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The Shrinking Gains from Global Trade Liberalization in Computable General Equilibrium Models

A Critical Assessment

The latest round of world trade negotiations, launched in Doha in 2001, has come to at least a temporary halt in the aftermath of the 2005 World Trade Organization (WTO) meeting in Hong Kong. The familiar arguments about the benefits of trade liberalization have been updated and forcefully reiterated: According to the World Bank and other leading analysts, massive computer modeling exercises show that a new trade deal could yield hundreds of billions of dollars in benefits, much of it going to developing countries, and could lift vast numbers of people out of poverty. Yet the arguments and the huge projected benefits appear to be less persuasive this time, as governments around the world have often proved unable or unwilling to make the compromises required for further steps toward trade liberalization.

This paper presents a critical review of the mainstream economic models used to project the effects of global trade policies, namely "computable general equilibrium" (CGE) trade models. The results of these models are typically reported as if they were hard, objective facts, providing unambiguous numerical measures of the value of liberalization. Discussion of these results often suggests that the sheer size of the estimates itself makes a powerful case for

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liberalization, that all countries will benefit, and that gains from trade liberalization will translate into gains (or at least no losses) in jobs.

However, looks can be deceiving; the dominant interpretation of the mainstream trade models is mistaken on at least three grounds, addressed in the three major sections of this paper. First, although the results of global trade modeling are often touted as evidence of large gains available from further trade liberalization, the most widely discussed CGE models now make surprisingly small estimates of the benefits of liberalization of merchandise trade. The estimates are especially small for developing countries, particularly under realistic assumptions about the likely extent of future trade liberalization. As a consequence, the estimated potential for free trade to reduce global poverty is also quite limited.

Second, although the predictions of global trade models per se are still important, many of the strongest claims and largest numbers for benefits of liberalization are based on modeling innovation that extend the assumed behavioral structure far beyond the standard models. There is much less consensus about methodology in these extensions than in the CGE models themselves and—not surprisingly—not much consensus about the results.

Third, although the effects of trade liberalization on employment are a fundamental concern of policy makers, the real-world impacts of trade on employment and growth are excluded by design from most CGE models. These along with other unrealistic, simplifying assumptions cause distortions in the model results. It should be possible to develop analyses that incorporate realistic employment impacts and adjustment effects of trade agreements; indeed, there are already promising initial steps in that direction. Such models would likely tell a story about winners and losers from trade quite different from the best-known current forecasts.

Forecasting the Benefits of Liberalization

What a difference two years make. In the discussion leading up to the WTO negotiations in Cancún in 2003, it was common to hear about the hundreds of billions of dollars of benefits available from trade liberalization, most of it going to developing countries. In 2003, World Bank economists estimated that an agreement to reduce tariffs could increase global income by as much as $520 billion, two-thirds of it going to developing countries, and lift an additional 140 million people out of poverty.[1] By 2005, leading up to the next round of negotiations in Hong Kong, the World Bank estimated that even complete trade liberalization (a more extensive degree of liberalization than assumed in the 2003 estimates) would create less than $300 billion in global gains, of which only one-third would be received by the developing world;

guesses at the likely outcomes of trade negotiations were predicted to yield much smaller gains and to have minimal effects on global poverty.

This section explores the projections of the benefits of merchandise trade liberalization made by the Global Trade Analysis Project (GTAP) model, the best-known and most widely used of the global trade models, and by the World Bank's LINKAGE model. Table 1 contrasts their best-publicized forecasts of the benefits of complete liberalization published in 2002–3 versus 2005. In both cases, the later estimates of global benefits have fallen to about one-third, and the benefits to developing countries have fallen to about one-fifth, of their previous levels.

Both of the newer studies appear as chapters in the same book, published by the World Bank (Anderson and Martin 2005). Both use the GTAP 6 database, describing the world economy as of 2001—the latest version of the standard database used by virtually all CGE trade models of global trade liberalization. Both incorporate trade agreements reached through 2005, including China's entry into the WTO, the expansion of the European Union in 2004, and the end of the Multi-Fiber Agreement, in their baseline.

This updated data is a principal reason why GTAP and LINKAGE now predict much smaller gains from liberalization than they did only two or three years ago. As of 2002–3, the models used the GTAP 4 or 5 databases, describing the world as of 1995 or 1997. Although some earlier forecasts attempted to look ahead and incorporate the expected effects of scheduled trade agreements, they did not completely anticipate the rapid pace of recent reduction in trade barriers, the rapid growth of East Asian economies, and other economic changes that affect the models. The newer models use 2001 as their base year and take into account trade preferences and recent policy reforms, such as the elimination of apparel and textile quotas and China's entry into the WTO (van der Mensbrugghe 2006).

In the latest, updated models, the basic data is less out of date, and the world has less protectionism left to lose, so there are smaller benefits available from going the rest of the distance toward liberalization. One source of disagreement among forecasts, therefore, is that some of the larger numbers still circulating, including some discussed below, are based on older data sets that assume there is more scope remaining for future liberalization. A comparative survey of CGE trade forecasts identified this as one of four major sources of differences between models, estimating that use of trade agreements data as of 2001, rather than updating through 2005, would boost the calculated benefits of complete liberalization by 36 percent (Bouet 2006). The other three major differences were the choice of elasticities, discussed later; technical details affecting the modeling of tariffs; and assumptions about the relationship between trade liberalization and productivity, also discussed later. The earlier

Table 1

Benefits of Complete Liberalization, Then and Now

		Benefits (billions of dollars)	
Model	Year	Developing countries	World
GTAP	2005	22	84
GTAP	2002	108	254
LINKAGE	2005	86	287
LINKAGE	2003	539	832

Sources: Anderson 2004: 550, table 10.1; Anderson et al. 2005: 28, table 17.1; Hertel and Keeney 2005: 33, table 2.9.

World Bank forecast shown in Table 1 includes the effects of assumptions about future productivity gains from trade liberalization.

GTAP

In their study, Thomas Hertel and Roman Keeney (2005) apply GTAP to estimate the benefits available from removal of all remaining barriers to merchandise trade. As shown in Table 1, their estimate of the remaining global benefits from full liberalization of merchandise trade is $84 billion. This is a modest benefit worldwide, equivalent to $14 per year, or $.04 per day, per capita. (Amounts per capita per day may be useful for comparison with common measures of global poverty such as the World Bank's poverty benchmarks of incomes of $1 or $2 per person per day in purchasing power parity terms; see Chen and Ravallion 2004.)

