-2.0	-1.6	-0.8	1.4	0.0	-1.1
Chem, Plastic, Rubber	-0.1	1.3	0.4	-0.6	-4.1	-2.0	-0.6	-0.3	-0.5	-0.7	-1.7	-1.7	-0.3	-1.1	-0.8	0.5	0.0	-1.3
Other manufacturing	-0.1	1.4	0.6	-0.6	-4.2	-2.1	-1.1	-0.1	-0.5	-0.2	-2.9	-1.7	-2.1	-1.2	-0.8	0.5	0.1	-1.5
Electricity and gas	0.2	0.4	0.3	-0.1	-0.6	0.4	-0.3	0.1	0.3	0.1	-0.8	-0.2	-0.2	0.1	0.0	0.3	0.1	-0.3
Construction	0.0	0.1	0.0	0.3	1.0	0.2	-0.1	0.1	0.2	0.1	0.4	-0.1	-0.1	0.1	0.1	0.1	0.1	0.3
Other services	0.0	0.5	0.2	0.1	-0.2	0.0	-0.1	0.0	0.0	0.0	-0.2	-0.3	-0.4	-0.2	-0.2	0.2	0.1	-0.1
Agriculture	2.7	-22.3	-24.4	6.4	26.2	8.0	3.8	0.6	1.5	0.4	10.0	8.9	3.1	4.5	3.6	-10.3	-0.6	6.8
Processed foods	-0.2	-10.1	-0.9	-3.4	24.8	3.9	2.1	-0.5	0.1	0.1	8.4	6.2	5.5	3.3	3.2	-3.8	-0.7	5.1
Manufacturing	-0.1	1.2	0.5	-0.3	-3.2	-1.6	-0.8	-0.1	-0.3	0.0	-2.0	-1.3	-1.5	-0.8	-0.6	0.5	0.1	-1.1
Services	0.0	0.5	0.2	0.1	-0.2	0.0	-0.1	0.0	0.0	0.0	-0.2	-0.3	-0.4	-0.2	-0.2	0.2	0.1	-0.1
Total	**0.0**	**0.0**	**0.1**	**-0.1**	**0.6**	**0.3**	**0.0**	**-0.1**	**0.1**	**0.0**	**0.6**	**0.0**	**0.5**	**0.1**	**0.1**	**0.0**	**0.0**	**0.2**
Agriculture and food	0.7	-13.4	-6.7	0.2	25.4	5.5	2.9	0.2	1.3	0.3	9.1	7.4	4.0	3.9	3.4	-5.7	-0.6	5.8

Source: Authors from model simulations.

Important disparities emerge between United States and Western Europe, however, especially in cereals and meat. Wheat has significantly higher prior protection in Europe, and the result of liberalization is significant contraction of Western European output, offset largely by expansion in the United States and elsewhere. The same thing happens with Bovine, other Meat, and Dairy products, with Western European output declining sharply against more competitive sources.

It is also worth noting that similar, but more dramatic effects occur in high income Asia. Rice output falls by about two thirds, while wheat drops more than three quarters and meats fall by about half. The main beneficiaries of this market diversion are the Low and Middle Income Countries and the Cairns Group.

Overall (see last row) Agriculture and Food contract sharply in Western Europe and High Income Asia, and this offset by expansion in the United States, ANZ, and a wide variety of low income countries in Latin America, Africa, and Asia. Indeed, one of the most salient features of these results is redistribution between OECD farmers in the prior group and farmers in poor countries. Our results appear to support the inference that wealthy taxpayers are undermining incomes of the rural poor across the developing world. While Western European protection appears to be sustaining artificially high aggregate agricultural protection, U.S. support actually represses agriculture by comparison to open multilateralism. If all support were removed multilaterally, aggregate U.S. agricultural output would be 0.7 percent higher annually from 2015. Given the huge fiscal burden of this protection, this indicates that U.S. protection is justifiable only on a defensive basis, and that (apart from relatively narrow sectoral interests like sugar), the United States should rationally take the developing countries side in the Doha Round.

Finally, note the aggregate agriculture output effect for the regional aggregates in the

latter columns of Table 2. Here again the progressive nature of the implied income distribution is immediately apparent. According to our results, the prevailing regime of global agricultural support is repressing output and incomes in most low-income continents, including Africa, Latin America, and low income Eastern Europe and Asia. This trend is particularly ironic since the support budgets in question comfortably exceed development assistance budgets exerting themselves in the opposite direction.

