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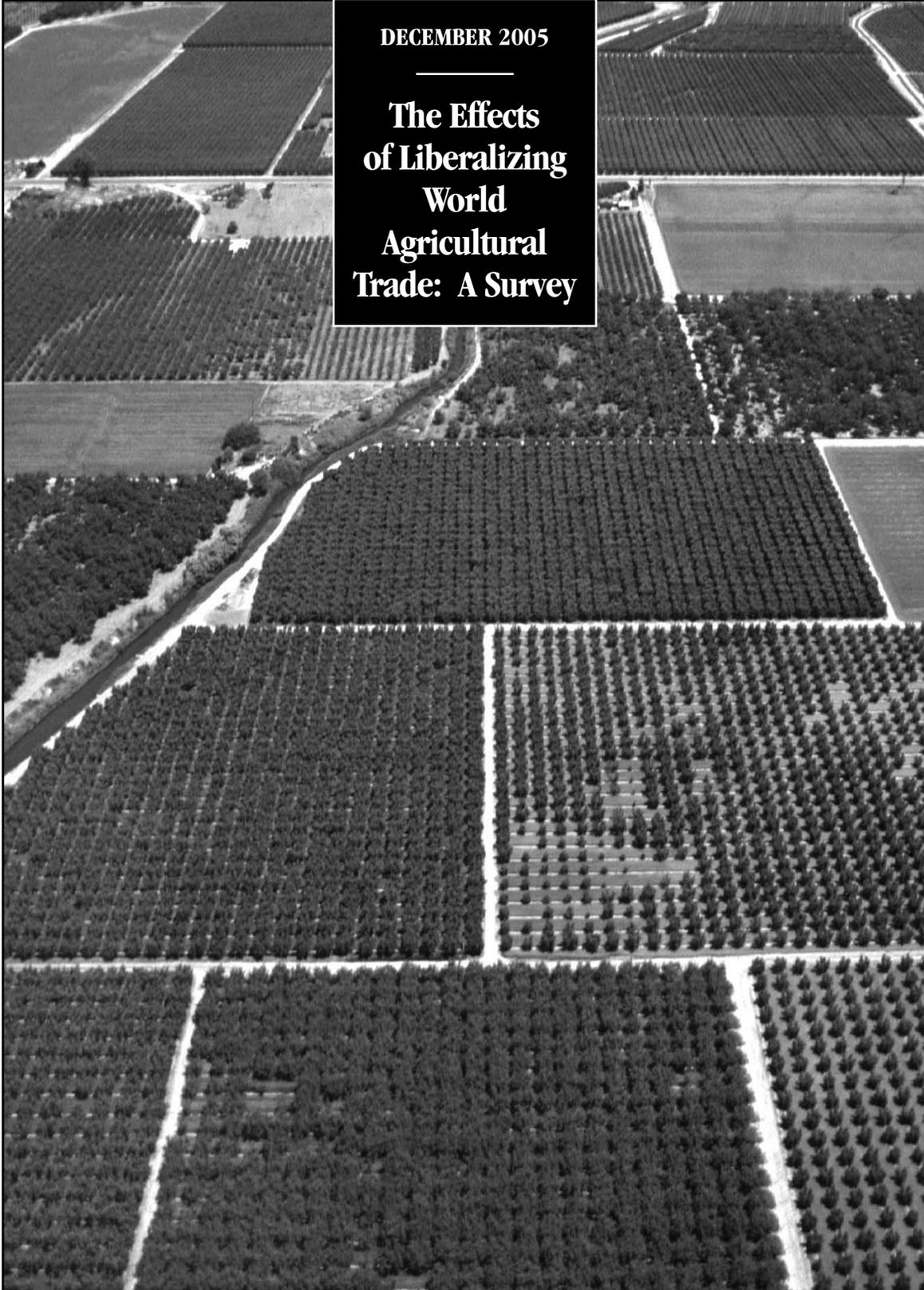
The Effects of Liberalizing World Agricultural Trade: A Survey

December 2005

The Congress of the United States ■ Congressional Budget Office

Notes

Numbers may not add up to totals because of rounding.

In this report, the word "country" includes the European Union. For purposes of international trade policy, the European Union is effectively one country. There is free trade among its members, its members have a common trade policy toward the rest of the world, and the union itself (rather than its individual member countries) is a member of the World Trade Organization.

Preface

A major issue on the agenda of the ongoing Doha Round of multilateral negotiations by members of the World Trade Organization concerns how and to what extent policies that affect agricultural trade should be liberalized. For most of the postwar period, the series of multilateral negotiating rounds under the auspices of the General Agreement on Tariffs and Trade allowed policies that distort agricultural trade to continue in large part while tariffs and other policies that distort trade in other sectors were progressively reduced or eliminated. The Uruguay Round, which took place from 1986 through 1994, began the liberalization of agricultural trade; yet tariffs remain much higher, and the use of subsidies remains much more prevalent, in agriculture than in other goods-producing industries.

In August of this year, in response to part of a request by the Chairman of the House Ways and Means Committee, the Congressional Budget Office (CBO) published a paper that presented statistics on policies around the world that distort agricultural trade. This paper, prepared in response to the same request, presents the results of studies that estimate the economic effects of liberalizing those policies. In keeping with CBO's mandate to provide objective, impartial analysis, this paper makes no recommendations.

Douglas Holtz-Eakin
Director

December 2005

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Summary

This paper summarizes the results of a number of studies that address the question: What would be the economic effects of reducing or eliminating the policies that distort agricultural trade around the world? The question is of interest because agricultural trade liberalization is a major issue in the Doha Round of multilateral trade negotiations that is currently under way.

The Total Cost of Policies That Distort Agricultural Trade

Countries typically adopt trade-distorting agricultural policies—tariffs, tariff-rate quotas, production-distorting subsidies, and export subsidies—to benefit their domestic agricultural producers. In doing so, however, they often impose costs on their consumers (who must pay more for agricultural products subject to tariffs and tariff-rate quotas), domestic taxpayers (who must pay for any subsidies), and competing foreign producers (who lose sales). The costs to domestic consumers and taxpayers alone are usually greater in dollar terms than the benefits to domestic producers. Therefore, eliminating those policies is generally beneficial. The studies that the Congressional Budget Office (CBO) examined support two major conclusions about the economic benefits to the world from eliminating the policies or, alternatively, the cost—in terms of forgone benefits—of keeping those policies in place:

■ The likely total annual economic benefit to the world in 2015 from efficiency gains and investment growth that would result from full agricultural liberalization from 2005 through 2010 is in the range of roughly $50 billion to $185 billion (measured in 2001 dollars), or 0.1 percent to 0.4 percent of the value of world output of all goods and services. Expanding the analysis to include the effects of liberalization on the rate of productivity growth can raise the estimates by amounts ranging from 50 percent to more than 100 percent, depending on the study.

■ The cost of policies that distort agricultural trade is roughly two-thirds of the total cost of all policies that distort trade in goods of any kind.

Partial Liberalization

Any agreement from the Doha Round is likely to allow countries to maintain some policies that distort agricultural trade. As a result, it is important to understand the more complicated effects of partial liberalization. The studies support the following conclusions about such effects:

■ Of the policies that distort world agricultural trade, tariffs and tariff-rate quotas are by far the most costly—accounting for 80 percent to 90 percent of the cost—followed by domestic subsidies and then export subsidies.

■ Subsidies tend to benefit countries purchasing the subsidized products and to harm countries granting the subsidies and countries that are competing agricultural exporters. Because most subsidies are granted by developed countries, export subsidies tend to benefit developing countries and harm developed countries. To a lesser extent, the same pattern is true of domestic subsidies.

■ The Doha Round tariff negotiations concern tariff bounds—that is, limits above which tariffs may not be raised. However, there is a significant gap between many tariffs and their current bounds. Because of that slack, the percentage reductions in applied rates will be much smaller than any negotiated percentage reductions in the bounds. For the world as a whole, the average rate of the tariffs actually applied is 55 percent lower than the average bound rate. The corresponding numbers for developed, developing, and least-developed countries are 47 percent, 57 percent, and 83 percent, respectively.

■ Domestic subsidy-reduction negotiations in the Doha Round similarly concern reductions in bound values. As with tariffs, most countries' domestic subsidies are significantly lower than their bounds, so the percentage reductions in actual domestic support for agriculture that result from negotiated reductions in the support bounds will be much smaller than the percentage reductions in the bounds themselves.

■ Extremely high tariffs on selected products, which are a common feature in agriculture, account for a disproportionately large percentage of the economic cost of agricultural tariffs and tariff-rate quotas. Allowing all countries to classify as little as 2 percent of their tariff lines as "sensitive products" and developing countries to classify an additional 2 percent of their tariff lines as "special products"—categories that allow smaller tariff cuts than are negotiated for agricultural tariffs generally—could eliminate 80 percent of the economic gain that would otherwise result from negotiated agricultural tariff cuts.