The modeled benefits are very unevenly distributed. Most of the benefits ($55.7 billion) come from liberalization of agriculture; the great majority ($47.6 billion) results from agricultural liberalization in high-income countries. As shown in Table 2, more than 90 percent of the benefits of high-income agricultural liberalization come from improved import market access (i.e., elimination of tariffs and quotas in high-income countries). Most of the benefits of eliminating tariffs accrue to the high-income countries themselves, because their consumers are presumed to enjoy lower prices. The corresponding losses to producers from lower prices are artificially minimized by the models, as explained below.

The benefits of eliminating high-income countries' export subsidies and

Table 2

Benefits of Agricultural Liberalization in High-Income Countries (GTAP) (Millions of Dollars)

	Beneficiary region			
Policy	High income	Transition	Developing	World
Import market access	31,811	1,608	10,376	43,795
Export subsidies	2,554	−488	−1,023	1,043
Domestic support	2,450	76	284	2,810
Total	36,815	1,196	9,637	47,648

Source: Hertel and Keeney 2005, 31, table 2.7.

domestic support are quite small and are heavily concentrated in the high-income countries. Elimination of rich-country export subsidies is on balance a setback for developing countries, because it raises the prices paid by low-income food-importing countries. Elimination of domestic support policies in rich countries yields a numerically insignificant benefit to the developing world. The pattern is not unique to this study; a survey of earlier models by Joseph Stiglitz and Andrew Charlton (2004) found four studies of the effects of eliminating Organization for Economic Cooperation and Development domestic support for agriculture and two studies of the effects of removing such export subsidies. All six estimated that these policies would represent a net loss of welfare for developing countries.

Turning to the aggregate benefits of complete liberalization, the numbers can be viewed in three different ways: as total amounts in billions of dollars; as per capita amounts, in dollars per person; and as percentages of gross domestic product (GDP) (see Table 3). High-income countries come out ahead in total dollars and in per capita amounts, whereas developing countries do better in terms of percentage of GDP. However, neither rich nor poor countries as a whole stand to gain as much as half of 1 percent of GDP.

As the first section of Table 3 shows, more than two-thirds of the total global benefits result from the liberalization of agricultural trade; most of those benefits go to high-income countries. The benefits of liberalizing "other" (i.e., nontextile manufactures) are even more heavily skewed toward high-income countries. It is only in textiles that developing countries capture most of the potential benefits. More than 70 percent of the total benefits of liberalization, encompassing all sectors, go to high-income countries.

Table 3

Benefits of Complete Liberalization (GTAP)

	Beneficiary region			
Liberalizing sector	High income	Transition	Developing	World
Total amounts[a]				
Agriculture	41.6	2.2	11.9	55.7
Textiles	1.3	–0.2	8.8	9.8
Other	16.6	1.0	1.4	18.9
Total	59.5	2.8	22.1	84.3
Per capita[b]				
Agriculture	$40.00	$5.37	$2.54	$9.09
Textiles	$1.25	–$0.49	$1.88	$1.60
Other	$15.96	$2.44	$0.30	$3.08
Total	$57.21	$6.83	$4.72	$13.75
Percentage of GDP				
Agriculture	0.16	0.25	0.24	0.18
Textiles	0.01	–0.02	0.18	0.03
Other	0.07	0.11	0.03	0.06
Total	0.23	0.32	0.44	0.27

Sources: Hertel and Keeney 2005, 33, table 2.9; and author's calculations.
[a]In billions of dollars. [b]In dollars per person.

The contrast is even sharper in per capita terms, as the second part of Table 3 shows: liberalization is worth $57 per person in the high-income world versus less than $5 per person in the developing world. Agricultural liberalization is worth less than a penny per person per day for the developing world; all trade liberalization combined is worth just over a penny per person per day. In the high-income world, in contrast, all trade liberalization combined is worth more than ten times as much per capita, nearly $.16 per person per day.

Evidence of trade liberalization differentially favoring developing countries is confined to the third part of Table 3. As a percentage of GDP, liberalization is indeed worth more to developing countries, according to Hertel and Keeney's (2005) estimates. The difference, amounting to 0.44 percent versus 0.23 percent of GDP, results almost entirely from the benefits of textile liberalization. These percentage gains are quite small, especially considering they are a one-time step increase, not a change in the rate of growth of GDP. They are analogous to a single pay raise, not an increase in the annual rate of growth in wages.

Within the developing world, not all countries benefit equally. In fact, just five countries receive more than two-thirds of benefits in every sector, as shown in Table 4: Argentina, Brazil, and India receive most of the benefits of agricultural liberalization to developing countries, whereas China and Vietnam receive most of the benefits of textile liberalization. These five countries also receive virtually all of the modest benefits of other liberalization to the developing world.

The benefits to China and India appear large merely because they are such large countries. In per capita terms, both, especially India, receive less than the average for the developing world; in terms of percentage of GDP, they are both close to the average. For Argentina, Brazil, and Vietnam, however, the per capita benefits of liberalization are far above average, as is the share of GDP for Brazil and particularly for Vietnam.

LINKAGE

The World Bank's LINKAGE model is similar in design to GTAP but adds selected dynamic features, attempting to describe some types of changes over time (Anderson, Martin, and van der Mensbrugghe 2005). Starting from a 2001 base year, it estimates annual growth through 2015, including the assumed effects of trade negotiations. The Anderson et al. 2005 estimate for global benefits in 2015 from complete liberalization, $287 billion, is more than three times Hertel and Keeney's (2005) estimate. However, World Bank analysts have provided a reconciliation of the LINKAGE and GTAP studies. The biggest difference is that the world economy will presumably be much larger in 2015 than in 2001. If the Anderson et al. forecast was expressed as a percentage of GDP and applied to 2001 data, it would amount to $156 billion, a little less than twice the GTAP estimate for that year. The remaining difference is due, in about equal measure, to the LINKAGE model's dynamic assumptions and to differences in these models' price elasticities, which determine how fast the models respond to price changes (van der Mensbrugghe 2006). Both the influence of elasticities and the LINKAGE approach to dynamics are addressed later in this article.