The results in Table 3 enable us to better understand the microeconomics of the adjustment process for the high-income countries and the regional aggregates. As one would expect from a producer support program, abolition leads to direct and indirect increases in the cost of capital, and this is particularly evident in Western Europe where direct producer support is quite high. Even on an average basis, High Income capital costs rise quite significantly when support is removed multilaterally. Returns to capital fall uniformly within countries because of the current model specification assumed perfect domestic capital mobility.

In the case of land, we see the expected result that factors' rate of return falls sharply, while its price declines to partially offset this as output is reduced. Land prices fall dramatically in the United States under the first scenario. Our model treats land as being imperfectly substitutable among agriculture activities. Land devoted to grains production experiences the steepest decrease, with a 45, 74, and 63 percent reduction for land devoted to rice, wheat, and other coarse grains, respectively. Generally speaking, the interactions between expanding and contracting sectors and land intensity are relatively complex but, at the regional aggregate level, the net burden of protection determines the direction of the adjustment in rate of return, land values, and rural incomes. Again richer farmers are the losers and poorer ones the winners.

Table 3: Factor returns in agriculture

(percent change from baseline in 2015)

	United States	*Western Europe*	*High income Asia*	*Canada*	*Australia and New Zealand*	*Low- and middle-income countries*	*High-income countries*	*World total*	*Cairns group*
Cost of capital inclusive of subsidies									
Paddy rice	2.5	-1.1	10.3	0.0	3.4	0.9	17.7	7.5	1.5
Wheat	2.7	121.2	10.0	3.1	3.4	1.9	48.8	20.6	1.2
Other cereal grains	3.1	145.3	14.2	5.8	3.4	1.8	30.6	16.1	2.6
Vegetable and fruits	0.6	-0.6	0.3	0.5	3.4	2.0	-0.8	1.3	2.4
Oil seeds	2.8	136.7	21.9	3.5	3.4	3.2	26.5	10.8	3.3
Raw sugar	2.0	-0.6	8.6	0.5	3.4	2.4	1.6	3.3	2.1
Plant based fibers	0.6	-0.7	0.3	0.0	3.4	1.2	1.0	1.1	2.2
Other crops	0.6	-0.6	0.3	0.5	3.4	1.8	0.9	1.8	2.3
Bovine cattle etc	4.1	442.5	42.9	4.4	4.7	2.2	200.6	85.5	2.5
Other livestock	3.4	19.3	21.5	11.0	3.4	2.1	13.3	4.4	2.7
Raw milk	18.9	13.2	13.0	13.7	3.4	1.9	13.0	6.9	2.6
Returns to capital exclusive of subsidies									
Paddy rice	0.6	-1.1	0.3	0.0	3.4	0.9	7.7	4.8	1.5
Wheat	0.6	-0.6	0.3	0.5	3.4	2.0	-5.6	0.5	0.7
Other cereal grains	0.6	-0.6	0.3	0.5	3.4	1.8	-3.7	0.4	2.1
Vegetable and fruits	0.6	-0.6	0.3	0.5	3.4	2.0	-0.8	1.3	2.4
Oil seeds	0.6	-0.6	0.3	0.5	3.4	3.2	-2.5	2.1	3.0
Raw sugar	0.6	-0.6	0.3	0.5	3.4	2.5	0.5	3.1	2.2
Plant based fibers	0.6	-0.7	0.3	0.0	3.4	1.2	1.0	1.1	2.2
Other crops	0.6	-0.6	0.3	0.5	3.4	1.8	0.9	1.8	2.3
Bovine cattle etc	0.6	-0.6	0.3	0.5	3.4	2.3	-4.2	-0.4	1.9
Other livestock	0.6	-0.6	0.3	0.5	3.4	2.2	-1.0	1.1	2.4
Raw milk	0.6	-0.6	0.3	0.5	3.4	1.9	-0.5	1.0	1.9
Cost of land inclusive of subsidies									
Paddy rice	80.8	-59.9	-65.5	0.0	180.1	2.0	-19.4	2.3	4.1
Wheat	4.6	-53.2	-70.2	22.2	27.3	5.1	42.4	36.3	12.5
Other cereal grains	3.1	-55.5	-63.7	7.9	19.6	5.0	23.5	23.2	9.4
Vegetable and fruits	4.6	-42.1	-51.6	7.6	20.2	2.9	-31.6	-2.1	5.0
Oil seeds	-0.5	-49.6	-60.0	14.5	26.6	4.4	22.5	16.5	7.8
Raw sugar	-15.8	-49.9	-63.9	0.0	21.5	3.8	-25.2	5.0	5.7
Plant based fibers	3.7	-35.5	-36.0	0.0	14.2	2.4	3.3	2.5	3.3
Other crops	-0.9	-39.1	-53.2	7.0	26.3	4.3	-22.7	-2.7	6.8
Bovine cattle etc	5.9	-45.6	-55.6	12.2	33.7	4.3	-2.9	3.9	9.8
Other livestock	4.2	-38.5	-52.6	3.0	19.4	2.0	-24.6	-0.1	6.6
Raw milk	4.6	-39.9	-58.7	4.0	46.7	5.7	-20.1	0.1	14.9
Returns to land exclusive of subsidies									
Paddy rice	0.2	-77.8	-68.4	0.0	180.1	2.0	-27.8	0.8	4.1
Wheat	-73.2	-95.8	-79.3	-31.6	15.2	5.4	-72.8	-27.0	1.0
Other cereal grains	-62.3	-95.7	-68.0	-36.3	6.1	5.8	-62.5	-19.8	7.4
Vegetable and fruits	4.6	-42.1	-51.6	7.6	20.2	2.9	-31.6	-2.1	5.0
Oil seeds	-23.4	-96.5	-61.6	-19.7	26.6	4.4	-46.1	-3.7	4.9
Raw sugar	-29.5	-66.3	-63.9	0.0	12.7	3.8	-40.2	2.9	5.5
Plant based fibers	3.7	-35.5	-36.0	0.0	14.2	2.4	3.3	2.5	3.3
Other crops	-0.9	-39.1	-53.2	7.0	26.3	4.3	-22.7	-2.7	6.8
Bovine cattle etc	-3.6	-50.6	-56.3	-8.4	20.0	4.3	-11.8	1.2	7.5
Other livestock	-3.7	-47.9	-53.3	-14.0	4.8	2.1	-31.6	-1.0	5.8
Raw milk	-5.0	-47.7	-58.7	0.6	38.6	5.7	-28.1	-2.4	14.3

