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The Shrinking Gains from Trade: A Critical Assessment of Doha Round Projections

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Abstract

Computable general equilibrium (CGE) models of world trade, often presented as demonstrating the benefits of trade liberalization, now make much more modest forecasts than they did just a few years ago. The estimated benefits are not only small in the aggregate, but also skewed toward developed countries; the expected contribution of trade liberalization to economic development and poverty alleviation is extremely limited. Related calculations, for the expected benefits of services liberalization, trade facilitation measures, and long-term productivity gains from trade liberalization, remain problematical and/or speculative. The empirical limitations of CGE forecasts rest on broader theoretical weaknesses: the models are largely locked within a static framework, and remarkably assume that trade policy causes no changes in total employment, up or down. Models built on more adequate theories, which have only begun to appear, would paint a very different picture of the effects of trade liberalization.

Introduction

In the months leading up to trade negotiations, estimates of the economic gains from trade liberalization suddenly become newsworthy. The numbers produced by massive "computable general equilibrium" (CGE) trade models seem to answer an important and difficult question: what will be the economic effects of further trade liberalization – on the world as a whole, on individual countries, and on industries, regions, and population subgroups within countries? The results of complex modeling exercises are typically reported as if they were hard, objective facts, providing unambiguous numerical measures of the value of liberalization. Discussion of these reports often suggests that the sheer size of the estimates itself makes a powerful case for liberalization.

This paper argues that the dominant interpretation of the leading trade models is mistaken on at least three grounds. First, in contrast to the situation just a few years ago, the best-known, most widely discussed CGE models now make surprisingly small

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estimates of the benefits of liberalization of merchandise trade, especially for developing countries. As a consequence, the estimated potential for free trade to reduce global poverty is also quite limited. Second, the larger estimates still being reported from some studies reflect speculative extensions of standard models, and/or very simple, separate estimates of additional benefit categories, not the core results of established modeling methodologies. Third, the modelers' simplifying assumptions often build in rigid, predetermined answers to some of the key questions that are of greatest interest to policy makers. Critical dimensions of the real-world impacts of trade on employment and growth are excluded by design, while detailed attention is focused on secondary economic effects. It should be possible to develop analyses that incorporate realistic employment impacts and adjustment effects of trade agreements; indeed, there are already a few 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.

More specifically, section 1 of this paper examines recent estimates of the benefits of trade liberalization from GTAP and from the World Bank's LINKAGE model, focusing on the distribution of overall benefits predicted by those models. The potential for poverty reduction resulting from trade liberalization is the subject of section 2.

Turning to the extensions of standard approaches, section 3 reviews two innovations seen in the Brown-Deardorff-Stern (BDS) model, the effects of assuming increasing returns to scale in production, and the calculation of the benefits of liberalizing trade in services. Section 4 continues with two further innovations that have been important in recent discussion: estimates of the benefits of trade facilitation measures, and hypotheses about dynamic effects such as long run productivity gains from trade liberalization. Section 5 examines the theoretical framework of computable general equilibrium (CGE) models, which are used to model trade liberalization, and highlights some of the unrealistic features shared by most of the models – such as the assumption of fixed employment. A brief conclusion summarizes the major points of the paper.

1. Forecasting the benefits of liberalization

What a difference two years makes. 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. Exact numbers and definitions varied, but $500 billion of benefits to the developing world was a widely quoted figure. By 2005, leading up to the next round of negotiations in Hong Kong, it was difficult to find estimates of benefits to the developing world as high as $100 billion – and easy to find figures much lower than that.

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 major trade models, and by the World Bank LINKAGE model. Table 1 contrasts their forecasts of the benefits of complete liberalization

published in 2002-03 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 in 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. Both incorporate trade agreements reached through 2005, including China's entry into the WTO, the expansion of the EU in 2004, and the end of the Multi-Fiber Agreement, in their baseline.

Table 1. Benefits of complete liberalization, then and now

Model	*Year*	*benefits (billions of dollars) to*	
		Developing countries	World
GTAP	2005	22	84
GTAP	2002	108	254
LINKAGE	2005	90	287
LINKAGE	2003	539	832

This updated data is a principal reason why GTAP and LINKAGE now predict much smaller gains from liberalization than they did only 2-3 years ago. As of 2002-2003, 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.

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 which assume that there is more scope remaining for future liberalization. (The larger, earlier World Bank forecast shown in Table 1 also includes assumptions about future productivity gains from trade liberalization, a topic discussed in section 4.)

GTAP

In their recent study, Thomas Hertel and Roman Keeney apply GTAP to estimate the benefits available from removal of all remaining barriers to merchandise trade (Hertel and Keeney 2005). As shown in Table 1, their estimate of the 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. But as Hertel and Keeney show, it is very unevenly distributed.