Although the absolute numbers estimated by LINKAGE and GTAP are different, the distribution of benefits is broadly similar in the two studies, as shown in Table 5. For Anderson et al. (2005), as for Hertel and Keeney (2005), about two-thirds of the global benefits of complete liberalization are due to freer trade in agriculture; most of those benefits—more than half of the global total for all sectors—are enjoyed by the high-income countries. In per capita terms, Anderson et al. find that the benefit to developing countries

Table 4

Benefits of Selected Countries (GTAP)

	Billions of dollars					
Country	Agriculture	Textiles	Other	Total	Per capita	% of GDP
Argentina	1.2	0	0.1	1.3	$35.95	0.48
Brazil	5.0	0	0.2	5.1	$29.58	1.00
China	0.6	4.3	0.5	5.4	$4.25	0.46
India	1.3	0.2	0.2	1.7	$1.65	0.36
Vietnam	0	1.4	0.5	1.9	$23.90	5.81
Other	3.8	2.9	–0.1	6.7	$3.15	0.24
All developing	11.9	8.8	1.4	22.1	$4.72	0.44

Sources: Hertel and Keeney 2005: 34, table 2.10; and author's calculations.

is more than $17 per person per year, or about $.05 per person per day. In high-income countries, the benefit of complete liberalization would amount to nearly $200 per person per year, or $.53 per person per day.[2] As a percentage of GDP, benefits are slightly greater to developing countries: 0.8 percent of GDP versus 0.6 percent in high-income countries.[3] Again, this is a one-time step increase, not a rate of growth that applies year after year.

Benefits to the developing world are still concentrated in the hands of a few countries. The five countries that receive most of Hertel and Keeney's (2005) benefits to the developing world—Argentina, Brazil, China, India, and Vietnam, combined with three other countries, Thailand, Mexico, and Turkey—receive half of Anderson et al.'s (2005) developing world benefits. Thailand, second only to Brazil among the eight countries, would benefit from increased rice exports following tariff reduction in Japan, Korea, and Taiwan.

Anderson et al. (2005) also project that, in regard to the distribution of benefits among the high-income countries, relatively little will go to the United States and Canada. Some 85 percent of the benefits to high-income countries will go to Europe, Japan, Korea, Taiwan, Hong Kong, and Singapore. A principal form of benefit to high-income countries, in the models, is the increase in real income that consumers enjoy due to lower food prices when agricultural tariffs are eliminated. The estimated benefits are, therefore, greater in the countries that have higher agricultural trade barriers at present.

Table 5

Benefits of Complete Liberalization (LINKAGE)

	Beneficiary region		
Liberalizing sector	High income	Developing	World
Total amounts[a]			
Agriculture	128	54	182
Textiles	16	22	38
Other	57	10	67
Total	201	86	287
Per capita[b]			
Agriculture	$126.45	$10.55	$29.70
Textiles	$15.81	$4.30	$6.20
Other	$56.31	$1.95	$10.93
Total	$198.57	$16.80	$46.83
Percentage of GDP in 2015			
Agriculture	0.38	0.50	0.44
Textiles	0.05	0.20	0.09
Other	0.17	0.09	0.16
Total	0.60	0.80	0.70

Sources: Anderson et al. 2005: 28–32, tables 17.1, 17.2; and author's calculations.
[a]In billions of dollars. [b]In dollars per person.

"Likely Doha" Scenarios

The GTAP and LINKAGE estimates discussed so far simulate complete elimination of all remaining barriers to merchandise trade, a proposal that has never been on the table in the Doha Round of negotiations and does not seem likely to be adopted in the near term. Although World Bank and WTO officials, in addition to media commentators, have repeatedly referred to the $300 billion of annual gains available from liberalization (rounding up the Anderson et al. [2005] global estimate), even the most optimistic possibilities for the Doha Round have always been far more limited.

Moving toward greater political realism, Anderson et al. (2005) explore scenarios for possible agreements under the Doha Round of negotiations. The scenario they analyze at greatest length (their Scenario 7) calls for agricultural tariff rate reductions in developed countries of 45 to 75 percent and reductions in developing countries of 35 to 60 percent; the least developed

Table 6

Benefits of "Likely" Doha Round Scenario

	Beneficiary region		
Liberalizing sector	High income	Developing	World
LINKAGE			
Total amounts, billions of dollars	80	16	96
Per capita, dollars per person	$79.04	$3.13	$15.67
Percentage of GDP	0.25	0.16	0.23
GTAP–Extrapolated			
Total amounts, billions of dollars	24	4	28
Per capita, dollars per person	$23.20	$0.84	$4.61
Percentage of GDP	0.10	0.08	0.09

Sources: Anderson et al. 2005: 31–32, tables 17.5, 17.6; Hertel and Keeney 2005: 33, table 2.9; and author's calculations.

countries are not required to make any reductions in agricultural tariffs. For nonagricultural tariff bindings, the scenario calls for 50 percent cuts in developed countries, 33 percent in developing countries, and zero in the least developed countries. As shown in the first portion of Table 6, this scenario has projected benefits in 2015 of $96 billion, about one-third of the estimated value of full liberalization.

Their "Doha scenario," however, does not simply reduce benefits to all parts of the world to one-third of their maximum potential level. The differential pattern of liberalization tilts the benefits even more toward high-income countries. This is because the scenario calls for faster tariff reduction, and hence greater price cuts, in high-income countries. Standard CGE models focus on the benefits to consumers of lower prices while minimizing the impacts on producers (as explained later). Under the Doha scenario, developing countries receive 18 percent of their potential gains from full liberalization, or only $16 billion. This version of Doha is worth about $3 per year, or less than a penny a day, for each person in the developing world. In contrast, high-income countries receive 41 percent of their potential gains from full liberalization, amounting to $80 billion. Doha will mean a gain of $79 per year, or more than $.20 per day, for each person in high-income countries.

Even as a percentage of GDP, this scenario favors affluent countries: It brings a projected one-time 0.24 percent step increase in income to the developed world versus 0.14 percent for developing countries. Once again, the benefits are distrib-

uted very unequally, with losses rather than gains resulting from the scenario in at least Mexico, Bangladesh, the Middle East, and much of Africa. Some of the losers under the Anderson et al. (2005) Doha scenario are countries that already benefit from relatively liberalized trade. Mexico, for example, already enjoys open access to the United States, its dominant export market, under the North American Free Trade Agreement (NAFTA). With broader liberalization, Mexico might encounter stiffer competition in U.S. markets. Likewise, Bangladesh and many African countries benefit from existing systems of trade preferences and might face greater competition in a more liberalized future.