■ Special and differential treatment—according to which the cuts in tariffs and subsidies that developing countries are required to make are not as large as those required of developed countries—is economically detrimental to developing countries. According to one study, eliminating special and differential treatment from a realistic liberalization scenario would increase the benefit of that scenario to high-income countries by 21 percent, to middle-income countries by 37 percent, and to low-income countries by 64 percent.

Distributional Issues

The distribution among and within countries of the economic benefits from agricultural trade liberalization is also significant. The studies support the following conclusions relating to distributional issues:

■ All except one of the studies predict that the United States would gain from full liberalization of agriculture. The one exception (which uses an alternative assumption about the workings of nonagricultural markets—see the discussion at the end of this summary) nevertheless predicts that U.S. agriculture would benefit. The studies generally agree that all developed countries would benefit and that most devel-

oping countries—including China, India, and Brazil—would gain as well.

■ Countries whose agricultural sectors are likely to benefit most from liberalization include Australia, New Zealand, Canada, Brazil, and Argentina. Countries whose agricultural sectors are likely to be harmed include the members of the European Union and the European Free Trade Association and high-income Asian countries. The United States is someplace in the middle, with most modeling studies predicting that U.S. agriculture as a whole would moderately benefit and one predicting a reduction in the rate of growth of output. China and India are also in the middle, with little effect predicted for their agricultural sectors.

■ Predictions are uncertain regarding the effects of liberalization on narrow components of U.S. agriculture.

■ Liberalization will most likely increase the wages of both skilled and unskilled labor and, to a slightly lesser extent, the returns to capital (rates of interest and profit) in almost all countries, with larger effects for less-developed countries. Whether unskilled wages increase by more than skilled wages do or vice versa will most likely depend for each country on whether the growth of its agricultural output increases or decreases as a result of liberalization.

■ Developing countries as a group would benefit more from liberalization of their own policies, which directly affect both their exports and their imports, than they would from liberalization of developed countries' policies, which directly affect only their exports. To the extent that developing countries are harmed by developed countries' policies that distort trade, the evidence points to the European Union and high-income Asian countries as much larger sources of harm than the United States.

A Final Note

Studies of the effects of agricultural liberalization generally must consider the influence of nonagricultural markets as well as agricultural markets. With regard to nonagricultural markets, most studies assume that at typical scales of operations, the efficiency and productivity of firms are independent of their scale of operations and that the markets for their products are competitive. The con-

clusions presented here are drawn from such studies. One of the studies that CBO surveyed assumes instead that at typical scales of operations, the efficiency and productivity of firms increase with their scale of operations and that the markets for their products are therefore less competitive. At least in part because of that difference in assumptions, the results of that study are at odds with some of the conclusions presented here.

The Effects of Liberalizing World Agricultural Trade: A Survey

Introduction

A central objective of the Doha Round of multilateral trade negotiations under the auspices of the World Trade Organization (WTO) is to liberalize world agricultural markets. To illuminate that issue, the Congressional Budget Office (CBO) published in August of this year *Policies That Distort World Agricultural Trade: Prevalence and Magnitude*, which presented statistics on agricultural tariffs, domestic subsidies, and export subsidies around the world. This paper follows up on that analysis by summarizing research that addresses the question: What would be the economic effects of reducing or eliminating those policies?

Background

Tariffs, quotas, subsidies, and other policies distorting trade in nonagricultural goods have been progressively reduced, and in some cases eliminated, by agreements reached in a succession of multilateral trade negotiations over the post-World War II period. However, policies distorting agricultural trade were largely left alone until the Uruguay Round Agreement, the provisions of which have been phased in over the past decade.

The Uruguay Round Agreement required that each country's nontariff barriers to agricultural imports be converted to tariff-rate quotas providing equivalent protection for imports and equivalent access to the country's market. It further required that upper limits (or *bounds*) be set on all agricultural tariffs, above which the tariffs cannot be raised. Developing and least-developed countries were allowed to set many of their bounds at levels substantially higher than the tariffs they actually imposed at the time. A schedule for each country listed the country's tariff bounds as well as the specifics of its tariff-rate quotas. The agreement required that developed countries' bounds be reduced by 36 percent, on average, over six years with a minimum cut of 15 percent for each prod-

uct, and that developing countries' bounds be reduced by 24 percent, on average, over 10 years with a minimum cut of 10 percent for each product. Least-developed countries were not required to make any reductions.

The agreement grouped domestic support measures into five categories, or boxes: the green box, the blue box, the special and differential box, de minimis support, and the amber box. The green box is for measures (defined in some detail in the agreement) that were deemed to have little or no distorting effects on trade or production. The blue box is for certain subsidies that distort production but are coupled with production-limiting programs that offset to a greater or lesser extent the distortions that would otherwise occur. The special and differential box is for certain subsidies by developing countries that are part of programs for agricultural and rural development. De minimis support consists of subsidies below specified levels deemed sufficiently small that any distortion of trade and production they might cause is not large enough to merit further limitation of the subsidies. The amber box is for the remaining subsidies—those considered the most distorting to trade. Amber-box subsidies are the only ones that the agreement limited and reduced.

The total value of a country's amber-box support is called its *total aggregate measure of support*, or *total AMS*. The agreement required that each developed country reduce its total AMS by 20 percent over six years from its value in a base period defined as 1986 to 1988; each developing country was required to reduce its total AMS by 13 percent over 10 years. The resulting limits on amber-box subsidies are called *bound values* or *bindings*, and they are listed for each country on its schedule.

The agreement lists the export subsidies to which it applies. The list includes most of the subsidy practices that were prevalent in the agricultural sector at the time the agreement was negotiated. Although international food

aid is not on the list, the agreement contains a separate provision designed to ensure that food aid is not used as an export subsidy. Countries were required to agree to reduction commitments for their export subsidies on a product-specific basis. In particular, developed countries were required to commit to reductions, to occur in equal annual steps over six years, of 21 percent in the base-period volumes of their subsidized exports and 36 percent in their budgetary outlays for the subsidies. Developing countries were required to reduce volumes by 14 percent and budgetary outlays by 24 percent over 10 years.

Each country's commitments, also called *bound values* or *bindings*, are listed on its schedule. In general, no export subsidies are allowed without corresponding reduction commitments. A temporary exception was made for developing countries to grant certain subsidies related to marketing costs and internal transport during the implementation period, which extended for nine years from the date the agreement took effect in 1995. The implementation period is now over, so the only export subsidies allowed are those for which the countries granting them have made reduction commitments.

Notwithstanding the reductions required by the Uruguay Round Agreement, CBO's August 2005 paper on the current status of policies that distort agricultural trade drew the following broad conclusions:

■ Policies that distort agricultural trade remain much more pervasive and substantial around the world than policies that distort trade in other goods.

■ High agricultural tariffs are most prevalent in East Asian countries. The United States has a low average agricultural tariff, and the European Union's (EU's) average is in the middle.

■ The European Union provides the largest *amount* of amber-box subsidies as measured by dollar value, with the United States a distant second and Japan a distant third. The highest *rates* of such subsidies, measured as a percentage of total agricultural output value, are those of the members of the European Free Trade Association, or EFTA (Iceland, Norway, and Switzerland-Liechtenstein), followed by the European Union. The United States is further down the list.

■ The EU is by far the dominant provider of export subsidies, providing 85 percent to 90 percent of the world's total.

A major goal of the Doha Round is to significantly reduce, or *liberalize*, the remaining agricultural tariffs and subsidies. The task of this paper is to survey the results of a number of studies that attempt to estimate the likely economic effects of such liberalization.

Measuring the Effects of Liberalization

For an assessment of the overall benefit or harm to countries from liberalization, most studies present estimates of *welfare effects*—technically, a dollar value of the net effect of liberalization. Specifically, the studies estimate the additional dollars that would be needed to make countries as well off without liberalization as they would be under the liberalization scenario at issue.

Liberalization can be expected to have two different kinds of effects: static and dynamic. *Static effects* are those related to reducing the misallocation of each country's current resources—its capital, labor, land, and natural resources—toward industries favored by current policies and away from industries that compete on the basis of economic fundamentals. Although such effects may take many years to completely phase in, they are "one-time" in the sense that the economy shifts from the configuration prior to liberalization to the more efficient use of resources afterward—hence, the term *static effects*.

Over the period of time that the static effects phase in, some industries contract (or grow more slowly than they would otherwise) while other industries expand (or grow more rapidly than they would otherwise).