Source: Authors from model simulations.

Most agricultural economists believe that the rental rate paid by producers would fall by the amount (rents to landlords) corresponding to the rate of return. The rental rate paid should fall because the rental rate was inflated by the farm programs formerly received by producers/renters. This may be a limitation of the GTAP database - all subsidies go to the factor owner not the user of the factor.

Now we examine the most dynamic adjustments, exports and imports by sector and country. Tables 4 and 5 present these on the following pages. There are many interesting individual adjustments. Note for example that world rice exports expand by 800 percent. Trade of cattle meat products expands substantially (70% for cattle, 69% for beef, 48% for other meats). Global grain trade expands by 20 to 25 percent despite an expansion of livestock output in major grain producing countries (Argentina, United States, and Australia). The EU experiences a major surge in meat and grain imports (130 percent for wheat and coarse grains, 129 and 176 percent for cattle and beef), and a collapse of its exports of the same products (-87 and 94 percent for coarse grains and wheat, -77 percent for cattle; –82 percent for beef). Dairy and sugar trade expands significantly. The GTAP database does not track raw sugar trade separately and it is difficult to disentangle changes in trade patterns in refined and raw sugar. Nevertheless it is clear that Brazil, India, China, and Sub-Saharan Africa benefit from sugar trade liberalization as their exports increase substantially.

While the tables reward this kind of close inspection, however, we now direct the reader's attention to the last row of aggregate agricultural exports and imports by exporter and importer, respectively. On the export side, the story of course mirrors sectoral output adjustments in Table 2. For example, the United States expands agricultural exports by 16 percent more per year by 2015 under multilateral liberalization, while the Cairns Group manages a 26 percent

Table 4: Change in exports from full removal of agricultural protection in high-income regions

(percent change from baseline in 2015)