Because Hertel and Keeney (2005) do not offer their own Doha scenario, the final portion of Table 6 extrapolates Anderson et al.'s (2005) Doha scenario onto Hertel and Keeney's forecast. That is, it starts with the regional gains from complete liberalization according to Hertel and Keeney, then multiplies by the fraction of total gains available under the likely Doha scenario according to Anderson et al.: High-income countries receive 41 percent of the gains Hertel and Keeney identify from complete liberalization, whereas developing countries receive 18 percent. The result is an extremely small estimate of benefits—no more than $4 billion to the developing world as a whole. This is less than $1 per person per year, or less than a quarter of a penny per person per day. Meanwhile, the developed countries receive $23 per person per year, more than $.06 per person per day. If this extrapolation is even approximately correct, the Hertel and Keeney forecast implies that the "likely" outcome of the Doha Round analyzed by Anderson et al. is of virtually no value to developing countries as a group. As an anonymous World Bank economist told the *Economist,* the Doha Round's potential impact amounts to "'small beer' for the poor" ("Weighed in the Balance" 2005: 63)

Modeling Poverty Reduction

The CGE models used by the World Bank and others to analyze global trade liberalization do not normally produce forecasts of income distribution or poverty reduction. Estimates of potential gains to developing countries include incomes that will be received both by the poor and by other income groups and business interests in the same countries. For example, the billions of dollars that would flow to Brazilian agriculture if trade were fully liberalized include gains both for the country's poorest rural workers and for its wealthy ranchers, plantation owners, and agribusinesses. Additional hypotheses and analyses are required to translate gains for a nation, in Brazil or elsewhere, into impacts on poverty and widespread living standards.

Some models forecast the impact of trade gains or losses on the returns to capital, land, and labor, often distinguishing between skilled and unskilled

Table 7

Estimates of Poverty Reduction[a]

	South Asia	Sub-Saharan Africa	World
Anderson et al. 2005			
Reduction due to likely Doha scenario	2.3	0.5	6.2
Reduction due to full liberalization	9.6	20.4	65.6
Baseline: Extent of poverty	912.2	612.2	1946.3
Cline 2004			
Main model forecast	30	19	98
Productivity effect	98	1	156
Capital growth effect	122	26	184
Total	250	46	438
Weisbrot et al. 2004 recalculation of Cline	10	34	79

Sources: Anderson et al. 2005: 34, table 17.7b; Cline 2004b: revised table 5.3; Weisbrot et al. 2004: 12, table 4.

[a] Millions of people moved above the $2 per day poverty line.

wages. These projections of factor incomes are based on hypotheses about smoothly functioning markets within countries, which are not always realistic in practice. Even granting the accuracy of the forecasts for unskilled wages, however, further analysis is necessary: Some unskilled workers work more hours, or live in larger, multiearner households, resulting in higher per capita incomes, whereas others receive correspondingly less. Thus the accuracy of a poverty reduction forecast depends not only on the underlying trade model but also on the data manipulation required to estimate the resulting changes in the household income distribution. The impacts of economic growth on inequality and poverty turn out to depend quite sensitively on data definitions and measurement issues (Adams 2004).

The LINKAGE model discussed above was extended by Anderson et al. (2005) to estimate the change in the real wage of unskilled workers. This allows the calculation of the number of people who would be moved past the poverty line, relying on previously calculated World Bank "poverty elasticities"—the percentage change in the number of people in poverty for each 1 percent growth in average income—for each region of the world (Anderson et al. 2005). The results are shown in Table 7.

Using the $2 per day poverty line, full merchandise trade liberalization would lift an estimated 66 million people out of poverty as of 2015, 10 mil-

lion of whom are in South Asia and 20 million in sub-Saharan Africa. For the world as a whole, this would represent a 3.4 percent reduction in poverty. The scenario for the likely results of the Doha Round would reduce worldwide poverty by only 6 million people, or 0.3 percent of global poverty. As the Anderson et al. note, "This corresponds to the relatively modest ambitions of the merchandise trade reforms as captured in these Doha scenarios" (2005: 22).

Using a different methodology but also simulating a Doha scenario with GTAP, William Cline (2004b) has produced a much larger estimate of the impact of trade liberalization on poverty. As shown in Table 7, his central estimate is a reduction in poverty (at the $2 per day level) of 438 million people, including massive poverty reduction in South Asia.[4] Although his study is responsible for much of the current interest in trade and poverty, it unfortunately relies on dated and questionable approaches to the problem. World Bank economists have criticized Cline's estimates in an online debate.[5] Also, an independent recalculation of his results using a slightly different technical judgment comes coincidentally close to matching the findings of Anderson et al.

Cline's (2004b) results rest on the Harrison-Rutherford-Tarr CGE model and the GTAP 5 database, reflecting the state of the world as of 1997–98. Thus "future" opportunities for liberalization in his model include the completion of the Uruguay Round, as well as China's accession to the WTO, the expansion of the European Union from fifteen to twenty-five members, and the elimination of Multi-Fiber Agreement in textiles. So it is not surprising that Cline's estimates of the benefits from complete liberalization—0.93 percent of GDP worldwide and 1.35 percent of GDP for developing countries—are higher than the estimates based on GTAP 6.

Two additional sources of growth are included along with the main CGE model estimates. First, Cline (2004b) reviews other studies of the relationship between trade and income growth and concludes that a 1 percent increase in the ratio of trade to GDP leads to productivity increases creating, on average, a 0.5 percent increase in per capita incomes. This is the "productivity effect" shown in Table 7. Second, because trade liberalization increases the return on capital, Cline performs a modified run of his CGE model, assuming that the capital stock will grow rapidly in response to the higher return. This calculation shows that with a huge infusion of capital into developing countries, incomes could rise by an impressive amount. Cline's central case is the sum of the main CGE model effect, the productivity effect, and the capital growth effect.

Cline (2004b) then translates changes in incomes into reductions in the number of people in poverty, based on a reasonable-sounding assumption about the distribution of income within countries. However, in a critique of

his model, Weisbrot, Rosnick, and Baker (2004) identify two flaws and one potentially misleading feature of Cline's analysis.