Most of the benefits, $55.7 billion, come from liberalization of agriculture; the great majority, $47.6 billion, results from liberalization in high-income countries. As shown in Table 2, more than 90% of the benefits of high-income agricultural liberalization come from improved import market access, i.e. elimination of tariffs and quotas. Most of the benefits of eliminating tariffs accrue to the high-income countries themselves, since their consumers are presumed to enjoy lower prices. (The corresponding losses to producers from lower prices are artificially minimized by the models, as explained in section 5.)

Table 2. Benefits of high-income agricultural liberalization (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

The benefits from eliminating high-income countries' export subsidies and domestic support are quite small, and are largely or entirely concentrated in the high-income countries. Elimination of subsidies to high-income country exports is on balance a setback for developing countries, since 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 found four studies of the effects of eliminating OECD domestic support for agriculture and two studies of the effects of removing OECD export subsidies. All six estimated that these policies would represent a net loss of welfare for developing countries (Stiglitz and Charlton 2004).

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 GDP (see Table 3). High income countries come out ahead in total dollars and in per capita amounts, while 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 0.5% of GDP.

As the first section of Table 3 shows, 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% of all benefits of liberalization, in all sectors, go to high-income countries.

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 10 times as much per capita, nearly $.16 per person per day.

Table 3. Benefits of complete liberalization (GTAP)

Liberalizing sector	*Beneficiary region*			
	high-income	transition	developing	world
	Total amounts, billions of dollars			
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, dollars per person			
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%

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 estimates. The difference, amounting to 0.44% versus 0.23% of GDP, results almost entirely from the benefits of textile liberalization. These percentage gains are quite small, especially since they are one-time, not continuing, improvements; they are analogous to a single pay raise, not an annual rate of growth in wages. If trade liberalization were phased in over a number of years, the benefits would presumably be spread out as well, with even smaller annual gains.

Within the developing world, not all countries benefit equally. In fact, just five countries receive more than two thirds of benefits in every category, as shown in Table 4. Specifically, Argentina, Brazil, and India receive most of the benefits of agricultural liberalization to developing countries as a whole, while 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 Vietnam.

Table 4. Benefits for selected countries (GTAP)

	billions of dollars					
	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 developing	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%

LINKAGE

The forecast by Kym Anderson et al. employs the World Bank's LINKAGE model, which is similar in design to GTAP but adds selected dynamic features, attempting to describe some types of changes over time (Anderson et al. 2005a). Starting from a 2001 base year, it estimates annual growth through 2015, including the assumed effects of trade negotiations. The estimate for global benefits in 2015 from complete liberalization, $287 billion, is more than three times Hertel and Keeney's estimate. However, Anderson et al. provide a reconciliation of the two studies. The biggest difference is that the world economy will presumably be much larger in 2015 than in 2001. If the Anderson 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 new dynamic assumptions added to the LINKAGE model, and to a recent revision of the model's elasticities (parameters that determine how fast the model responds to price changes).

Although the absolute numbers are different, the distribution of benefits is broadly similar in the two studies, as shown in Table 5. For Anderson et al., as for Hertel and Keeney, about two thirds of the global benefits of complete liberalization are due to freer trade in agriculture; most of those benefits, almost 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 is more than $17 per person per year, or almost $.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.[1]

As a percentage of GDP, benefits are slightly greater to developing countries, 0.8% of GDP versus 0.6% in high-income countries. In their text, Anderson et al. disingenuously quote a much higher figure for the benefit to developing countries, 1.2% 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, which are big winners from liberalization, the impact on developing countries, according to the detailed tables in Anderson et al., is 0.8% of GDP. Again, this is a one-time step increase, not a rate of growth that applies year after year.

Table 5. Benefits of complete liberalization (LINKAGE)

Liberalizing sector	*Beneficiary region*		
	high-income	developing	world
Total amounts, billions of dollars			
agriculture	126	56	182
textiles	14	24	38
other	57	10	67
total	197	90	287
Per capita, dollars per person			
agriculture	$124.48	$10.95	$29.70
textiles	$13.83	$4.69	$6.20
other	$56.31	$1.95	$10.93
total	$194.63	$17.59	$46.84
Percentage of GDP in 2015			
agriculture	0.38%	0.50%	0.44%
textiles	0.04%	0.21%	0.09%
other	0.17%	0.09%	0.16%
total	0.60%	0.80%	0.70%

Benefits to the developing world are still concentrated in the hands of a few countries. The five countries that receive more than half of Hertel and Keeney's benefits to the developing world, Argentina, Brazil, China, India, and Vietnam, get only about one third of Anderson's comparable figure. However, if three other countries, Thailand, Mexico, and Turkey, are added to the list, half of Anderson's developing world benefits go to these eight countries. 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. also show the projected distribution of benefits among the high-income countries. The striking pattern here is the comparative lack of benefits to the US and Canada. Some 85% of the benefits to high-income countries go to Europe, Japan, Korea, Taiwan, Hong Kong, and Singapore. A principal form of benefits 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. Therefore, the estimated benefits are greater in the countries that have higher agricultural trade barriers at present.