	United States	*Western Europe*	*High income Asia*	*Canada*	*Australia and New Zealand*	*Argentina*	*Brazil*	*China*	*India*	*Rest of East Asia*	*Rest of Latin America and the Caribbean*	*Eastern Europe and Central Asia*	*Sub Saharan Africa x SACU*	*Rest of the World*	*Low- and middle-income countries*	*High-income countries*	***World total***	*Cairns group*
Paddy rice	2543.5	-94.3	..	..	8268.5	-5.1	..	5776.8	398.0	31.9	38.0	..	..	53.0	282.6	2919.4	804.1	617.3
Wheat	13.4	-40.5	..	55.5	12.4	6.1	45.6	678.1	24.5	33.4	240.5	67.4	..	125.9	60.1	13.4	25.6	41.4
Other cereal grains	-12.5	-86.7	..	2.0	-19.4	46.3	28.3	238.1	..	-16.4	102.4	136.1	146.5	121.5	89.1	-24.9	20.0	32.9
Vegetable and fruits	31.9	-10.1	133.9	8.1	-15.6	-4.3	12.8	34.7	12.4	8.9	6.3	20.9	10.5	20.9	11.3	7.2	10.2	4.9
Oil seeds	-15.6	-51.3	-77.0	54.5	23.2	-1.5	35.1	60.5	12.9	-2.5	19.9	18.3	115.1	5.2	30.3	-8.4	13.4	31.8
Raw sugar	..	-43.3	..	..	..	..	..	..	..	..	..	..	..	..	..	-43.3	-43.3	..
Plant based fibers	4.7	20.0	148.3	..	-23.2	-11.1	-1.0	..	1.2	3.1	-6.1	2.0	-3.0	0.5	-1.1	-1.0	-1.1	-15.5
Other crops	15.1	20.0	73.5	-3.5	-21.7	-14.3	5.0	9.9	4.1	7.0	6.3	13.1	-1.2	2.1	3.7	17.3	5.4	5.2
Bovine cattle etc	212.4	-77.2	1069.5	20.8	-12.6	-6.2	..	212.0	..	..	16.8	295.0	18.7	295.4	180.8	2.6	70.0	10.7
Other livestock	-1.3	-4.6	57.0	-16.5	-25.2	-25.4	33.5	-5.1	-27.1	-21.2	-7.3	4.3	-24.0	7.2	-1.5	-5.7	-3.7	-11.1
Raw milk	..	-22.1	..	..	..	..	..	..	-11.3	..	..	-17.1	..	-16.2	-15.6	-22.1	-16.0	..
Fossil fuels	1.6	3.9	3.6	1.6	-8.2	-10.8	-5.8	3.1	-1.6	2.0	-3.7	-0.8	-3.5	-0.3	-1.1	1.3	-0.6	-2.0
Other natural resources	1.4	4.9	5.0	0.8	-10.8	-13.8	-5.2	1.7	-0.2	2.5	-5.0	-1.5	-4.2	-1.1	-1.5	-1.4	-1.5	-4.4
Bovine meat products	47.8	-82.5	196.4	77.0	106.6	231.7	387.9	-3.6	11.3	57.3	168.0	118.1	639.1	500.3	209.9	21.4	68.9	149.5
Other meat products	27.6	-33.4	188.0	50.2	30.6	2.8	17.2	69.3	..	65.3	1247.2	45.7	48.6	275.7	166.5	-7.5	47.9	191.5
Vegetable oils and fats	-4.8	-10.3	247.2	1.8	-34.6	-6.5	4.7	-29.0	-2.4	7.5	1.7	10.1	33.9	28.9	2.9	7.8	4.5	2.1
Dairy products	150.0	-36.8	399.8	311.8	146.2	13.4	..	-43.6	-41.7	24.1	180.0	553.1	36.9	310.6	315.1	13.6	43.8	146.3
Refined sugar	213.7	-93.6	82.3	152.7	-10.4	60.3	19.5	20.2	97.2	13.6	91.7	44.4	200.8	165.9	81.5	-56.4	61.5	48.8
Oth ProcFood, Bev, Tob	-7.8	2.7	40.8	-4.3	-23.4	-19.1	-10.0	-12.8	-7.8	-9.0	-12.1	-7.8	-14.5	-9.3	-10.4	1.5	-3.3	-11.4
Text, Leath, and Apparel	1.1	4.0	2.9	-0.8	-15.1	-15.9	-6.6	-0.2	-3.4	0.5	-6.7	-3.6	-7.1	-3.4	-1.8	3.0	0.3	-3.5
Chem, Plastic, Rubber	-0.4	2.5	1.9	-1.5	-13.5	-14.7	-6.0	-1.1	-3.6	-1.2	-6.4	-4.0	-6.0	-3.4	-2.9	1.5	0.5	-3.7
Other manufacturing	-0.5	2.3	1.2	-1.0	-11.2	-11.8	-5.5	-0.4	-2.8	-0.2	-5.6	-3.4	-5.9	-2.7	-2.2	1.1	0.3	-2.8
Electricity and gas	-0.4	1.4	0.9	-0.2	-6.4	-9.4	..	0.0	..	0.1	-2.4	-0.8	-1.8	-1.0	-1.1	1.1	0.1	-1.2
Construction	-1.1	1.1	0.0	-1.4	-7.9	-8.5	-4.3	-1.1	-1.9	-0.7	-4.4	-2.5	-3.5	-1.7	-2.2	0.6	0.0	-3.6
Other services	-0.6	3.3	2.3	-1.4	-13.0	-13.9	-6.7	-0.6	-2.5	-0.3	-7.3	-2.5	-5.8	-2.6	-2.7	1.6	0.4	-4.7
Agriculture	24.3	-21.5	97.4	31.0	23.9	14.9	19.0	92.8	41.0	2.7	11.0	41.4	5.2	30.3	19.2	12.6	16.9	15.6
Processed foods	8.2	-13.0	80.5	27.7	76.9	27.2	18.5	-5.6	0.5	0.2	62.7	48.2	62.6	44.8	28.5	3.5	14.0	34.9
Manufacturing	-0.4	2.4	1.4	-0.8	-11.1	-12.4	-5.6	-0.4	-3.0	0.0	-5.4	-3.1	-4.5	-1.9	-2.0	1.3	0.3	-2.9
Services	-0.6	3.3	2.3	-1.4	-13.0	-13.9	-6.7	-0.6	-2.5	-0.3	-7.3	-2.5	-5.8	-2.6	-2.7	1.6	0.4	-4.7
Total	0.5	1.9	2.1	0.8	0.6	4.3	2.4	-0.2	0.8	0.0	1.1	0.2	1.9	0.4	0.5	1.5	1.2	0.8
Agriculture and food	16.0	-14.2	82.3	29.5	57.9	21.8	18.8	12.7	15.3	0.6	31.0	45.2	16.1	36.1	23.8	6.1	15.1	25.9