First, Weisbrot et al. (2004) point out, and Cline (2004a) acknowledges on his Web site, Cline made an algebraic mistake in his original work. The result of this correction is to lower the number of people lifted out of poverty by about 100 million; the figures in Table 7 are the corrected estimates, not the higher ones that Cline originally published. Second, Weisbrot et al. argue that an at least equally logical alternative assumption about income distribution would yield a dramatically lower estimate of poverty reduction, only 79 million worldwide, making no other changes in Cline's methodology. The Weisbrot et al. recalculation of Cline's central case, shown in the last line of Table 7, is coincidentally reasonably close to the Anderson et al. (2005) calculation of the reduction in poverty from full trade liberalization. Cline, however, contests this recalculation, and a detailed debate continues.[6]

In broader terms, any such estimate may be misleading. The headcount measure of poverty reduction used by Cline (2004b), and by many other studies, simply counts the number of people who move across the poverty line—even if they move from only pennies below to pennies above the line. Weisbrot et al. (2004) calculate the average incomes of the people lifted out of poverty in Cline's model in seventeen countries. Only in two of the countries is the average preliberalization income of this population below $1.88 per day or the postliberalization income above $2.13 per day. In Bangladesh, the people moved out of poverty range from $1.97 to $2.03 per day.

Moving millions of people just across the poverty line would of course be preferable to leaving the same people just below the line. Yet it is only a pale shadow of the original claims of lifting hundreds of millions of people out of poverty, which launched the discussion of trade liberalization as an antipoverty measure.

Extensions to the Standard Model

The most recent global trade CGE models show small gains to further trade liberalization and predict that these gains will accrue disproportionately to high-income countries. These new results, along with outdated, larger estimates, are nonetheless used to bolster arguments that developing countries will gain from continuing trade liberalization. In addition to the GTAP and LINKAGE studies discussed earlier, a few innovations on standard CGE models stand out as important in the literature, either for resulting in conspicuously large estimated gains of the kind that seem to garner the most attention or in shedding light on the likely breakdown of winners and losers of further liberalization. This section examines three of these innovations—for the

expected benefits of increasing returns in the manufacturing sector, services liberalization, and long-term productivity gains from trade liberalization—all of which remain problematical and/or speculative.

New Trade Theory and Increasing Returns

Among the major CGE models used to estimate the effects of trade liberalization, the Brown-Deardorff-Stern (BDS) model stands out from the rest, both in methodology and in results (Brown, Deardoff, and Stern 2002). Although using the GTAP data set and sharing many common assumptions and approaches, it parts company with the models discussed above in a few important ways, including its reliance on "new trade theory" and its assumption of increasing returns in manufacturing.

For the world as a whole, the BDS model projects net losses from agricultural liberalization and enormous gains from manufacturing liberalization. A 33 percent reduction in agricultural protection is estimated to cause worldwide losses of $8 billion, whereas a 33 percent reduction in manufacturing tariffs is expected to produce a gain of $267 billion. The manufacturing number is unusually large (especially for one-third, rather than full, liberalization), in part because this is an older projection, still counting as available future benefits the results of liberalization that had already occurred by 2005. It is, however, even larger than other estimates of the same vintage; and the estimate of net worldwide losses from agricultural liberalization is unique. These "outlier" results can be traced to the manner in which BDS implements new trade theory.

Traditional trade theory, as applied in GTAP and many other models, assumes constant returns to scale in all industries: Doubling production means precisely doubling income, costs, and profits. "New trade theory," so named when it was new some twenty to thirty years ago, breaks with this tradition and assumes that economies of scale exist in many export industries. When an industry experiences increasing returns, doubling production leads to less than doubling of costs, implying more than doubling of net incomes. Empirical research motivated by new trade theory has confirmed the existence of increasing returns in many, though not all, branches of U.S. manufacturing (Antweiler and Trefler 2002).

Elementary microeconomics demonstrates that perfect competition is unstable in an industry with increasing returns; instead, imperfect competition, such as oligopoly, is the norm. Under these conditions, as Paul Krugman (1987) pointed out in an early review of new trade theory, laissez-faire outcomes are no longer optimal, and there is no theoretical basis for rejecting all government intervention. The assumption of increasing returns in leading sectors

of the economy is a foundation of the infant industry argument for strategic uses of trade protection. Alice Amsden (2001), Ha-Joon Chang (2002), and others have argued that trade protection and other forms of intervention have been essential to virtually all past successes in industrialization. Although most economists are now firmly committed to free trade, there is a long intellectual history to the debate, and interest in the issue has not entirely vanished (Ackerman 2004; Irwin 1996).

It is all the more remarkable, therefore, that the use of new trade theory in the BDS model increases the estimated benefits of free trade. The infant industry argument is a dynamic application of increasing returns to scale, suggesting that under some circumstances, defying the market's short-run judgment could pay off in the long run. In contrast, BDS offers a static analysis of increasing returns. In static terms, the market's short-run judgment is all that matters; there will always be an immediate gain from expanding a country's strongest existing industries. One of the reasons why such a dynamic model shows even larger gains from trade is that it does not allow for international capital mobility (thus preventing a country to lose its base in strategic industries). Thus, although moving from static to dynamic modeling efforts are a step in the right direction, global CGE models are still quite constrained in their ability to model the real-world applications of global trade and investment flows.

BDS shares with most other CGE models both the static nature of the analysis and the fixed level of total employment that is assumed to prevail both before and after trade policy changes. The combination of these characteristics, along with increasing returns in manufacturing but not agriculture, explains the BDS finding of losses from agricultural liberalization.

As some countries' agricultural output expands due to the liberalization of agricultural trade, the fixed employment assumption means that agriculture must draw labor out of other sectors such as manufacturing. As a result, manufacturing contracts and loses more than proportionally in income and profits, due to economies of scale in reverse. At the same time, agriculture expands but gains only proportionally to the increase in inputs. Thus the net change in national income can be negative, even when trade policy is expanding a country's agricultural markets. Conversely, liberalization of manufacturing trade draws labor out of agriculture with its constant returns and expands industry with increasing returns, adding an extra bounce to the economic benefits of liberalization.

Other modelers who have experimented with increasing returns have commented on this effect as an undesirable artifact of the models (Bouet, Mevel, and Orden 2005; François, Van Meijil, and van Tongeren 2003). Unlike BDS, their models do not imply global losses from agricultural liberalization, and their projected gains from manufacturing liberalization are more modest. It

is possible that BDS has assumed more rapidly increasing returns than other models, exaggerating the apparent losses in industry when agriculture expands and pulls labor back to the farm.

Modeling Services

In view of the growing importance of services in trade negotiations, it seems appealing to extend the trade models to include the benefits of liberalization in this area. Unfortunately, the data needed for CGE modeling are largely nonexistent; tariffs and quotas play a very small role in service industries, and the negotiations are not mainly about percentage reductions in well-defined, quantitative trade barriers. In order to use the CGE apparatus, it is necessary to create "tariff equivalent" numbers for service sectors, which can then be reduced in modeling liberalization.