Dynamic effects of trade liberalization refer to effects on and through rates of investment and productivity growth. Trade liberalization in general can be expected to increase the rate of capital investment. Even if the rate of saving remained constant, reductions in tariffs on capital goods would decrease their price so that the constant rate of saving would purchase more of those goods. The resulting increase in investment would boost the rate of growth of the aggregate capital stock of each country for a period of time. Eventually, depreciation of the increasing capital stock would start to increase as well until net investment —investment minus depreciation—returned to what it was before liberalization.

Some analysts argue that liberalization can also be expected to increase the rate of productivity growth. Thus, one study contends that productivity growth is linked to the ratio of exports to output.[1] The study argues that as producers' "exports grow and they increase their penetration of world markets, they learn new technologies (through comparison with their competitors' products); they improve production processes to match international standards (such as safety, health, packaging, style, and others); and they can benefit from scale economies as they produce for a larger market."[2] Unlike in the case of investment, any increases that might occur in the rate of productivity growth would not eventually be choked off by anything analogous to increased depreciation. Hence, the effect on output would continue to increase over time indefinitely.

Estimates of dynamic effects—particularly effects on productivity growth rates—are subject to greater uncertainty than are estimates of static effects, and various studies undertake a mixture of estimates. Some of the studies that CBO surveyed incorporate only static effects, others incorporate static and investment effects but not productivity effects, and still others incorporate all three.

Finally, the studies predict the effects of liberalization only. They do not forecast changes in the economy stemming from other factors, such as fluctuations of the business cycle. They generally assume that the economy is in equilibrium—neither in recession nor in expansion. Were a recession to occur by happenstance at the same time that liberalization were to occur, that would not necessarily mean that a study's prediction of gains from liberalization is wrong. Quite possibly the recession would be worse in the absence of liberalization.

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1. World Bank, "Envisioning Alternative Futures: Reshaping Global Trade Architecture for Development," Chapter 6 in *Global Economic Prospects and the Developing Countries 2002* (Washington, D.C.: World Bank, 2002), p. 167.

2. Some of the reasons presented in this quote are more relevant to manufacturing than to agriculture. The study in question allows for effects of trade on productivity growth in both manufacturing and agriculture. Another study allows for such effects only in manufacturing. Even changes in the manufacturing sector, however, affect agricultural trade since some countries export manufactured goods in exchange for imports of agricultural products.

The Total Cost of Policies That Distort Agricultural Trade

Estimates from a number of studies are generally consistent with an annual welfare benefit to the world of roughly $50 billion to $185 billion (measured in 2001 dollars) by 2015, or 0.1 percent to 0.4 percent of the value of world output of all goods and services, from the static and investment effects of full global agricultural liberalization phased in from 2005 through 2010. Depending on the study, including the effects of liberalization on productivity growth rates can raise the estimate by amounts ranging from 50 percent to more than 100 percent. Studies that focus on static effects alone find lower gains. The benefits from liberalization can be thought of as the cost of keeping in place current policies that distort agricultural trade. By some estimates, the cost of those policies is roughly two-thirds of the total cost of all policies that distort trade in goods of any kind.

The Total Cost to the World

Eight of the studies that CBO surveyed present estimates of the worldwide welfare cost of policies that distort agricultural trade.[3] The estimates vary considerably from study to study; however, that variance results partly from differences in what is measured in the studies and not simply from differences in the estimated significance of liberalization. First, some of the models incorporate only the static effects of liberalization, whereas others include static and investment effects, and still others include those effects and effects on productivity growth rates (hereafter referred to as productivity effects).

Second, the studies have different base years for their economic data and for the trade-distorting policies that they analyze. All else being the same, a study with an earlier base year for economic data is likely to predict smaller welfare effects because studies usually (although not always) apply their liberalization scenarios to the economies described by the base-year data without any allowance for growth that has occurred since then. That, in

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3. The studies are the dynamic analysis in the 2005 World Bank study (Anderson, Martin, and van der Mensbrugghe in the bibliography); the static analysis in that same study (Hertel and Keeney in the bibliography); the 2002 World Bank study; the Economic Research Service study (the Burfisher "Overview" and Diao, Somwaru, and Roe in the bibliography); the Brown, Deardorff, and Stern study; the study by Roberts and others; the study by Buetre and others; and the study by Beghin, Roland-Holst, and van der Mensbrugghe.

turn, means that the liberalization is effectively applied to smaller economies than would be the case if data were used from a later base year, leading to smaller welfare effects measured in dollar values (although not when measured in percentage terms). In the opposite direction, all else being the same, studies that have earlier base years for the policies being liberalized will predict larger welfare effects because they include in their estimates the welfare benefits from liberalization that has already occurred since the base year.

Third, in studies with investment or productivity effects, the magnitudes of the effects of liberalization vary with the length of time between when liberalization is assumed to occur and the year that the welfare effect is evaluated, because those effects grow over time.

Fourth, some dynamic analyses include growth that does not stem from the liberalization at issue—such as population growth and productivity growth arising from factors other than liberalization—and others do not. All else being the same, studies that include such growth will predict larger effects measured in terms of dollar value (but not necessarily when measured in percentage terms) than studies that do not. The reason is that the growth results in the economy being larger at the time the welfare effect is evaluated.

Fifth, different studies analyze different degrees and kinds of liberalization. All else being equal, a study that models the effects of full liberalization—that is, elimination of all policies distorting agricultural trade—will predict larger effects than a study that examines a 50 percent reduction in such policies. Similarly, a study of full liberalization will predict larger effects than one that presumes elimination of tariffs but leaves subsidies in place.

It is possible to make rough corrections for many of the differences to make the various studies' results more nearly comparable with one another. The estimate from the dynamic analysis in the 2005 World Bank study is for the welfare effect in 2015 (measured in 2001 dollars) stemming from static and investment effects of eliminating, in equal annual increments from 2005 through 2010, all policies distorting agricultural trade. When rough adjustments are made to the other estimates of static-plus-investment effects in the studies to account for

differences in timing and liberalization analyzed and thereby make them more nearly comparable to the dynamic World Bank estimate, the estimates from all of the studies are generally in the range of $50 billion to $185 billion annually, or 0.1 percent to 0.4 percent of world gross domestic product (GDP). Depending on the study, adding in effects of liberalization on productivity growth rates as well can raise the estimate by amounts ranging from 50 percent to more than 100 percent. Static effects alone (adjusted to the year 2015) are lower. With one major exception, they are in the range of $50 billion to $170 billion annually. Moreover, the upper half of that range results from considerable uncertainty in the adjustment for the study by Roberts and others and the fact that that study liberalizes the policies in effect in 1995, when little of the Uruguay Round liberalization had yet taken place. Without that study, the range would be $50 billion to $105 billion.

The major exception to the range of static estimates is the estimate from the study by Brown, Deardorff, and Stern. That study predicts a static loss in total world economic welfare from a balanced reduction in all policies distorting agricultural trade, a result that derives from the reduction of export subsidies. The study finds that a 33 percent reduction in tariffs increases world welfare by $9.5 billion, and a 33 percent reduction in domestic subsidies increases it by $10.6 billion. However, a 33 percent reduction in export subsidies reduces world welfare by $23.2 billion, bringing the total to a net loss of $3.1 billion. The reduction in export subsidies benefits the countries that grant the subsidies, but the resulting increase in the international prices of agricultural products harms countries that import those products even more, resulting in the net loss for the world.

As will be seen in the following sections of this paper, the Brown, Deardorff, and Stern study also differs from the other studies in several of its other major findings. One reason for the different results is that the Brown, Deardorff, and Stern study, unlike the others, assumes that manufacturing and service industries have increasing returns to scale—that is, that given percentage increases in labor, capital, and other inputs to those industries result in larger percentage increases in output—and makes corresponding assumptions about the state of competition in

those industries.[4] That set of assumptions makes the model used in the study significantly different from those used in the other studies.

Comparison with the Cost of Trade-Distorting Policies in Other Goods Sectors

The World Bank studies and the Brown, Deardorff, and Stern study also look at policies distorting trade in sectors other than agriculture. The World Bank studies examine trade in all other goods sectors, and the Brown, Deardorff, and Stern study looks at policies distorting services trade as well. The World Bank studies find that the vast bulk of the cost of policies distorting goods trade results from policies relating to agriculture. The Brown, Deardorff, and Stern study has the unique result that policies distorting agricultural trade produce a net benefit to the world.