Doha scenarios

All the estimates discussed so far are for complete elimination of all remaining barriers to merchandise trade, a proposal that is not currently on the table and does not seem likely to occur in the near term. Moving toward political realism, Anderson et al. 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, 70, and 75 percent within three bands of existing tariffs, and reductions in developing countries of 35, 40, 50, and 60 percent within four bands of tariffs; the least developed countries are not required to make any reductions in agricultural tariffs. For nonagricultural tariff bindings the scenario calls for 50% cuts in developed countries, 33% 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.

Table 6. Benefits of "likely" Doha Round scenario

	Beneficiary region		
	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	0.24%	0.14%	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%

However, their “Doha scenario” 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 in section 5). Under the Doha scenario, developing countries get 18% of their potential gains from full liberalization, or only $16 billion. 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 get 41% 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, the scenario favors affluent countries: it brings a projected (one-time) 0.24% increase in income to the developed world, versus 0.14% for developing countries.

Once again, the benefits are distributed 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 Doha scenario are countries that already benefit from relatively liberalized trade. Mexico, for example, already enjoys open access to the US, its dominant export market, under NAFTA; with broader liberalization, Mexico might encounter stiffer competition in US markets. Likewise, Bangladesh and many African countries benefit from existing systems of trade preferences, and might face greater competition in a more liberalized future.

Since Hertel and Keeney do not offer their own Doha scenario, the final portion of Table 6 extrapolates Anderson's Doha scenario into 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 get 41% of the gains Hertel and Keeney identified from complete liberalization, while developing countries get 18%. 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*, 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.

2. Modeling poverty reduction

The CGE models used to analyze trade liberalization do not normally produce forecasts of income distribution or poverty reduction. Estimates of gains that might be received by developing countries include incomes that will be received both by the poor, and by other income groups and business interests in the same countries. 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.

Some models forecast the impact of trade gains or losses on the returns to capital, land, and labor, often distinguishing between skilled and unskilled wages. These projections of factor incomes are based on hypotheses about perfectly functioning markets within countries, which are not always realistic in practice. However, even granting the accuracy of the forecasts for unskilled wages, further analysis is necessary: some unskilled workers work more hours, or live in larger, multi-earner households, resulting in higher per capita incomes, while 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).

Anderson et al.

The LINKAGE model discussed in section 1 has been extended 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 percent change in the number of people in poverty for each 1% growth in average income – for each region of the world (Anderson et al. 2005b). The results are shown in Table 7.

Table 7. Estimates of Poverty Reduction (Anderson)
(millions of people)

	South Asia	sub-Saharan Africa	World
$2 per day poverty line			
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
$1 per day poverty line			
Reduction due to likely Doha scenario	1.4	0.5	2.5
Reduction due to full liberalization	5.6	21.1	31.9
Baseline: extent of poverty	215.9	339.5	622.0

Using the $2 per day poverty line, full merchandise trade liberalization would lift an estimated 66 million people out of poverty as of 2015, of whom 10 million are in South Asia and 20 million are in sub-Saharan Africa. For the world as a whole, this would represent a 3.4% reduction in poverty. The scenario for the likely results of the Doha round would reduce worldwide poverty by only 6 million people as of 2015, or 0.3% of global poverty. Using the lower $1 per day poverty line, full liberalization would reduce poverty by 32 million people, or 5.1% of the global total; the likely Doha scenario

would reduce poverty by 2.5 million people, or 0.4% worldwide. As the authors note, "This corresponds to the relatively modest ambitions of the merchandise trade reforms as captured in these Doha scenarios." (Anderson et al. 2005b, 22)

Cline

Using a different methodology, William Cline has produced a much larger, and widely discussed, estimate of the impact of trade liberalization on poverty (Cline 2004b). As shown in Table 8, his central estimate is a reduction in poverty of 438 million people, including massive poverty reduction in South Asia.[2] 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. A recalculation of his results using a slightly different technical judgment comes coincidentally close to matching the findings of Anderson et al.