Source: Authors from model simulations.

Table 5: Change in imports from full removal of agricultural protection in high-income regions

(percent change from baseline in 2015)

	United States	*Western Europe*	*High income Asia*	*Canada*	*Australia and New Zealand*	*Argentina*	*Brazil*	*China*	*India*	*Rest of East Asia*	*Rest of Latin America and the Caribbean*	*Eastern Europe and Central Asia*	*Sub Saharan Africa x SACU*	*Rest of the World*	*Low- and middle-income countries*	*High-income countries*	***World total***	*Cairns group*
Paddy rice	101.5	55.7	6568.0	0.0	..	..	-6.1	..	..	-1.5	-10.5	-2.5	-41.1	-1.3	-6.2	1241.1	787.4	-7.3
Wheat	33.1	130.6	14.0	459.8	..	..	-8.2	-17.9	-21.6	-0.5	-8.3	-0.5	-18.6	-14.1	-10.0	89.1	25.1	-3.0
Other cereal grains	16.8	133.5	-13.9	18.5	..	17.1	-11.1	-18.1	..	-19.4	-3.8	1.2	-0.1	-14.1	-11.6	44.7	18.7	-7.8
Vegetable and fruits	2.7	12.1	39.3	2.5	10.2	3.9	-5.5	-4.1	-2.0	-3.4	3.1	0.2	4.3	-0.2	-1.2	13.7	10.5	0.7
Oil seeds	64.4	17.1	40.5	-5.5	-4.5	-1.7	-3.4	-7.9	..	-4.2	-0.1	3.7	3.6	-3.3	-4.3	25.3	13.4	-2.1
Raw sugar	..	-43.3	..	..	..	..	..	..	..	..	..	..	..	..	..	-43.3	-43.3	..
Plant based fibers	-3.0	1.8	0.8	-0.6	..	..	-0.3	-2.8	-2.8	-3.1	3.7	-0.4	-0.8	-0.9	-1.7	1.3	-1.1	-1.3
Other crops	27.1	-1.7	9.0	1.9	27.8	3.8	-0.4	-0.4	3.0	-0.9	6.5	4.1	1.3	1.0	2.1	6.2	5.4	5.0
Bovine cattle etc	11.4	129.0	305.1	6.4	33.9	55.1	5.8	..	..	-15.6	1.0	-3.6	5.0	-4.8	-5.7	92.0	71.6	-1.3
Other livestock	-0.6	-0.2	-19.9	52.2	13.1	5.0	-0.2	-5.3	-1.3	-3.0	36.9	4.7	3.4	2.3	0.6	-5.5	-3.8	23.0
Raw milk	18.9	-12.9	-51.8	..	..	..	..	..	..	..	..	..	..	..	..	-16.0	-16.0	..
Fossil fuels	-1.3	0.0	-0.2	-0.5	1.1	3.2	-0.4	-1.6	-0.6	-1.0	-2.7	-0.9	-0.3	-1.2	-1.1	-0.4	-0.6	-0.9
Other natural resources	-1.5	-1.7	-1.5	-0.8	3.2	3.1	1.0	-2.9	-0.5	-1.3	1.2	-0.8	2.7	-0.6	-1.3	-1.6	-1.5	0.0