Two global CGE models have incorporated services liberalization, adopting very different modeling strategies and coming up with very different estimates of the available benefits. François et al. (2003) used a modified version of GTAP to find that full liberalization of services trade might produce $53 billion of benefits. According to BDS, on the other hand, a 33 percent reduction in barriers to services trade would produce $427 billion of global benefits (Brown et al. 2002); tripling this figure to approximate full liberalization suggests that it could be worth $1281 billion to BDS, fully 24 times the estimate from François et al.

François et al. (2003: 5) observe that the discussion of services liberalization "seems to confuse FDI [foreign direct investment] and migration with international trade. As a result, efforts to quantify market access in service sectors (a basic requirement if we want to then quantify liberalization) have been problematic at best." Their solution to the problem begins by estimating a "gravity equation" predicting each country's imports for each service sector as a function of per capita income, population, and European Union membership. The tariff equivalent is then based on the ratio of actual to predicted imports, modified by the sector's demand elasticity.

The BDS approach begins with gross operating margins (i.e., the difference between total revenues and total operating costs) for each service sector and country. In each sector, the country with the smallest gross operating margin is assumed to be freely open to foreign firms; the excess in other countries above the minimum gross operating margin is assumed to be the result of trade barriers. A critique of an earlier version of the BDS model found that Australia was generally the country with the lowest gross operating margins and that the BDS methodology implied that the United States had higher barriers to services trade than the European Union, Japan, Korea, or Mexico (Dorman

2001). At that time, the model implied that complete elimination of barriers to trade in the service sector would lower prices paid by U.S. consumers by more than 25 percent.

It is not intuitively obvious whether either of these approaches is reliable. The finding of extremely high U.S. service sector "tariffs" might lead to doubts about the BDS methodology in particular. Hertel and Keeney (2005) mention the François et al. estimates, referring to them as "highly speculative"; they see them as increasing the GTAP estimate of global benefits of complete liberalization by $66 billion, "with the lion's share going to high-income countries" (2003: 17–18). A prudent conclusion might be that there is no solid basis for CGE estimation of the benefits of services liberalization at this time.

Productivity Effects

A final benefit category is frequently appended to CGE-based studies. Trade liberalization is often said to have an effect on productivity, over and above the effects captured in CGE models. Cline (2004b) includes such an effect in the previously discussed study. Anderson et al. (2005) also consider such an effect, reporting that it would increase their estimate of global gains from merchandise trade liberalization by one-third, with the benefits differentially favoring developing countries (Anderson, Martin, and van der Mensbrugghe 2006).

Although reported in the same publications as CGE model results, these productivity effects are off-line calculations, not part of the model per se. As seen with Cline (2004b), the analyst often reviews the available literature on productivity and trade, deriving a simple ratio or expected effect. If this effect were entirely separate from the effect tracked by the CGE model, it might seem appropriate to add the two. Yet a careful review of the underlying literature would be required to ensure that the productivity effect seen in the other studies has not already been included in the base models. The interindustry shifts that result from liberalization, the core results of most global CGE trade models, will themselves boost average productivity. The danger of double counting is even greater with a model such as LINKAGE, which explicitly includes fourteen years of dynamic effects. Is there really a wall between the dynamic effects that are endogenous to the model and the dynamic effects that are reflected in the literature on productivity, forming the basis for the off-line calculations?

Moreover, there are no built-in constraints ensuring the internal consistency of the productivity calculations; unlike CGE estimates, they are not required to be consistent with other calculations. A review article by Anderson (2004: 569) illustrates the astonishing upside potential for off-line productivity calcu-

lations. After summarizing major CGE estimates of the benefits of liberalization, Anderson casually observes that there are additional dynamic gains from trade; the experiences of Korea, China, India, and Chile "suggest that trade opening immediately boosts GDP growth rates by several percentage points." (ibid., 559). In order "to err on the conservative side," he assumes that trade liberalization boosts GDP growth rates by one-sixth for developed countries and one-third for developing countries. Almost as an afterthought, he adds that "those rates are assumed to continue to 2050" (ibid., 559), or forty-five years after the base year of his calculations. The present value for the forty-five-year stream of expected benefits is $23 trillion for his "optimistic Doha" scenario, or $46 trillion for full liberalization. "Even if the benefits ceased after fifty years," he observes, this would be quite valuable (ibid., 567–68). A response to his article notes that even the best economic policies do not always produce results that endure undiminished for forty-five or fifty years (Pronk 2004).

Such calculations suggest the vast uncertainty associated with ad hoc estimation of dynamic effects. CGE models, despite other limitations, do enforce a consistent framework that deduces effects from first principles and prevents double counting. In off-line productivity calculations, on the other hand, there are no obvious limits: Why stop at only forty-five years? To systematize this discussion, there is a clear need for a dynamic model of trade and productivity, as difficult as it may be to develop one.

Limitations of Economic Modeling

The models of trade liberalization discussed in this paper are global CGE models. They incorporate interactions among all sectors of the economy, not just the ones of immediate interest; they reflect supply and demand balances, and resource and budget constraints, in all markets simultaneously. Their name suggests a link to one of the most imposingly abstract branches of economics, general equilibrium theory, although in practice applied modelers do not use much of the theory beyond the idea that all markets clear at once.

The comprehensiveness of coverage of the economy is the good news about CGE models: They offer a systematic framework for analyzing price and quantity interactions in all markets, ensuring that both direct and indirect effects are counted, whereas none are double counted. The bad news about the models also stems from their comprehensiveness: In order to provide such complete coverage of the economy, they rely on debatable theoretical simplifications and impose enormous information requirements (Ackerman and Gallagher 2004; Stanford 2003).

Any modeling exercise involves simplification of reality. The question is

not whether simplifications are involved but whether they clarify or distort the underlying reality. Unfortunately, in the case of the CGE models of international trade used by the World Bank and other mainstream economic institutions, it is all too clear that model structures and assumptions introduce unintended distortions into the results. Three examples of such distortions are discussed here: the problem of "Armington elasticities," the choice of static versus dynamic frameworks, and the assumption of fixed total employment.