According to the dynamic analysis in the 2005 World Bank study, which includes static and investment effects, 63.4 percent of the annual benefit from phasing out all policies distorting goods trade—$182 billion out of a total of $287 billion—would derive from the elimination of policies in the agricultural sector.[5] According to the static analysis in the same study, 66.1 percent of the static benefits—$55.7 billion out of $84.3 billion—would derive from agricultural liberalization.[6]

The earlier 2002 World Bank study, which uses the same basic model as that used in the dynamic analysis in the 2005 study, presents two estimates for the same liberalization scenario as in the 2005 study: one including static and investment effects but no productivity effects, and one including all three kinds of effects. The former attributes 69.9 percent of the total annual benefits—$248 billion out of $355 billion—to agricultural liberalization. The latter attributes 70.6 percent—or $587 billion out of $832 billion—to agricultural liberalization.

The Brown, Deardorff, and Stern study finds that a 33 percent reduction in policies distorting agricultural trade

reduces world welfare by $3.1 billion annually (measuring only static effects). It finds that a 33 percent reduction in policies distorting trade in manufactured goods increases world welfare by a much larger $163 billion and that a 33 percent reduction in policies distorting services trade increases world welfare by a still larger $413.7 billion.

Some Important Considerations Concerning Partial Liberalization

The Doha Round is likely to yield only partial liberalization. Assessment of partial liberalization is complicated by a number of factors that do not arise in the assessment of full liberalization. Important considerations include which trade-distorting policies are most costly economically, the distinction between bound and applied tariffs and between bound and applied domestic support, exceptions made for sensitive and special products, the effects of liberalization of other goods sectors, and special and differential treatment for developing countries. Some of those considerations have the potential to make a liberalization agreement much less beneficial economically than it first appears.

Breakdown of Costs by Type of Policy

Breaking down the cost of trade-distorting policies by type of policy reveals two significant results: the vast bulk of the cost arises from trade restrictions, and a number of developing countries—those that are net importers of agricultural products—would be harmed by the elimination of domestic and especially export subsidies.

Tariffs Are the Most Costly Trade-Distorting Policy. Of five studies that CBO surveyed that present welfare results by type of policy, four agree that tariffs (and tariff-rate quotas) are by far the most costly of the policies distorting agricultural trade.

The static analysis in the 2005 World Bank study estimates the total welfare cost of all policies distorting agricultural trade at $55.7 billion per year.[7] It estimates the cost of tariffs at $51.8 billion, or 93.1 percent of the total. Domestic support is second at $2.8 billion, or 5.0 percent of the total. Last are export subsidies at $1.0 billion, or 1.9 percent of the total.

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4. Technically, the corresponding assumptions are that products are heterogeneous and that industries are monopolistically competitive.

5. See Anderson, Martin, and van der Mensbrugghe in the bibliography.

6. See Hertel and Keeney in the bibliography.

7. Ibid.

The Economic Research Service (ERS) study places the costs in the same order.[8] It estimates the total static welfare cost of all trade-distorting policies in agriculture at $31.1 billion per year. It attributes $25.2 billion of that cost, or 81.2 percent, to tariffs. Domestic support comes in second at $2.8 billion, or 9.0 percent. Last are export subsidies at $0.3 billion, or 0.8 percent.

The study by Beghin, Roland-Holst, and van der Mensbrugghe, which looks only at the trade-distorting policies of high-income countries, actually attributes slightly more than 100 percent of the $82.1 billion total annual cost of such policies to what it calls "border protection," in which it includes tariffs and export subsidies. That result implies that domestic support by high-income countries actually benefits the world very slightly, which conflicts with the findings of the World Bank and ERS studies just discussed.

A study by Hoekman, Ng, and Olarreaga examines whether tariffs or domestic subsidies are more detrimental to trade between developed and developing countries and consequently to the economic welfare of the two groups of countries. Looking only at tariff lines of agricultural products that receive domestic subsidies in at least one country (158 tariff lines out of 900 at the six-digit Harmonized System, or HS, level), the study estimates that a 50 percent cut in tariffs would increase developed countries' exports 10 times as much, their imports 63 times as much, and their economic welfare almost 27 times as much as would a 50 percent cut in domestic subsidies. For developing countries, the cut in tariffs is estimated to increase exports over eight times as much as the cut in subsidies. The cut in subsidies reduces developing countries' imports and economic welfare, making ratio calculations problematic, but the magnitude of the effects of the tariff cut on imports and economic welfare is much larger than is the magnitude of the effects of the subsidy cuts.

The only study CBO examined that does not find tariffs to be the most costly of the policies distorting agricultural trade is that of Brown, Deardorff, and Stern. As noted earlier, that study (which examines static effects only) finds that a 33 percent reduction in tariffs increases world welfare by $9.5 billion annually; a 33 percent reduction in domestic subsidies increases it by a slightly larger $10.6

billion; and a 33 percent reduction in export subsidies reduces it by a still larger $23.2 billion.

Eliminating Subsidies Harms Many Developing Countries. In general, subsidies harm the countries that grant them (and competing agricultural exporters) and benefit the countries that purchase the subsidized products. They do so because they cause the subsidized products to be sold at prices that are less than the cost of production. The effect is more pronounced for export subsidies than for domestic subsidies because many of the sales of products receiving domestic subsidies are to domestic customers. High-income countries grant more than 90 percent of the domestic subsidies and more than 95 percent of the export subsidies reported by member countries to the WTO. Therefore, one would expect that eliminating those subsidies would benefit many high-income countries and harm many developing countries and that the effect would be more pronounced for export subsidies than for domestic subsidies.

Results from the static analysis in the 2005 World Bank study and from the ERS study support that reasoning. The World Bank analysis indicates that eliminating export subsidies would lead to a static annual welfare increase of $2.6 billion for high-income countries and a static annual welfare loss of $1.0 billion for developing countries. Moreover, 14 of the 17 individual developing countries and developing-country regions studied would see their welfare decline. Similarly, the ERS study indicates a static annual welfare increase of $2.5 billion for developed countries and a static welfare decline of $2.3 billion for developing countries. Moreover, the study indicates harm to all six of the individual developing countries and developing-country regions examined.

As would be expected, the results are less pronounced for domestic subsidies. The World Bank analysis indicates a benefit to developing countries as a group from eliminating such subsidies; however, the benefit is small, and a number of developing countries are harmed. The ERS study indicates harm to developing countries as a group and to five of the six individual developing countries and developing-country regions it examined. Both studies indicate that high-income countries benefit from the elimination of domestic subsidies.

Two scenarios in the study by Beghin, Roland-Holst, and van der Mensbrugghe differ only in the elimination of domestic subsidies. A comparison of the results from

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8. See Diao, Somwaru, and Roe in the bibliography.

those scenarios indicates that that elimination benefits developing countries as a group and harms only one major developing country, China. Contrary to expectation, the comparison also indicates that elimination harms developed countries as a group. The harm occurs to Western Europe and high-income Asian countries—not to the United States, which benefits.

Reductions in Bindings Versus Reductions in Actual Tariffs and Subsidies

The Doha Round negotiations concerning reductions in tariffs and domestic subsidies are framed in terms of reductions in tariff bounds and subsidy bounds—not reductions in actual tariffs and subsidies. The idea is that the reductions in the bounds will cause reductions in the actual applied values. However, most tariff and subsidy bounds are significantly higher than the actual applied tariffs and subsidies they are meant to constrain. Consequently, reductions in the bounds will not begin to reduce actual tariffs and subsidies until the slack between bound and actual values is eliminated.

Tariff Bindings. CBO's August 2005 paper on policies that distort agricultural trade presented statistics showing that the most-favored-nation (MFN) agricultural tariffs actually imposed by most countries are significantly lower than their bound values:[9] 19 percent lower, on average, for developed countries and lower by much larger amounts—ranging from 42 percent in Africa to 65 percent in the Middle East—for developing countries. The framework agreement for the Doha Round stipulates that "[t]ariff reductions will be made from bound rates" and that "[s]ubstantial overall tariff reductions will be achieved as a final result from negotiations." Because of the first stipulation, the second will indeed have to be accomplished in order to have even a small effect on actual tariffs, and therefore on trade, since actual tariffs will not begin to be affected until the bound rates are reduced enough to eliminate the gap between bound and actual rates. As a corollary, the reductions in applied tariffs will

be much smaller, on average, than the reductions negotiated in the Doha Round (see Box 1).