Table 8: Estimates of Poverty Reduction (Cline)

(millions of people)

	Bangladesh, India, Pakistan	Sub-Saharan Africa	World
Main model forecast	30	19	98
Productivity effect	98	1	156
Capital growth effect	122	26	184
Central case total	250	46	438
Central case, Weisbrot recalculation	10	34	79

Cline's results depend in part 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, and the elimination of textile tariffs and quotas. So it is not surprising that his estimates of the benefits from complete liberalization, 0.93% of GDP worldwide and 1.35% of GDP for developing countries, are much higher than the estimates discussed in section 1.

Two additional sources of poverty reduction are included along with the main CGE model estimates. First, Cline reviews other studies of the relationship between trade and income growth, concluding that a 1% increase in the ratio of trade to GDP leads to productivity increases creating, on average, a 0.5% increase in per capita incomes. This is the "productivity effect" shown in table 8. Second, since trade liberalization increases the return on capital, Cline performs a modified run of his CGE model, allowing the capital stock to grow enough to keep the rate of return on capital constant. This shows that with a huge infusion of capital into developing countries, incomes could rise by an impressive amount. Cline assumes that in the long run, trade liberalization would lead to half of this capital stock growth, along with the associated income gains.

It seems possible that these two effects are double counting the same phenomenon. A big increase in the capital stock would be expected to increase labor productivity; if both effects are included, the productivity growth should be restricted to the amount that is independent of or additional to the effects of capital stock growth.

Cline then has to translate changes in incomes into reductions in the number of people in poverty. He assumes that each country's income distribution follows a lognormal distribution – that is, the logarithms of individual incomes are normally distributed. The lognormal distribution provides a credible, rough approximation of many income distributions, although the fit is far from being perfect in every case. However, there are two problems that emerge in his treatment of the data, as identified by Mark Weisbrot et al. in a recent critique (Weisbrot et al. 2004).

First, Weisbrot et al. point out, and Cline has acknowledged on his web site (Cline 2004a), that Cline made an algebraic mistake in his original work on the lognormal distribution. The result of this correction is to lower the number of people lifted out of poverty by about 100 million; the figures in Table 8 are the corrected estimates, not the higher ones that Cline originally published.

Second, Weisbrot et al. argue that there are at least two equally logical ways to fit a lognormal distribution to a country's income data. The alternative not taken by Cline would yield a dramatically lower estimate of poverty reduction, only 79 million worldwide, making no other changes in Cline's methodology. The Weisbrot recalculation of Cline's central case, shown in the last line of Table 8, is coincidentally reasonably close to the Anderson et al. calculation of the reduction in poverty from full trade liberalization, as seen in Table 7 (using the $2 per day poverty line, as Cline does).

Moreover, Weisbrot et al. observe that the headcount measure of poverty reduction used by Cline, and by many other studies, simply counts the number of people moved from anything under the poverty line to anything over the line. While the phrase “poverty reduction” may suggest a qualitative transformation in economic circumstances, the model results more often imply a change of pennies per day, moving people from just below to just above $2 – valuable to be sure, but incremental rather than transformative.

Specifically, Weisbrot et al. calculate the average incomes of the people lifted out of poverty in Cline's central case in 17 countries. Only in two of the countries, Pakistan and Thailand, is the pre-liberalization income of this population below $1.88 per day, or the post-liberalization income above $2.13 per day. In India, the people moved out of poverty go from $1.93 to $2.08 per day; in Bangladesh, the comparable movement is only from $1.97 to $2.03 per day.

Moving tens of millions of people just across the poverty line, the effect of complete trade liberalization according to both the Anderson et al. study and the Weisbrot et al. recalculation of Cline's work, would of course be preferable to leaving 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 anti-poverty measure.

3. A different model

Among the major CGE models used to estimate the effects of trade liberalization, the Brown-Deardorff-Stern (BDS) model stands out from the rest (Brown et al. 2002). While using the GTAP data set and sharing many common assumptions and approaches, it parts company with the models discussed above in two important respects: it relies on "new trade theory" and assumes increasing returns in manufacturing; and it incorporates estimates for the benefits from liberalization of trade in services.

New trade theory and increasing returns

The BDS model projects net losses, for the world as a whole, from agricultural liberalization, and enormous gains from manufacturing liberalization. A 33% reduction in agricultural protection is estimated to cause worldwide losses of $8 billion, while a 33% 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 has already occurred by 2005. However, it is 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 it is usually applied in GTAP and many other models, assumes constant returns to scale in all industries: doubling production means precisely doubling income, costs, and profits. The "new trade theory," so named when it was new, some 20 to 30 years ago, breaks with this tradition and assumes that there are economies of scale in many export industries. Empirical research motivated by new trade theory has confirmed the existence of increasing returns in many, though not all, branches of US manufacturing (Antweiler and Trefler 2002). When an industry experiences – increasing returns, doubling production leads to less than doubling of costs, implying more than doubling of net incomes.