Bovine meat products	16.5	176.1	21.9	32.8	8.7	9.2	-4.2	-3.9	..	-3.2	-4.2	-13.4	-11.7	-13.4	-8.6	102.0	71.8	4.4
Other meat products	6.5	73.6	59.6	172.4	13.9	7.7	6.7	-4.2	..	-3.7	4.0	-0.1	-3.9	0.2	-1.0	67.4	46.8	47.0
Vegetable oils and fats	15.2	14.7	-24.9	12.7	13.2	4.3	-1.3	2.3	0.9	1.1	-1.4	1.5	17.6	3.1	2.1	8.4	4.7	1.6
Dairy products	92.4	39.3	245.7	797.6	16.0	4.0	-6.7	-14.4	-10.6	-8.3	-13.0	-15.8	-21.9	-11.7	-12.5	74.6	44.5	20.1
Refined sugar	133.0	163.7	114.1	-0.4	0.4	7.9	..	-2.1	-3.9	-2.3	1.5	-1.1	-2.8	-7.0	-3.6	139.7	62.9	-0.5
Oth ProcFood, Bev, Tob	0.5	-3.3	-16.4	-0.8	9.5	8.1	1.4	1.8	2.6	2.4	3.9	3.3	5.1	2.3	2.9	-5.8	-3.4	3.0
Text, Leath, and Apparel	-0.2	-0.1	-0.6	0.4	3.0	8.1	3.3	0.7	1.0	0.1	2.7	0.9	2.2	0.8	1.2	-0.1	0.3	2.0
Chem, Plastic, Rubber	0.4	-0.3	-0.9	0.6	5.3	7.1	3.9	0.6	1.4	0.2	2.6	1.3	3.5	1.6	1.6	-0.1	0.5	2.2
Other manufacturing	0.1	0.1	-0.2	0.2	3.6	5.3	2.5	0.5	1.4	0.1	1.3	1.0	1.8	0.9	0.9	0.1	0.3	1.1
Electricity and gas	0.2	-0.2	-0.1	0.2	..	3.1	1.3	..	1.1	0.9	1.3	0.1	0.7	0.8	0.5	-0.1	0.1	1.2
Construction	0.4	-0.5	0.0	1.2	5.2	4.9	2.1	0.7	1.2	0.6	2.8	1.3	1.7	0.8	1.0	-0.3	0.0	1.3
Other services	0.5	-1.4	-0.9	1.2	8.2	8.6	4.0	0.4	1.7	0.3	4.3	1.7	3.6	1.5	1.9	-0.6	0.1	2.9
Agriculture	15.9	21.0	51.5	7.3	20.8	3.9	-4.1	-6.8	-3.9	-4.3	1.1	1.7	-6.8	-6.9	-3.8	26.2	16.4	-0.1
Processed foods	13.2	28.5	9.5	29.7	10.3	7.6	-0.8	0.4	0.8	-0.1	0.3	0.2	1.8	-0.9	0.0	21.6	14.2	6.1
Manufacturing	0.0	0.0	-0.4	0.2	3.7	5.7	2.6	0.4	1.1	0.1	1.5	0.8	2.0	0.9	0.9	0.0	0.3	1.2
Services	0.5	-1.4	-0.9	1.2	8.2	8.6	4.0	0.4	1.7	0.3	4.3	1.7	3.6	1.5	1.9	-0.6	0.1	2.9
Total	0.6	1.5	1.3	1.2	4.9	6.2	2.5	0.1	1.1	0.0	1.8	0.9	2.4	0.7	0.9	1.3	1.2	1.6
Agriculture and food	14.4	25.4	24.9	22.0	12.7	6.1	-2.7	-3.2	-1.7	-2.1	0.6	0.7	0.0	-2.8	-1.4	23.4	15.1	3.6