That conclusion is strengthened by the fact that many countries' average applied tariffs are lower than their average MFN tariffs. Some developed countries, such as the United States and the European Union, have preferential tariffs for imports from some developing countries, and countries that are parties to free-trade agreements generally charge no tariffs at all on imports from other parties to the agreements. Consequently, the differences between average tariff bounds and average applied rates are larger than the differences between average tariff bounds and average MFN rates. Worldwide, the average bound tariff for agricultural products is 37.4 percent, whereas the average MFN tariff is 24 percent and the average applied tariff is 17 percent.[10] Thus, the average applied rate is 54.5 percent (not percentage points) lower than the average bound rate. For developed countries, the average applied rate is 47.4 percent lower than the average bound rate. For developing and least-developed countries, the average applied rates are 57.2 percent lower and 82.7 percent lower, respectively, than the average bound rates.[11]

Domestic Support Bindings. As it does for the tariff-reduction negotiations, the framework agreement for the Doha Round stipulates that negotiations to reduce domestic support proceed with bound values as their starting point. Specifically, the agreement mandates the negotiation of reductions in levels of *trade-distorting domestic support*, where that term is defined as amber-box support plus de minimis support plus blue-box support. Furthermore, the agreement stipulates that the negotiations take as their starting point for each country an amount equal to the country's amber-box bound plus its maximum permitted level of de minimis support plus either its level of blue-box support in a recent historical period to be agreed on or 5 percent of the value of its production in that historical period, whichever is greater. In addition, the agreement mandates the negotiation of reductions in amber-box support alone and stipulates that those negotiations take each country's amber-box bound as their starting point.

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9. Congressional Budget Office, *Policies That Distort World Agricultural Trade: Prevalence and Magnitude* (August 2005). With certain exceptions, the WTO agreement prohibits countries from charging different tariffs on imports from different WTO members (although they can charge different tariffs to nonmembers). The tariffs a country charges to WTO members are called *most-favored-nation tariffs*.

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10. See Jean, Laborde, and Martin in the bibliography.

11. Ibid.

Box 1.

The Effect of the Gaps Between Tariff Bounds and Actual Tariffs

The effect of the gap, or slack, between tariff bounds and actual tariffs on the efficacy of reductions in tariff bounds can be illustrated by a simple example. Suppose that a tariff bound is equal to 40 percent and that the corresponding actual tariff is equal to 15 percent. The resulting slack between the bound and the actual tariff is 25 percentage points, or 62.5 percent of the bound. Therefore, assuming that a country does not cut any of its applied tariffs until forced to do so by reductions in the corresponding bounds, the applied tariff will not begin to be cut until the cut in the bound exceeds 62.5 percent.

The effects of various percentage reductions in tariff bounds are as follows:

Percentage Cut in Tariff Bound	Tariff Bound After Cut	Actual Tariff After Cut	Percentage Cut in Actual Tariff
0	40	15	0
25	30	15	0
50	20	15	0
75	10	10	33
100	0	0	100

Thus, a 25 percent or 50 percent cut in the bound results in no cut in the actual tariff, and a 75 percent cut results in only a 33 percent cut in the actual tariff. Only for a 100 percent cut in the bound is the resulting cut in the tariff not lower than the cut in the bound.

The average tariff bound for agricultural products worldwide is 37.4 percent, whereas the average tariff actually applied is 17.0 percent, which is 54.5 percent lower. Therefore, the typical slack in tariffs is similar to that in this example. For any given country, some tariffs are closer to their bounds than are others, so a negotiated cut in tariff bounds does not have to exceed the percentage difference between a country's average tariff bound and its average applied tariff in order to have an effect on the country's average applied tariff rate. Nevertheless, the basic principle remains that the average cut in applied tariffs will be much smaller than the average cut in tariff bounds unless the average cut is close to 100 percent.

For most countries, actual amber-box support is significantly lower than its bound value—in excess of 50 percent lower for many countries.[12] Consequently, the same issue arises as in the tariff negotiations: countries will have to agree to substantial reductions in subsidy bounds in order to have even a small effect on actual domestic subsidies.

In an extensive discussion of domestic support limits in the WTO, the 2005 World Bank study argues that the necessary reductions may be even larger because of an un-

intended consequence of the way amber-box support is calculated unless the Doha Round Agreement changes the method of calculation. That argument is discussed in the appendix to this paper.

Economic Effects. Two studies present results showing the influence of the gaps between bound values and actual values on the benefits from partial liberalization. First, the dynamic analysis in the 2005 World Bank study presents simulation results for a scenario of realistic but aggressive tariff and subsidy reductions that are consistent with the requirements of the framework agreement for the Doha Round. The scenario involves marginal cuts in tariff bounds ranging from 35 percent to 75 percent, with

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12. For statistics on each country's amber-box support and bound, see Congressional Budget Office, *Policies That Distort World Agricultural Trade*, pp. 30-31.

the highest tariff bounds receiving the largest cuts.[13] It also involves cuts in subsidy bounds of 35 percent to 75 percent, with 75 percent cuts applied to the two countries granting by far the most subsidies (the European Union and the United States).[14] Despite the seeming aggressiveness of the cuts in the bounds, the annual welfare benefit to the world predicted by the analysis is $74.5 billion—only 41 percent of the $182 billion annual welfare benefit that the study estimates for the elimination of all policies distorting agricultural trade.[15]

The second study, by Buetre and others, finds that a reduction of 15 percent in bound tariffs would increase world gross national product (GNP) by $2.2 billion, whereas a reduction of 50 percent would increase world GNP by $12 billion. Thus, increasing the reduction in bound tariffs by a factor of 3.3 increases the effect on world GNP by a factor of 5.5. That happens because a significant portion of the initial 15 percent reduction is devoted to taking up the slack between the bound tariffs and actual tariffs and does not affect the actual tariffs. Af-

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13. Specifically, the framework agreement for the Doha Round calls for the negotiation of a tiered tariff-reduction formula in which deeper cuts are made in higher tariffs so as to reduce the disparity in tariffs across products. The agreement also calls for special and differential treatment for developing countries, meaning that those countries are not required to liberalize their policies that distort agricultural trade as much as developed countries are. In accordance with those requirements, the analysis applies to agricultural tariffs a marginal bracket formula of the sort used in the U.S. federal income tax system, with different marginal rates and inflection points for developed and developing countries. For developed countries, the first 15 percentage points of each tariff are cut by 45 percent, the next 75 percentage points (the component of the tariff from 15 percent up to 90 percent) are cut by 70 percent, and any additional percentage points (those above 90 percent) are cut by 75 percent. For developing countries, the first 20 percentage points of each tariff are cut by 35 percent, the next 40 percentage points (those from 20 percent up to 60 percent) are cut by 40 percent, the next 60 percentage points (those from 60 percent up to 120 percent) are cut by 50 percent, and any additional percentage points (those above 120 percent) are cut by 60 percent. Thus, for a 100 percent tariff imposed by a developed country, the cut would be 45 x 15 + 70 x (90-15) + 75 x (100-90) = 66.75 percentage points.

14. Specifically, the subsidy cuts are those in the scenario described in the appendix. Countries are assumed to eliminate their market-price-support programs as a means of mitigating actual cuts in support, with results as discussed in the appendix.

15. Again, the liberalization is assumed to take place in equal increments from 2005 through 2010, and the welfare benefit is measured in 2015.

ter that initial reduction, the slack has already been taken up for many tariffs, so more of the subsequent 35 percent reduction actually lowers tariffs.

Allowance for Sensitive and Special Products

Extremely high tariffs are a common feature in the agricultural sector. A number of countries—particularly, a number of high-income food-importing countries and a number of developing countries—want to protect some of those high tariffs from reduction under the tiered reduction formula that is negotiated. Consequently, the framework agreement for the Doha Round contains provisions for so-called *sensitive products* for all countries and *special products* for developing countries. Such products are to be subject to less severe cuts in tariff bounds than other products are.

The language in the framework agreement does not specify how many products will be classified as sensitive or special or how much the tariffs on such products will be cut. The answers to those questions are important because extremely high tariffs are the source of a substantial portion of the cost of all policies distorting agricultural trade. Moreover, if care is not taken to ensure that the number of such tariffs excluded from the tiered reduction formula is extremely small, the exemptions will eliminate almost all of the benefit from liberalization. Much of the benefit can be maintained, however, if a cap is applied to the highest tariffs.

Study by Fontagne, Guerin, and Jean. Results from this study show the importance of extremely high tariffs. The study estimates the effects on welfare, GDP, and trade of several different trade-liberalization scenarios that differ primarily in how they treat extremely high tariffs. One scenario, referred to as "uniform," consists of a 35 percent reduction in all tariffs (not just agricultural tariffs) at the six-digit HS level. A second scenario, termed "uniform, except peaks," consists of a 35 percent reduction in all tariffs at the six-digit HS level except for nonagricultural tariffs that are higher than 15 percent and agricultural tariffs that exceed 85 percent, both of which are left alone. A third scenario, termed "evening out," consists of a 35 percent reduction in all tariffs at the six-digit HS level except for nonagricultural tariffs that are higher than 15 percent and agricultural tariffs that exceed 85 percent, both of which are reduced by a formula that results in a more substantial reduction of the higher tariff rates than occurs in the uniform scenario, thereby evening out the

higher tariffs to bring them more in line with the lower ones. All three scenarios eliminate tariffs below 2 percent.