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 pointed out in an early review of new trade theory (Krugman 1987), laissez-faire outcomes are no longer optimal, and there is no theoretical basis for rejecting all government intervention. Models based on new trade theory simply show, according to Krugman, that free trade is better than no trade; they unfortunately provide no guidance in identifying the forms of government intervention that would be welfare-enhancing, relative to the free market.

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 and others have argued that trade protection and other forms of intervention have been essential to virtually all past successes in industrialization (Amsden 2001). Although most economists are now firmly committed to free trade, there is a long intellectual history to the debate, and interest in the issue outside of academia has not entirely vanished (Irwin 1996), (Ackerman 2004).

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.

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. It is the combination of these characteristics, along with increasing returns in manufacturing but not agriculture, which explains the BDS finding of losses from agricultural liberalization.

Liberalization of agricultural trade means that some countries expand agricultural output; 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, 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 (Francois et al. 2003; Bouet et al. 2004). Unlike BDS, their models do not imply global losses from agricultural liberalization. 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 importance of services in upcoming trade negotiations, it seems appealing to extend the trade models to include the benefits of liberalization in this area. Unfortunately, the necessary data 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 CGE models have incorporated services liberalization, adopting very different modeling strategies and coming up with very different estimates of the available benefits. Francois et al. used a modified version of GTAP to find that full liberalization of services trade might produce $53 billion of benefits (Francois et al. 2003). According to BDS, on the other hand, a 33% 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 Francois et al.

Francois et al. 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." (Francois et al. 2003, 5) 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 a dummy for EU 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 US had higher barriers to services trade than the EU, 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 US consumers by more than 25%.

It is not intuitively obvious that either of these approaches is reliable, or that one is preferable to the other, although the finding of extremely high US service sector "tariffs" might lead to doubts about the BDS methodology. Hertel and Keeney mention the Francois 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." (Hertel and Keeney 2005, 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.

4. Other benefits

Two additional categories of benefits have been important in recent modeling and related discussion. One results from trade facilitation measures. According to Francois et

al., who incorporate these benefits into their model, trade facilitation measures "are meant to target less transparent trade barriers, such as customs procedures, product standards and conformance certifications, licensing requirements, and related administrative sources of trading costs." As they observe, "the estimates of trading costs [imposed by such barriers] are very rough (at best)." (Francois et al. 2003, 5) Based on a few available studies, they apparently assume that trade facilitation could remove barriers equal to 3% of the value of trade. Almost nothing is said about the policies that would accomplish trade facilitation, or the feasibility, cost, or timetable for such measures. Francois et al. estimate that under full liberalization, trade facilitation measures could yield $151 billion of benefits worldwide, almost identical to the same study's total estimate for merchandise trade liberalization.

Hertel and Keeney also examine trade facilitation measures, lowering trading costs for developing countries by assuming that they are brought halfway to the global average in port facilities, customs and regulatory procedures, and e-commerce. (It is not clear that they are considering the same trade facilitation measures as Francois et al.; the measures discussed by Hertel and Keeney sound somewhat less procedural and more infrastructural.) Hertel and Keeney find that trade facilitation would add $110 billion of benefits to the GTAP estimates, and that these benefits would be heavily skewed toward developing countries. They add, "However, unlike trade policy reform, which has few direct economic costs, trade facilitation requires substantial investments in infrastructure, ports and customs personnel. As such, that gross flow of benefits must be weighed against the potential upfront costs." (Hertel and Keeney 2005, 19)

Along similar lines, Jeffrey Sachs has identified geographic isolation and high transportation costs as one of the obstacles to development for the world's poorest countries (Sachs 2005). He emphasizes the need for substantial foreign aid to pay for the infrastructure of "trade facilitation" – along with a broader agenda of public health and education investments. While there are excellent arguments for such investments, there is, as Hertel and Keeney suggest, no reason to think that the benefits of trade facilitation can be brought about through negotiations alone.

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 includes such an effect, in the study discussed in section 2. Anderson et al. 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.