Armington Elasticities

One of the important technical aspects of global CGE trade models (as well as partial equilibrium and econometric models) involves the use of Armington elasticities. Following a procedure developed by economist Paul Armington (1969), the models use a set of elasticities first to apportion a country's demand for a specific good (such as U.S. demand for paper) between domestic production and imports and then to distribute the demand for imports among the countries that export that good. Although convenient for the process of calculation, this procedure imposes the implausible assumptions that every exporting country produces a differentiated product and has some degree of market power (even for bulk commodities) and that, even if prices change, no country ever shifts completely from importing to exporting a commodity or vice versa (Tokarick 2005). The Armington framework is also inappropriate for differentiated industrial products made by multinational corporations; for such products, the differentiation is by producer, not by location. Although considerable research effort has gone into estimation of Armington elasticities, substantial uncertainties and hence wide confidence intervals remain in the latest estimates, particularly for key commodities such as wheat and rice (Hertel et al. 2004). A recent critique of CGE global emphasizes the importance of Armington elasticities and argues that the appropriate values are likely to be lower than those commonly used, implying smaller gains from trade (Taylor and von Arnim 2006). Such questions have proved to be of more than academic importance. Rival analyses of a proposed free-trade agreement between the United States and Australia came to opposite conclusions about whether it would be beneficial for Australia, based largely on their use of different Armington elasticities (ACIL Consulting 2003; Centre for International Economics 2003).

Static Modeling

Another limitation is the static nature of most CGE analyses. Most models offer only a comparison of two snapshots: an equilibrium that is assumed to have existed before a policy change and a second equilibrium reached after the

policy change. The length and cost of the transition, an issue of great practical political significance, is outside the scope of most models. Moreover, the static version of new trade theory, as discussed previously, excludes many of the innovative aspects of the original, dynamic theory. Crucial dynamic questions, such as the viability of infant industry development strategies, simply cannot be addressed in a static framework. In this respect, CGE models follow the lead of general equilibrium theory, which has achieved elegant and definitive static results but has led primarily to mathematical paradoxes when extended to dynamic analysis (Ackerman 2002).

A partial exception to the static orientation of most CGE models is the World Bank's LINKAGE model, discussed above. It begins with a description of the world economy in 2001, then models growth in annual steps through 2015. Thus it recognizes that the effects of trade policy may take time to be felt and allows growth to be faster in some parts of the world than others. Three arbitrary assumptions are, however, imposed to calculate growth paths: government fiscal balances (deficits or surpluses) are fixed at their base year level, with taxes on households assumed to change as needed to meet this objective; current account balances are fixed, with exchange rates assumed to change as needed to maintain the balances; and "investment is savings driven." The first two assumptions ensure that two of the most important and variable indicators of macroeconomic performance are held constant for every country; the third assumption echoes Say's Law, the tenet of classical economics that rules out unemployment and underinvestment. In short, LINKAGE moves beyond the usual CGE snapshots of comparative statics, only to provide an album of fourteen annual snapshots based on artificially perfect macroeconomic stability.

Incorporating a dynamic structure in a model does not guarantee one result or another; a wide range of dynamic assumptions can be included, implying larger or smaller gains from trade liberalization. Another model with a dynamic structure similar to LINKAGE produces much smaller estimates of benefits of trade; the modelers attribute the difference primarily to the choice of Armington elasticities (Bouet et al. 2005). However, in the absence of a dynamic structure, the set of questions and policy proposals that can be evaluated is severely constrained. A static model is capable only of answering questions about short-run comparative statics and thus misses much of what is interesting and important about economic development.

Fixed Employment

For policy makers, one of the most important results of trade models is the forecast of the employment impacts of liberalization. Much of the politi-

cal passion surrounding trade policy reflects the hopes and fears about its effects on employment. In developing countries, will access to new export markets allow workers to move out of disguised unemployment in very low productivity, informal sector occupations, into formal employment in higher productivity, modern sectors of the economy? In developed countries, will loss of protection for declining industries lead to unemployment of workers whose limited education or geographic location makes it hard to retrain them for other jobs? Most CGE models are silent by design on these fundamental, controversial questions.

This issue is highlighted in a literature review by Joseph Stiglitz and Ed Charlton, who write that the standard analysis of the benefits of trade liberalization "is predicated on a set of assumptions that is not satisfied in most developing countries: full employment, perfect competition, and perfect capital and risk markets" (2004: 7).They list a series of problems with CGE models, including the failure to account for the presence of persistent unemployment in developing countries and the failure to incorporate costs of transition, implementation, and adjustment to policy changes—costs that are likely to be larger in developing countries.

The same issue arises if employment is fixed at any specified level, whether or not there is some involuntary unemployment. The problem is that a fixed-employment model does not allow analysis of changes in employment. Each country's level of unemployment after a policy innovation is, by assumption, the same as the level before. If aggregate employment is held constant, a change in trade policy can expand or contract industries, but it cannot increase or decrease unemployment. Workers can and will change industries, but they are playing musical chairs with exactly enough chairs for everyone who had a seat before the music started. Less metaphorically, fixed-employment models cannot confirm or deny the much-feared migration of jobs to China as a result of trade liberalization; rather, the models have assumed in advance that such job flight is impossible.

In effect, the question that fixed-employment models are answering is, "What would be the effects of the interindustry shifts resulting from trade liberalization if every country's workers retain exactly the number of jobs they had before but are free to move between industries as needed?" This is one question about the economic impacts of trade policy, but it may not be the first question that policy makers and the public would ask.

This aspect of the models may help make sense of the results presented above. Most CGE model results have nothing to do with any change, up or down, in overt or disguised unemployment; by hypothesis, none is possible. Rather, they are all about the price changes, and the resulting interindustry shifts, that would occur within a fixed-employment economy. If Europe

eliminates trade barriers and increases food imports, European farmers are assumed to find jobs elsewhere; there is no net loss of employment in Europe. Likewise, there is no net gain of employment in the countries that expand their exports of food to Europe.

Although the fixed-employment assumption is conventional, it is not required for CGE modeling. A number of articles have explored both the possibility and the desirability of calculating employment impacts of trade in a CGE framework (in addition to the studies examined here, see Kurzweil [2002] and Oslington [2005] for theoretical analysis and Ganuza et al. [2005] for empirical analysis of varying employment assumptions in CGE models). Some studies done for the United Nations Conference on Trade and Development, using GTAP, have modeled trade liberalization under the assumption that the employment of unskilled labor in developing countries can vary as needed, whereas wages remain fixed. One such study projected that trade liberalization could cause substantial gains in employment of unskilled labor in developing countries. Although benefits to most countries would be increased by the variable employment assumption, the majority of the increased gains, in dollar terms, would go to China (Fernández de Córdoba and Vanzetti 2005).