The study's results indicate that the effects of the peak tariffs are substantial. For many countries, the evening-out scenario increases GDP by twice as much as the uniform-except-peaks scenario.

2005 World Bank Study. The importance of keeping the number of sensitive and special products small is demonstrated by some results in the 2005 World Bank study. In addition to examining the effects on tariff averages of the tiered tariff-cutting formula discussed earlier, the study calculates the effects on tariff averages that result from a scenario with the same tiered tariff-reduction formula but with allowances for sensitive and special products.[16] In that scenario, all countries are allowed to select 2 percent of their tariff lines as sensitive products, and all developing countries are allowed to select an additional 2 percent of their tariff lines as special products. Tariff bounds on sensitive and special products are exempted from the tiered reduction formula applicable to the bounds for other products and instead are cut by 15 percent. Countries are assumed to select as sensitive and special products those tariff lines that would cause the biggest reduction in tariff revenues if the tiered formula were applied, ensuring that the tariff lines chosen involve both high tariffs and significant import volumes.

The results show that the straight tiered tariff-reduction scenario reduces the trade-weighted average world tariff by 5.5 percentage points, but the scenario that allows for sensitive and special products reduces it by only 1.1 percentage points. Thus, the allowance eliminates 80 percent of the reduction in the average world tariff.

In part, the allowance for sensitive and special products has such a large effect because the 2 percent of tariff lines chosen cover a disproportionately large amount of trade. If sensitive and special products are limited to tariff lines covering 2 percent of the value of imports instead of 2 percent of tariff lines, the reduction in the average world tariff is 4.5 percentage points—more than 80 percent of the reduction from the tiered formula.

The framework agreement for the Doha Round calls for further evaluation of a tariff cap in connection with sensitive products. If a 200 percent tariff cap is added to the

scenario in which countries are allowed to designate 2 percent of their tariff lines as sensitive and special products—that is, after the cuts in that scenario have been made, all tariffs over 200 percent are cut to 200 percent—the resulting cut in the average world tariff is 3.2 percentage points. Thus, with the tariff cap, almost 60 percent of the reduction from the tiered formula without provision for sensitive and special products is maintained.

The welfare effects of allowing for sensitive and special products and of implementing a 200 percent tariff cap as calculated in the dynamic analysis of the study are what one would expect from the effects on tariff averages.[17] Without the allowance for sensitive and special products, the tiered reduction scenario results in an annual welfare benefit to the world of $74.5 billion in 2015 from the reductions phased in from 2005 through 2010. With countries allowed to select 2 percent of their tariff lines as sensitive products (and developing countries allowed to select an additional 2 percent of their lines as special products), the annual welfare benefit drops to $17.7 billion. Adding a 200 percent tariff cap pushes the benefit back up, to $44.3 billion.

The Effects of Liberalizing Other Goods Sectors
The Doha Round of trade negotiations covers not only agricultural liberalization but also the liberalization of trade in other goods. Developed countries' exports of manufactured goods to developing countries would be increased by the developed countries' liberalization of their own agricultural markets, and developing countries' exports of agricultural products to developed countries would be increased by developing countries' reducing barriers to imports of manufactured goods. The reason is that both areas of liberalization make it easier for countries with a comparative advantage in agriculture to export agricultural goods in exchange for imports of manufactured goods from countries with a comparative advantage in manufacturing. Moreover, the gain to developing countries from reducing barriers to imports of manufactured goods is greater in percentage terms than is the gain to developed countries, according to results from the dynamic analysis in the 2005 World Bank study.

In addition to the results for the tiered agricultural formula discussed earlier, that analysis presents results for

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16. See Jean, Laborde, and Martin in the bibliography.

17. See Anderson, Martin, and van der Mensbrugghe in the bibliography.

the same tiered-formula scenario modified to include cuts in tariffs on nonagricultural products. The cuts are 50 percent for developed countries, 33 percent for developing countries, and zero percent for the least-developed countries. Developed countries and developing countries both benefit in terms of economic welfare from the additional tariff cuts on nonagricultural products. Under the tiered agricultural scenario only, developing countries have a welfare benefit of $9.0 billion; when the tariff cuts on nonagricultural products are included, the welfare benefit rises to $16.1 billion—an increase of 78.9 percent. For developed countries, the respective welfare benefits under the two scenarios are $65.6 billion and $79.9 billion—the latter being 21.8 percent larger than the former.

The Effects of Special and Differential Treatment

The framework agreement for the Doha Round calls for *special and differential treatment* for developing countries, which means that they will not be required to make cuts in their tariffs and subsidies that are as deep as those required of developed countries. That provision, which has been a feature in previous negotiating rounds as well, is a concession by the developed countries to the developing countries. In fact, however, additional simulation results from the 2005 World Bank study indicate that special and differential treatment is more harmful to developing countries than it is to developed countries, and it is especially harmful to low-income developing countries.

The dynamic analysis in the 2005 World Bank study presents results for a scenario identical to the one discussed in the previous subsection—that is, the tiered agricultural formula plus cuts in tariffs on nonagricultural products—except that it contains no special and differential treatment for developing countries and instead requires them to make the same cuts required of developed countries. Elimination of special and differential treatment increases the annual welfare benefit to developed countries from $79.9 billion to $96.4 billion—a 20.7 percent increase. The annual benefit to middle-income developing countries rises from $12.5 billion to $17.1 billion—an increase of 36.8 percent. The annual benefit to low-income developing countries grows by 63.9 percent, from $3.6 billion to $5.9 billion.

The reason that developing countries favor such a provision notwithstanding its harm to them lies in the unemployment and other temporary ills that accompany the adjustment of their economies to the liberalization. Many developing countries' economies are comparatively inflex-

ible, so unemployment may last longer than it would in many developed countries. Moreover, many developing countries' tariffs are higher than the tariffs of many developed countries. Finally, the temporary loss of income from unemployment is often a more severe problem for people with low incomes than for people with high incomes, and people with low incomes are more numerous in developing countries than in developed countries.

Distributional Issues

A number of questions arise regarding the distribution of the gains to the world from agricultural liberalization, both internationally and within countries. Which countries would gain and which ones would lose? Which countries' agricultural sectors would gain or lose? In the United States, which parts of the agricultural sector would gain or lose? How would agricultural liberalization affect the wages of unskilled and skilled labor and the returns to owners of capital and land? Finally, which countries' liberalization would help developing countries the most? This section answers each of those questions in turn.

Which Countries Would Gain in Terms of Economic Welfare?

The studies that CBO reviewed are nearly unanimous in predicting that the United States and all other developed countries would benefit in terms of their economic welfare from the global elimination of all policies distorting agricultural trade. Similarly, almost all of the studies agree that developing countries as a group would gain, but by a smaller amount, and some studies indicate that some developing countries would lose initially. Over time, however, some or all of the countries that initially lost would eventually gain as the investment and productivity effects of liberalization overtook the negative static effects on those countries.

The United States. Seven of the studies that CBO surveyed present estimates of the welfare effects of agricultural liberalization on the United States.[18] All except one

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18. The studies are the dynamic analysis in the 2005 World Bank study (Anderson, Martin, and van der Mensbrugghe in the bibliography); the Economic Research Service study (the Burfisher "Overview" and Diao, Somwaru, and Roe in the bibliography); the Brown, Deardorff, and Stern study; the study by Roberts and others; the study by Buetre and others; the Fontagne, Guerin, and Jean study; and the Beghin, Roland-Holst, and van der Mensbrugghe study.

indicate that the United States would gain. Once again, the Brown, Deardorff, and Stern study is the exception.

As was the case for the world welfare effect discussed earlier, the estimate of the U.S. welfare effect from the dynamic analysis in the 2005 World Bank study is for the welfare effect in 2015 (measured in 2001 dollars) stemming from static and investment effects of eliminating all policies distorting agricultural trade in equal annual increments from 2005 through 2010. When rough adjustments are made to the other static-plus-investment-effects estimates to account for differences in timing and liberalization analyzed and to thereby make them more comparable to the dynamic World Bank estimate, the estimates from most of the studies are in the range of $8 billion to $27 billion annually, or less than 0.1 percent to about 0.2 percent of GDP.[19] Static effects alone (adjusted to the year 2015) are lower. With the exception of the Brown, Deardorff, and Stern study, they are in the range of $10 billion to $18 billion annually. Similar to the case for the world welfare effect but to a lesser degree, the upper end of that range is extended by considerable uncertainty in the adjustment for the estimate from the study by Roberts and others and by the fact that that study liberalizes the policies in effect in 1995, when little of the Uruguay Round liberalization had yet taken place. Excluding that study, the range would be $10 billion to $15 billion.