Source: Authors from model simulations.

increase. Even more dramatic are the Rest of Latin America (31%), Eastern Europe and Central Asia (45.2%), and the Rest of the World (36.1%), and ANZ with a sensational 58 percent increase. Some of this trade growth is displacing Western European exporters, whose shipments decline 14.2 percent, but the vast majority is driven by economic growth in a less distorted market environment. Again, the burden and opportunity cost of agricultural protection is far greater than simple market defense could justify.

On the import side, we see rising world food prices inducing greater food self-sufficiency in some poor countries, including Brazil, China, India, Rest of (low income) East Asia, and Rest of the (non-OECD) World. For richer countries, income effects and lower relative prices for foreign agricultural products drive significant increases in imports. Generally speaking, a Doha-style approach to more balanced abolition of agricultural price distortions would greatly increase global agricultural trade, improving the livelihoods of a significant and underprivileged majority of the world's farmers.

A final insight from these scenarios concerns world food prices. Table 6 presents these by sector under the two scenarios (removal of all domestic and trade support, removal of trade support only). These results clearly indicate that most of the burden of agricultural support on international food trade is indirect. When only tariff and export subsidies are removed, world food prices for these product categories never change by ten percent or more. If domestic and external supports are abolished together, however, percentage increased in global food prices can be up to two orders of magnitude greater by 2015. Cattle prices, for example, would drop half a percent if only external distortions were removed, indicating that the existing pattern of external policy toward this sector is withholding supply for world markets. If domestic support were removed, however, an 18 percent world price increase would be necessary to offset this and

restore equilibrium in world beef markets. Clearly, it is not conventional protectionism or export promotion that is most responsible for the dysfunction of today's agricultural markets, but direct producer support. It should also be noted that, upon inspection of trade weighted world prices for all product categories, we find that, although world food prices rise significantly, overall terms of trade improve for developing countries.

Table 6: Change in world prices

(percent change from baseline in 2015)

	Removal of all protection	*Removal of border protection*
Paddy rice	5.5	4.1
Wheat	12.0	1.9
Other cereal grains	14.5	2.7
Vegetable and fruits	0.3	0.1
Oil seeds	8.1	1.0
Raw sugar	-1.7	-2.2
Plant based fibers	1.8	1.4
Other crops	0.9	0.6
Bovine cattle etc	18.2	-0.5
Other livestock	2.2	-0.9
Raw milk	2.4	0.1
Bovine meat products	10.4	1.9
Other meat products	1.7	-0.9
Vegetable oils and fats	2.2	-0.2
Dairy products	8.3	5.9
Refined sugar	9.0	8.4
Other processed foods incl beverages and tobacco	-0.2	-1.0
Agriculture (weighted average)	4.3	0.7
Processed foods (weighted average)	2.1	0.3

Source: Authors from model simulations.

What would be the global distributional consequences of abolishing OECD agricultural protection? This can be inferred by the market linkages in question, i.e. rising global food prices improve incomes among farmers without prior support, but more detailed estimates are available directly from the simulation model and presented in Table 7. These changes in national rural value added indicate that the big losers would be farmers in Western Europe and High Income Asia (mainly Japan), while low and middle income farmers would benefit more in absolute (but

less in relative) terms. Indeed, OECD agricultural policies represent a huge tax on developing country agriculture. Removing all OECD subsidies would increase rural value added by more than $60 billion (per annum, not cumulatively) in low and middle-income countries.

Table 7: Impact on nominal rural[a] value added from agricultural reform in high-income regions

(Impact in 2015 compared to baseline)