While 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, 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. The interindustry shifts that result from liberalization, the core results of most CGE trade models, will themselves boost average productivity. The danger of double counting is even greater in the case of LINKAGE, which explicitly includes 14 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 reasonableness of the productivity calculations; unlike CGE estimates, they are not required to be consistent with other calculations. A review article by Anderson illustrates the astonishing upside potential for off-line productivity calculations (Anderson 2004). 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." 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," or 45 years after the base year of his calculations (Anderson 2004, 559). The present value for the 45-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 (Anderson 2004, 567-568). A response to his article notes that even the best economic policies do not always produce results that endure undiminished for 45 or 50 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 45 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.

5. Limitations of economic modeling

The models of trade liberalization discussed in this paper are computable general equilibrium (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, while 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).

Any modeling exercise involves simplification of reality. The question is not whether simplifications are involved, but whether those simplifications clarify or distort the underlying reality. Unfortunately, in the case of CGE models of international trade, 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.

One of the important but technical aspects of CGE trade models involves the use of Armington elasticities. Following a procedure developed by economist Paul Armington, the models use a set of elasticities first, to apportion a country's demand for a specific good – such as US 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 exporter 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). While 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). Such uncertainties have proved to be of more than academic importance; rival analyses of a proposed free-trade agreement between the US and Australia came to opposite conclusions about whether or not it would be beneficial for Australia, based largely on their use of different Armington elasticities (ACIL Consulting 2003; Centre for International Economics 2003).

Another limitation is the static nature of CGE analyses. Most models offer only a comparison of two snapshots, an equilibrium that is assumed to have existed before a policy change, and an 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 seen in section 3, excludes 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. However, three arbitrary assumptions are imposed in order 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" (Anderson et al. 2005a). The first two assumptions ensure that two of the most important and variable indicators of macroeconomic performance are artificially 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 14 annual snapshots based on artificially perfect macroeconomic stability.

For policymakers, the most important theoretical limitation of CGE models is their silence on the employment impacts of trade liberalization. Much of the political 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 and/or geographical 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" (Stiglitz and Charlton 2004, 7). They list a series of problems with CGE models that affect the analysis of developing countries, including among others:

- "CGE models often do not account for the presence of persistent unemployment in developing countries. In the presence of unemployment, trade liberalization may simply move workers from low productivity protected sectors into unemployment."
- "... most of the tools used to analyze general equilibrium effects of trade liberalization are static models. They describe the movement from one 'steady state' to another but do not incorporate the costs associated with transition or the consequences for economies which are initially out of steady state."
- "CGE models do not address the fact that implementation and adjustment costs are likely to be larger in developing countries." (Stiglitz and Charlton 2004, 8-9)

In response, CGE modelers point out that they typically assume fixed employment, not necessarily full employment.[3] However, this still does not allow analysis of changes in employment. Each country's level of unemployment after the policy innovation is, by assumption, the same as the level before, even if it is not always zero. 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 trade impacts, but it is far from the only one. Except among economists, it is unlikely to seem like the obvious place to start when thinking about trade.

An understanding of this limitation of the models may help make sense of the results presented above. The 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. This is why the gains to consumers from tariff reductions dominate the model estimates of the benefits of liberalization: producer impacts, positive or negative, have been largely suppressed by assumption. 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. No such artificial assumptions limit the estimated gains to European consumers, who now enjoy the full benefit of lower prices. In short, fixed-employment models tilt toward a full accounting of consumer impacts but a muted assessment of producer impacts, since everyone affected by trade is either coming from or going to a job elsewhere. The dominant role of consumer benefits is not so much a research finding, as a reflection of the loss of the other side of the equation. The oddity is that producer impacts were lost by design.

While the fixed employment assumption is conventional, it is not required for CGE modeling. Two recent articles have explored both the possibility and the desirability of calculating employment impacts of trade in a CGE framework (Kurzweil 2002; Oslington 2005). Some recent studies done for the United Nations Conference on Trade and Development (UNCTAD), using GTAP, have modeled trade liberalization under the assumption that the employment of unskilled labor in developing countries can vary as needed. This is done by changing the model algorithms so that wages remain fixed while the quantity of unskilled labor may vary. The fixed wage assumption is not totally satisfactory, as one would expect some movement in both the price and quantity of labor, but the authors claim that the pool of unemployed or underemployed in developing countries implies most of the adjustment occurs in employment rather than wages.

In one such study, the elimination of all industrial tariffs would lead to estimated increases in the employment of unskilled labor of between 5% and 8% in most of Asia,

Africa, and the Middle East, as well as in Central America and the Caribbean; elsewhere in Latin America, unskilled employment would increase by about 2%. The assumption of variable unskilled employment, compared to a conventional analysis with fixed employment, would add $40 billion to the global benefits from complete industrial trade liberalization. Most countries and regions would enjoy small increases in benefits, while more than 70% of the total increase would go to China. The estimated benefits of partial liberalization were naturally smaller (Fernández de Córdoba and Vanzetti 2005).