The welfare loss predicted by the Brown, Deardorff, and Stern study does not stem from harm to U.S. agriculture. To the contrary, that study predicts gains for U.S. agriculture. The reason for the loss is that the expansion of agriculture draws capital, labor, and other resources away from the manufacturing sector, causing it to shrink. As noted earlier, this study assumes increasing returns to scale in nonagricultural sectors, so when those sectors shrink, they become less productive. Because agriculture is assumed to have constant returns to scale, there is no offsetting increase in the productivity of agriculture when it expands. As a result, economic welfare declines.

Other Countries. Just as they do for the United States, almost all of the studies predict that all other major devel-

oped countries and groups of countries would gain in terms of economic welfare from agricultural liberalization. Only the study by Brown, Deardorff, and Stern predicts welfare losses for developed countries. It predicts losses for all of the developed countries and regions modeled except for a grouping of countries that encompasses the European Union and the European Free Trade Association.

In general, the studies predict that developing countries would gain as a group, as would most individual developing countries and groups of countries, including China, India, and Brazil. Some studies predict losses for some individual developing countries. The reasons for the losses are twofold. First, tariff reductions around the world would increase the demand for agricultural products internationally, and subsidy reductions would reduce their supply. The combination of increased demand and reduced supply would cause international prices to rise. For developing countries that import more agricultural products than they export, that price rise would be detrimental. Second, many developing countries are granted preferential tariffs by some developed countries, such as the United States and the European Union. Particularly in the case of the EU, liberalization would mean reduced price supports and increased imports from other countries that would drive down prices within the EU. As a result, the countries receiving preferential tariffs would receive lower prices for their exports to the EU.

The static studies have a greater tendency to show welfare losses for developing countries than do the studies that include investment or productivity effects of liberalization. Investment and productivity effects are generally positive for most, if not all, countries, and over time they tend to offset and even overcome any negative static effects.

Which Countries Would Gain in Terms of Agricultural Output?

To say that a country benefits from liberalization does not necessarily mean that its agricultural sector benefits, and neither does harm to a country from liberalization necessarily mean that the country's agricultural sector is harmed. Agricultural policies often are implemented to benefit a country's agricultural sector, not to benefit the country as a whole. This section looks at the effect of ag-

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19. The adjusted estimate for the study by Fontagne, Guerin, and Jean is considerably higher than that range, and it is not possible to adjust the estimate for the study by Beghin, Roland-Holst, and van der Mensbrugghe.

ricultural liberalization on output and value added in the agricultural sector around the world.[20]

The World. The two studies that present estimates of the effect of liberalization on total agricultural output worldwide both predict that effect to be slightly negative. The dynamic analysis in the 2005 World Bank study estimates that full liberalization of all goods trade would reduce the rate of growth of world agricultural output slightly—from the baseline average of 3.2 percent per year to an average of 2.9 percent per year. It estimates that the scenario of the tiered agricultural formula plus tariff cuts for nonagricultural products that was discussed earlier would reduce growth slightly less—to an average of 3.0 percent per year. Similarly, the study by Beghin, Roland-Holst, and van der Mensbrugghe, which uses the same basic model but an older data set for trade policies, predicts that if full liberalization of all goods trade by high-income countries was phased in from 2005 through 2010, annual world agricultural output in 2015 would be reduced by 0.6 percent from its baseline value.

The United States. Four of the five studies that present estimates of liberalization's effects on U.S. agricultural output or value added, or from which such effects can be inferred, predict that the U.S. agricultural sector as a whole would benefit. The one study that predicts a negative effect nevertheless predicts continued growth of the sector, but at a slower rate.

The dynamic analysis in the 2005 World Bank Study—alone among the analyses that CBO surveyed—predicts that liberalization would reduce the average annual growth rate of U.S. agricultural output from 2005 through 2015, with the result that agricultural value added would be lower in 2015 than it would be in the absence of liberalization. Growth would remain positive, however, at 1.3 percent per year under full liberalization of all goods trade, and a slightly higher 1.9 percent per year under the more realistic scenario of the tiered agricultural formula plus tariff cuts for nonagricultural products. As a result of the reduced growth rate, agricultural value added would be 15 percent lower in 2015 under full liberalization of all goods trade than it would be in the absence of liberalization, and 5.2 percent lower under

the scenario of the tiered agricultural formula plus tariff cuts for nonagricultural products.

The Brown, Deardorff, and Stern study predicts that a 33 percent reduction in all tariffs, subsidies, and other policies distorting trade in agricultural products, other goods, and services would result in a static increase in agricultural output of 1.86 percent. (The liberalization scenario for this result is more comprehensive than the one that produced most of the results from that study presented earlier in this paper. The scenario for those results involved a 33 percent reduction in only those policies distorting trade in agriculture.)

The study by Beghin, Roland-Holst, and van der Mensbrugghe estimates a gain of 0.7 percent in U.S. agricultural output in 2015 from full liberalization by high-income countries phased in from 2005 through 2010. It further estimates that such liberalization would increase value added in rural areas by 4.8 percent and that removal of border protection (import tariffs and export subsidies) by high-income countries would increase it by 6.6 percent. Presumably the study would predict even larger increases in output if the liberalization scenarios were extended to developing countries as well.

The study by Fontagne, Guerin, and Jean does not present estimates of effects on either agricultural output or value added. It does, however, present data on factor returns indicating that the tariff-reduction scenarios it examines would result in increases in the rates of return on land (explicit or implicit rents) in the United States. The increases imply that the model predicts that the U.S. agricultural sector would benefit from the tariff-reduction scenarios.

Finally, a study by Cooper, Johansson, and Peters that uses a partial-equilibrium model of the agricultural sector estimates that full global agricultural liberalization would cause a static increase of 0.3 percent in the volume of U.S. agricultural output and a 4.2 percent increase in the value of that output.

Taken together, the results of the five studies are consistent with the proposition that reducing agricultural tariffs benefits U.S. agriculture as a whole and that reducing domestic support harms U.S. agriculture as a whole. In particular, the study by Beghin, Roland-Holst, and van der Mensbrugghe estimates a larger increase in rural value added from removal of border protection than from full

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20. The value added in an industrial sector or region is the difference between the value of output of the industry or region and the value of raw materials and intermediate goods used to produce the output.

liberalization. In addition, one of the three studies that model tariff and subsidy reductions together—the dynamic analysis in the World Bank study—is the only one to predict a negative effect on U.S. agriculture; a second—the Brown, Deardorff, and Stern study—finds the static effect to be small in magnitude, suggesting the effects of the two liberalizations may be offsetting each other; and the third—the Cooper, Johansson, and Peters study—finds the effect on output volume to be very small.

Other Countries. Notwithstanding the different liberalization scenarios examined, the studies are largely in agreement concerning which other countries' agricultural sectors would gain and which ones would lose from liberalization. According to the World Bank's dynamic analysis, the big winners under full liberalization of all goods trade and under the scenario of the tiered agricultural formula plus tariff cuts for nonagricultural goods would be the agricultural sectors of Brazil, Argentina, Australia and New Zealand, Canada, and Latin America and the Caribbean generally. The agricultural sectors of developing countries as a group would gain, but that gain would be almost entirely among middle-income developing countries. The agricultural sectors of low-income developing countries as a group would be almost unaffected. The study estimates no effect on Chinese agriculture. Full liberalization would cause a very small loss for India's agricultural sector, and the tiered agricultural formula plus tariff cuts for nonagricultural goods would lead to a very small gain.

The study by Beghin, Roland-Holst, and van der Mensbrugghe predicts that the agricultural sectors gaining the most from liberalization by high-income countries would be those of Australia and New Zealand, Argentina, Canada, and Latin America and the Caribbean. Brazil's and India's agriculture would see small gains, and Chinese agriculture would see a very small gain. The winning agricultural sectors implied by the factor-returns results for tariff reduction from the study by Fontagne, Guerin, and Jean are those of members of the Cairns Group and members of the African, Caribbean, and Pacific Group of States (ACP).[21]

The agricultural sectors experiencing the biggest losses in the two liberalization scenarios of the World Bank's dynamic analysis are those of the European Union, the European Free Trade Association, and Japan, which the study finds would actually shrink from 2005 through 2015. Also losing are the agricultural sectors of Korea and Taiwan, which are projected in the study to have almost no growth over those years under full liberalization of all goods trade and slower growth than that of the U.S. agricultural sector under the more-realistic scenario of the tiered agricultural formula plus tariff cuts for nonagricultural goods.