A study by Lance Taylor and Rudolf van Arnim (2006) develops a simplified global CGE model as part of a detailed technical critique of standard CGE models and methods. They present results from their simplified model both for the World Bank's approach, à la LINKAGE with fixed employment, current account balances, and government deficits, versus a more Keynesian approach in which household taxes and exchange, wage, and profit rates are all held constant whereas employment, current account balances, and government deficits may vary. The choice between the two approaches, along with the choice of Armington elasticities, determines not only the size but also the direction of impacts of developing countries: The same scenario may have positive or negative effects on welfare in developing countries, based on these underlying economic hypotheses. (For a critique of CGE poverty reduction estimates on similar grounds, see Gunter, Taylor, and Yeldan 2005).

Sandra Polaski, (2006) a researcher at the Carnegie Endowment for International Peace, has also published a CGE model that goes beyond the standard labor market assumptions. The Carnegie model includes three different categories of labor: agricultural, urban unskilled, and urban skilled. The model incorporates actual unemployment rates and fixes the real wage for urban unskilled labor in developing countries whenever there is unemployment. When the unskilled urban labor market in developing countries reaches full employment, the wage is allowed to vary. Skilled labor in developing countries and all labor in developed countries is, however, fixed at full employment. Migration is also included in the model by linking the agricultural and urban

unskilled labor forces such that a strong unmet demand for labor in one sector can draw laborers from the other.

The Carnegie model focuses most of its attention on its "Central Doha" scenario (i.e., a guess about a potential outcome of the Doha Round), resulting in $59 billion in gains worldwide, split almost equally between developed and developing countries. Relatively little of the Central Doha gains come from agricultural liberalization ($5.5 billion in gains for developed countries and $63 million in losses for developing countries); the remainder, or almost all of global gains, comes from manufacturing liberalization. There are winners and losers: The biggest losers from liberalization are the poorest countries, including Bangladesh with almost $70 million in losses and sub-Saharan Africa with $375 million in losses.

These promising innovations, however, represent only a partial correction to the unrealistic assumption of fixed employment. They generally leave unchanged, by definition, both the number of jobs in developed countries and the number of skilled jobs in developing countries. Yet in the case of industrial liberalization, skilled jobs in developing countries would actually be at risk. Some of the countries gaining unskilled employment thanks to increased agricultural or raw material exports might simultaneously be losing industrial jobs that were formerly protected by tariffs. Likewise, developed countries could lose jobs in textiles and other industrial sectors in which developing countries are expanding; the difficulty of finding new jobs for older, less skilled workers, even in the richest countries, could lead to significant trade-related unemployment. Models with fully flexible employment levels, able to comprehend these politically important questions about job markets, have not yet appeared.

Conclusion

The numerical rhetoric surrounding the Doha Round of trade liberalization, the projected benefit of hundreds of billions of dollars to the developing world that continues to echo through trade policy debates, is simply not supported by recent CGE analysis. For the world's less affluent citizens and for developing countries with many people living on $1 or $2 per day, CGE models of full trade liberalization offer a penny per person per day in some variants and as little as one quarter of a penny from some forecasts of the likely effects of the Doha Round. Similarly, the number of people lifted out of poverty by trade liberalization turns out to be far fewer than the hundreds of millions originally advertised.

Modelers have tried with limited success to broaden the discussion, to discover other categories of benefits that could be brought into the same framework. Liberalization of services does not fit comfortably into trade models; for the most part, there are no service tariffs, making it hard to apply

methods developed for merchandise trade analyses. Hypothetical long-term productivity gains from trade liberalization remain open-ended and speculative, only loosely attached to the underlying CGE models of tariffs and short-term trade flows.

The limits of the most recent global CGE trade model predictions goes deeper than their inability to produce the expected huge forecasts of benefits for developing countries. On a conceptual level, they fall short of offering a useful, comprehensive framework for thinking about and measuring the important effects of trade. Despite all its complexity, the theoretical apparatus ironically enforces arbitrary, undesired simplifications, from the esoterica of Armington elasticities and the rigidities of static analysis, to the central flaw of ignoring employment effects by design. The employment-related questions that policy makers care most about cannot be answered within the standard CGE framework, because they cannot even be asked. Instead, attention is focused on a narrower analysis of interindustry shifts, often starting from the assumption that the total number of jobs in each country cannot be changed by trade policy.

Promising initial steps have been taken toward modeling with variable employment, such as in the Polaski (2006) and Taylor and von Arnim (2006) studies mentioned above. What would happen if this approach were carried to its logical conclusion? In general, modeling of variable employment throughout the economies of both developing and developed countries might be expected to amplify the results of conventional CGE models. Those who gain somewhat from trade, in the context of a fixed-employment model, would often gain more in a model that included realistic variation in employment. Those who lose somewhat from trade, under fixed-employment assumptions, would lose even more if their trade-related industries decline. The effect would not be proportional in all countries; issues of equity and distributional impacts, both between and within countries, would be highlighted. But the results would be more informative and useful than those available at present. An adequate economic analysis, modeling the full range of effects of trade policy, would employ a unified, dynamic framework designed to focus on the real problems of economic development.

Notes

1. Remarks by Richard Newfarmer at the release of *Global Economic Prospects 2004,* September 2003, available at http://web.worldbank.org/WBSITE/EXTERNAL/NEWS/,contentMDK:20126060~menuPK:34476~pagePK:34370~piPK:34424~theSitePK:4607,00.html.

2. These per capita figures are slight overestimates, because they are ratios of benefits in 2015 to population in 2001; with the larger population expected by 2015, the per capita benefit would be smaller.

3. In their text, Anderson et al. (2005) quote a higher but misleading figure for the benefit to developing countries: 1.2 percent of GDP. This is based on the category of developing countries as self-defined by WTO members, including Korea, Taiwan, Hong Kong, and Singapore, which are also counted as high-income countries by Anderson et al. Excluding those four countries, the impact on unambiguously developing countries, according to the detailed tables in Anderson et al., is 0.8 percent of GDP.

4. Cline's high case, not shown or discussed here, substitutes forecasts from a much simpler and more experimental agricultural model for a significant part of the CGE results. Cline himself comments on the substantial uncertainty surrounding the results of the agricultural model; see Cline 2004b: 163–68.

5. See http://blogs.cgdev.org/globaldevelopment/2005/12/trade_and_poverty_estimates_th.php and other links on that page.

6. Personal communication with William Cline and Mark Weisbrot, August 2005.

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