The UNCTAD study, however, represents only a partial correction to the unrealistic assumption of fixed employment. It leaves unchanged, by definition, both the number of jobs in developed countries, and the number of skilled jobs in developing countries. In the case of industrial liberalization, skilled jobs in some developing countries would indeed 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. Thus the net job gains, combining skilled and unskilled labor, might well be smaller than the UNCTAD projections.

Another modeling group, at the French research institute CEPII, has applied a different CGE model, MIRAGE, to agricultural trade liberalization in the Doha round (Bouet et al. 2004). Their model employs a number of innovations, including a new, detailed data set for agricultural tariffs and trade policies, the assumption of imperfect competition in industry and services, and a dual labor market in developing countries structured much like the UNCTAD model (with a totally elastic supply of unskilled labor at fixed wages), among other features.

Table 9. Doha scenario for agriculture (MIRAGE)

	gain or loss *($1997 billions)*	percent of GDP
Developed countries	19.0	0.06%
China	1.3	0.15%
South Asia	0.9	0.17%
Rest of World	-3.0	-0.06%
World total	18.2	0.06%

Source:(Bouet et al. 2004), Table 6, page 27.

Under their "likely Doha" scenario, the gains from agricultural trade liberalization amount to just $18 billion worldwide, as shown in Table 9. The developed world would receive benefits of $19 billion, while gains of about $1 billion each for China and for South Asia would be outweighed by losses of $3 billion for the rest of the developing world. Although this is a more discouraging outlook than most CGE forecasts offer for developing countries, its global total is roughly comparable to the extrapolated GTAP Doha scenario, presented in Table 6.[4] In their sensitivity analyses, the CEPII analysts

attributed their finding of limited gains from liberalization primarily to their new data set for tariffs and trade policies; the flexible employment assumption made the outcome of liberalization look only slightly worse for developing countries (Bouet et al. 2004).

6. Conclusion

The numerical rhetoric supporting trade liberalization, the benefit of hundreds of billions of dollars to the developing world that roared through trade policy debates as recently as 2003, has suddenly quieted to a whisper. For the world's less affluent citizens, for developing countries with many people living on $1 or $2 per day, CGE models of 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. Small wonder, then, that the effects of trade liberalization on global poverty turn out to be much less than 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. Trade facilitation measures, in part a new name for infrastructure, may well be useful but will not be cheap; real investments, not just negotiations, are required. 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 failure of CGE trade models goes deeper than their inability to produce the expected huge forecasts of benefits for developing countries. On a conceptual level, they fail to offer 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 policymakers care most about cannot be answered within the standard CGE framework, because they cannot even be asked. Consumer benefits from tariff reductions are highlighted, while producer impacts of trade policy are obscured, by the assumptions made before the models are built and applied.

Promising initial steps have been taken toward modeling with variable employment; 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; the current pattern of gains consisting largely

of consumer benefits from lower prices would be reduced. But the results would be more informative and useful than those that are available at present. An adequate economic analysis, modeling the full range of effects of trade that are of interest to policymakers and the public, would combine consumer and producer impacts in a unified framework.

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REFERENCES

ACIL Consulting (2003). A Bridge Too Far? An Australian Agricultural Perspective on the Australia-United States Free Trade Area Idea. Canberra, ACIL Consulting.

Ackerman, F. (2002). "Still dead after all these years: interpreting the failure of general equilibrium theory." *Journal of Economic Methodology* **9**(2): 119-139.

Ackerman, F. (2004). An offer you can't refuse: free trade, globalization, and the search for alternatives. *The Flawed Foundations of General Equilibrium: critical essays on economic theory*. F. Ackerman and A. Nadal. London and New York, Routledge**:** pp. 149-167.

Ackerman, F. and K. Gallagher (2004). Computable abstraction: general equilibrium models of trade and environment. *The Flawed Foundations of General Equilibrium: critical essays on economic theory*. F. Ackerman and A. Nadal. London and New York, Routledge**:** pp. 168-180.

Adams, R. H., Jr. (2004). "Economic growth, inequality and poverty: estimating the growth elasticity of poverty." *World Development* **32**(12): 1989-2014.

Amsden, A. (2001). *The Rise of "The Rest": Challenges to the West from Late Industrializing Economies*. New York, Oxford University press.

Anderson, K. (2004). Subsidies and Trade Barriers. *Global Crises, Global Solutions*. B. Lomborg. Cambridge and New York, Cambridge University Press**:** pp. 541-577.