	Removal of all protection	*Removal of border protection*	*Removal of all protection*	*Removal of border protection*
	$1997 bn		**percent**	
Western Europe	-28.8	-34.4	-15.5	-18.6
United States	5.5	7.6	4.8	6.6
High income Asia	-34.4	-35.0	-36.6	-37.2
Canada	2.1	1.5	15.4	11.1
Australia and New Zealand	7.8	6.6	41.5	34.9
Argentina	6.6	3.8	15.5	8.9
Brazil	5.7	3.3	7.0	4.0
China	7.9	4.6	2.0	1.1
India	4.9	3.6	3.3	2.4
Rest of East Asia	1.5	0.4	1.4	0.4
Rest of Latin America and the Caribbean	15.3	12.3	15.2	12.2
Eastern Europe and Central Asia	7.7	4.4	10.8	6.2
Sub Saharan Africa x SACU	3.4	2.6	6.3	4.8
Rest of the World	10.3	6.2	6.8	4.1
Low- and middle-income countries	63.4	41.2	5.5	3.6
High-income countries	-47.7	-53.7	-11.2	-12.6
World total	**15.7**	**-12.5**	**1.0**	**-0.8**
Cairns group	39.1	27.9	10.8	7.7

Note: a) Loss in value net of agricultural subsidies.
Source: Authors from model simulations.

This figure, incidentally, exceeds the most ambitious target for increased aggregate development assistance by over 20%. Unlike development assistance by conventional means, realizing poverty alleviation in this way would also occasion substantial savings for OECD taxpayers. Perhaps most significant, these $63.4B real, net dollars would be delivered directly to the doorstep of poor households in the developing world by the marketplace, bypassing local, regional, national governments and a variety of other mediating institutions. At the heart of these policies lies a potent catalyst for global poverty alleviation. For those, like the present authors,

who believe globalization has been beneficial to the poor, it would thus be ironic if, as the new US farm bill threatens to do, OECD agricultural protection were to break the Doha Round.

5. Conclusions and Extensions

Global agricultural trade is a centerpiece of the Doha Round of multilateral trade relations. This focus is eminently sensible since agriculture is one of the largest and most stubborn areas of government market intervention remaining after thirty years of determined progress toward open multilateralism. Agricultural protection is also seen as an important source market bias between rich and poor nations, and reconciling this has special significance in the context of recent multilateral commitments to more aggressively attack the causes of global (largely rural) poverty.

In this paper, we use a new dynamic simulation model and global database to assess the efficiency and welfare burdens of today's agricultural support programs. Our results indicate that these burdens are quite substantial, that their abolition would lead to dramatic shifts in domestic and international resource allocation, and that the result would be a more progressive distribution of farm income. In particular, our results give strong empirical support to the idea that current agricultural support in high-income countries is repressing output and incomes in low-income farm households across the developing world. Thus, for example, taxpayers in OECD countries are paying twice for development assistance, once to reduce the incomes of poor farmers and once to alleviate the same poverty.

Abolition of OECD agricultural support would be a potent catalyst for global poverty alleviation, at the same time realizing substantial savings for OECD taxpayers. Today, these policies reduce rural value added by more than $60 billion (per annum, not cumulatively) in low and middle-income countries, a figure 20% higher than the most ambitious goals for increased

development assistance. If they were also to undermine the Doha Round, as the new US farm bill portends, it would be a doubly regressive blow to North-South economic relations.

Among our more specific conclusions are the following:

a. Though world food prices would rise with the abolition of agricultural support program, the overall terms of trade would appreciate for developing regions as a group.

b. There would be significant growth and re-orientation of global agricultural trade, i.e. the current structure of production and trade is highly distorted. Trade in agriculture would increase by 17 percent at the global level, with agricultural and food exports increasing by 24 percent for low and middle-income countries. This would give the latter an essential opportunity to purchase more manufactured imports and capital goods.

c. Real wages in developing countries would rise across the board, and increase more than capital returns, i.e. removal of agricultural protection in OECD countries is pro-poor on average, and more than likely equitable.[1]

d. The Cairns group would be a clear beneficiary of this liberalization.[2]

The results reported here are preliminary in the sense that we would like to calibrate existing support patterns in greater detail, and also because this support may change significantly in the near future. The new Farm Bill in the United States has, in light of our results, momentous implications for the Doha Round. Not only does the Bill threatens escalation to unprecedented support levels, but in its present form it repudiates one of the important tenets of Doha: decoupling support from output levels. To reduce the distortionary impact of agricultural support, it has been argued that it should be converted from output-based assistance to lump sum income transfers. The new Farm Bill thus represents two steps backward from more liberal

[1] One caveat to this is rising food prices faced by the urban poor.

[2] Cairns group includes ANZ, ARG, BRA, Rest of East Asia, and Rest of LAC.

global trade, higher absolute subsidy burdens and more direct distortion of market incentives. In subsequent work, we hope to evaluate this policy and the potential for retaliation, including a breakdown of the Doha Round.

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