Anderson, K., W. Martin and D. van der Mensbrugghe (2005a). Market and Welfare Implications of Doha Reform Scenarios. *Agricultural Trade Reform and the Doha Development Agenda*. K. Anderson and W. Martin. Washington, D.C., OUP and the World Bank**:** Chapter 12.

Anderson, K., W. J. Martin and D. van der Mensbrugghe (2005b). Global impacts of the Doha Scenarios on poverty. *Putting Development Back into the Doha Agenda: Poverty Impacts of a WTO Agreement*. T. W. Hertel and L. A. Winters. Washington, D.C., the World Bank**:** Chapter 17.

Antweiler, W. and D. Trefler (2002). "Increasing returns and all that: a view from trade." *American Economic Review* **92**(1): 93-119.

Bouet, A., J.-C. Bureau, Y. Decreux and S. Jean (2004). Multilateral agricultural trade liberalization: the contrasting fortunes of developing countries in the Doha round, CEPII.

Brown, D. K., A. V. Deardorff and R. M. Stern (2002). Computational Analysis of Multilateral Trade Liberalization in the Uruguay Round and Doha Development Round. RSIE Discussion Paper No. 489. Ann Arbor MI, School of Public Policy, the University of Michigan.

Centre for International Economics (2003). Australia-United States Free Trade Agreement: Comments on the ACIL Report. Canberra, Centre for International Economics.

Cline, W. R. (2004a). Technical Correction to Trade Policy and Global Poverty. Washington, D.C., Institute for International Economics.

Cline, W. R. (2004b). *Trade Policy and Global Poverty*. Washington, D.C., Center for Global Development and Institute for International Economics.

Dorman, P. (2001). The Free Trade Magic Act. EPI Briefing Paper. Washington, D.C., Economic Policy Institute.

Fernández de Córdoba, S. and D. Vanzetti (2005). Now What? Searching for a Solution to the WTO Industrial Tariffs Negotiations. *Coping with Trade Reform*, UNCTAD.

Francois, J., H. van Meijl and F. van Tongeren (2003). Trade Liberalization and Developing Countries Under the Doha Round. Tinbergen Institute Discussion Paper 2003-060/2. Rotterdam and Amsterdam, Tinbergen Institute.

Hertel, T., D. Hummels, M. Ivanic and R. Keeney (2004). How Confident Can We Be in CGE-Based Assessments of Free Trade Agreements? GTAP Working Paper No. 26. West Lafayette IN, GTAP, Purdue University.

Hertel, T. W. and R. Keeney (2005). What's at stake: the relative importance of import barriers, export subsidies and domestic support. *Agricultural Trade Reform and the Doha Development Agenda*. K. Anderson and W. Martin. Washington, D.C., OUP and the World Bank**:** Chapter 2.

Irwin, D. A. (1996). *Against the Tide: An Intellectual History of Free Trade*. Princeton, NJ, Princeton University Press.

Krugman, P. R. (1987). "Is Free Trade Passe?" *The Journal of Economic Perspectives* **1**(2): pp. 131-144.

Kurzweil, M. (2002). "The need for a "complete" labor market in CGE modeling." *Landbauforschung Volkenrode* **52**(2): 107-119.

Oslington, P. (2005). "Unemployment and trade liberalization." *World Economy* **28**(8): 1139-1155.

Pronk, J. (2004). Subsidies and Trade Barriers: Alternative Perspective 10.1. *Global Crises, Global Solutions*. B. Lomborg. Cambridge and New York, Cambridge University Press**:** pp. 578-591.

Sachs, J. (2005). *The End of Poverty: Economic Possibilities for Our Time*. New York, The Penguin Press.

Stiglitz, J. E. and A. H. Charlton (2004). A Development-Friendly Prioritization of Doha Round Proposals. IPD Working Paper. New York and Oxford, Initiative for Policy Dialogue.

Tokarick, S. (2005). "Who bears the cost of agricultural support in OECD countries?" *World Economy* **28**(4): 573-593.

Weisbrot, M., D. Rosnick and D. Baker (2004). Poor numbers: the Impact of Trade Liberalization on World Poverty. CEPR Briefing Paper. Washington, D.C., Center for Economic and Policy Research.

ENDNOTES

[1] These per capita figures are slight overestimates, since 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.

[2] 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.

[3] Personal communication, David Vanzetti, July 2005.

[4] The MIRAGE forecast in Table 9, of $18 billion of global gains, refers to liberalization in agriculture only; the GTAP extrapolation in Table 6, with $28 billion of gains, refers to liberalization of all trade. Note that the figures in Table 9 correct an apparent small error in the world total line in the original source; the world total in Table 9 is consistent with both sets of regional detail data in the original.

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