In the study by Beghin, Roland-Holst, and van der Mensbrugghe, losing sectors from full liberalization by high-income countries include those of Western Europe and high-income Asian countries (Japan, South Korea, Taiwan, Singapore, and Hong Kong). In the tariff-reduction scenarios of the study by Fontagne, Guerin, and Jean, the losing agricultural sectors are those of Japan, the European Union, developing Asia (except in the study's "evening-out" scenario), and the rest of the world (that is, the world other than the United States, Japan, the European Union, the Cairns Group, developing Asia, and the members of the ACP).

Which Components of U.S. Agriculture Would Gain?
Not all components of U.S. agriculture can be expected to fare equally well under a liberalization agreement. Seven studies that CBO surveyed present product-specific effects of various general agricultural liberalization scenarios on U.S. agriculture, and another three present effects of liberalization of either the sugar component or the oilseeds component of agriculture alone.[22] An

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21. The Cairns Group is a coalition of agricultural exporting countries formed in 1986. Its members are Argentina, Australia, Bolivia, Brazil, Canada, Chile, Colombia, Costa Rica, Guatemala, Indonesia, Malaysia, New Zealand, Paraguay, the Philippines, South Africa, Thailand, and Uruguay.

    The ACP is an organization of countries created by the Georgetown Agreement in 1975 with objectives that include sustainable development of its member states and their gradual integration into the global economy. Its members include 76 developing countries in Africa, the Caribbean, and the Pacific.

22. The seven studies of general agricultural liberalization scenarios are the Cooper, Johansson, and Peters study; the Food and Agricultural Policy Research Institute study; the Beghin, Roland-Holst, and van der Mensbrugghe study; the study by Roberts and others; the Tsigas and Ingco study; the Economic Research Service study (Young and others in the bibliography); and the study by the Organization for Economic Cooperation and Development. The three studies of liberalization of the sugar component and the oilseeds component of agriculture alone are the Elobeid and Beghin study; the Koo study; and the Meilke, Wensley, and Cluff study.

overall assessment of the results of the studies is difficult because of differences in how the studies divide agriculture into sectors, differences in the liberalization scenarios, and conflicts among the studies' results concerning how some sectors would fare under liberalization. Product-specific effects appear to be among the studies' least reliable predictions.

Overall, it would appear that more sectors within U.S. agriculture would benefit than would be harmed by liberalization. Among the likely gainers are beef producers and, to a lesser degree of certainty, rice producers. Sugar producers would most likely lose. Given the difficulties and the conflicts among the studies, it is hard to place much confidence in predictions one way or the other for most other individual sectors.

What Would Be the Effects on Wages and the Returns to Capital and Land?

Four of the studies that CBO surveyed present estimates of the effects of liberalization on returns to factors of production (such as wages, returns to capital, and rents on land). Three of the four studies—the 2005 World Bank study, the 2002 World Bank study, and the study by Fontagne, Guerin, and Jean—show the same patterns of effects to varying degrees. The patterns in the effects, and their implications, are clearest in the results from the 2005 World Bank study, so the following discussion presents those results, followed by the different results of the fourth study.

2005 World Bank Study. The dynamic analysis in the 2005 World Bank study presents estimates of the effects of full liberalization of all goods trade on real factor returns (that is, factor returns adjusted for price changes). Because the policies distorting agricultural trade are by far the most significant of the policies distorting goods trade, the results should reflect primarily the effects of agricultural liberalization. The estimates exhibit four overall patterns overlaid upon one another.

First, for the world as a whole and for almost all countries and regions individually, the wages of both unskilled and skilled labor and the returns to capital increase.

Second, the percentage increases in wages and returns to capital tend to vary inversely with the level of development of a country, thereby reducing inequality of incomes among countries. Thus, for unskilled labor, the average wage increases by 4.2 percent for low-income

developing countries, by 3.2 percent for middle-income developing countries, and by 0.6 percent for high-income countries. For skilled labor, the average wage increases by 3.9 percent for low-income developing countries, by 2.6 percent for middle-income developing countries, and by 1.1 percent for high-income countries. Returns to capital increase by 1.9 percent for low- and middle-income developing countries and by 0.5 percent for high-income countries.

Third, for the world as a whole and for the vast majority of the individual countries and regions modeled, the wage gains are larger in percentage terms than are the increases in returns to capital. Assuming that owners of capital tend to be wealthier, on average, than either unskilled or skilled labor, which is likely to be true in most countries, the larger increase in wages should tend to reduce income inequality within countries.

Fourth, in countries and regions where the growth of agricultural output increases, the wages of unskilled labor rise more than those of skilled labor, and returns to land increase. In countries and regions where the growth of agricultural output declines (or actual output declines), the wages of unskilled labor rise by smaller amounts than those of skilled labor, and returns to land decrease.

Brown, Deardorff, and Stern Study. As with its other findings, the Brown, Deardorff, and Stern study is unique in its predictions of effects on factor returns. It incorporates only one type of labor and therefore has only one wage. The study predicts that a 33 percent reduction in agricultural subsidies and tariffs would cause the average wage to decline in all countries except South Korea and Malaysia.

Which Countries' Liberalization Would Help Developing Countries the Most?

Developing countries as a group would benefit more from liberalization of their own policies that distort agricultural trade than they would from liberalization of developed countries' policies. However, that does not mean that developing countries' exports would increase more as a result of developing countries' liberalization than they would as a result of developed countries' liberalization. Instead, developing countries' imports would increase significantly as a result of developing countries' liberalization, adding considerably to their welfare gain. To the extent that developing countries are harmed by the trade-distorting policies of developed countries, the evidence

points to the European Union and high-income Asian countries as much larger sources of harm than the United States.

High-Income Countries' Policies Versus Developing Countries' Policies. Results from the dynamic analysis in the 2005 World Bank study indicate that economic welfare in developing countries would rise slightly more from full liberalization of those countries' own policies distorting goods trade (not just agricultural trade) than they would from full liberalization by high-income countries—$28 billion versus $26 billion. In the earlier 2002 World Bank study, the inequality is more pronounced, with developing countries gaining $114 billion in economic welfare from their own full liberalization and only $31 billion from such liberalization by high-income countries.

Benefits from liberalization result both from exports and from imports. Whereas competing domestic producers may be harmed by imports, consumers generally benefit by a greater total amount. Consequently, the likelihood that developing countries as a group would benefit more from their own liberalization than from that of high-income countries does not necessarily mean that their own liberalization would increase their exports more than would liberalization by high-income countries. In fact, estimates from the dynamic analysis in the 2005 World Bank study and results from the ERS study indicate that liberalization of developed countries' policies that distort agricultural trade would increase the value of developing countries' exports by much more than would comparable liberalization by developing countries. However, developing countries' liberalization would also significantly increase developing countries' imports.

U.S. Policies Versus Other High-Income Countries' Policies. Western Europe and high-income Asian countries generally have the most substantial agricultural trade restrictions and subsidies.[23] That fact would seem to suggest that liberalization of those countries' policies would be more beneficial to developing countries than would liberalization of U.S. policies. Stronger evidence for that proposition comes from the study by Beghin, Roland-Holst, and van der Mensbrugghe. Its results indicate that for 16 of the 18 product groupings into which the model divides the agriculture and food sector, output by low- and middle-income countries increases as a result of full agricultural liberalization by high-income countries. Output in Western Europe declines for 15 of those 16 products, and the declines are substantial. Similarly, output in high-income Asian countries also declines for 15 of the 16 products (not identically the same 15 products as for Western Europe) with most of the declines being substantial. U.S. output decreases for only seven of the 16 products, and the declines are substantial only for refined and raw sugar.[24]

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23. Congressional Budget Office, *Policies That Distort World Agricultural Trade*.

24. Although strongly suggestive, the results presented here do not completely prove that liberalizing the trade-distorting policies of Western Europe and high-income Asian countries would be more beneficial to developing countries than liberalizing U.S. policies. To prove that would require output numbers expressed in actual value changes rather than percentage changes. It is always possible that a product with a high percentage increase in output has a small base from which to increase and therefore has a smaller dollar value increase in output than another product with a smaller percentage increase. Moreover, the data set used by Beghin, Roland-Holst, and van der Mensbrugghe does not consider tariff preferences, such as those granted by the United States and the European Union to a number of developing countries. In principle, the inclusion of such preferences could change the results.
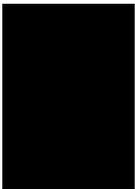
Appendix: The Implications of Market-Price-Support Programs for Negotiated Reductions in Domestic Subsidies

Because the actual domestic subsidies of most countries are substantially lower than the bounds on those subsidies, the reductions in domestic subsidy bounds that are negotiated in the Doha Round must be substantial if they are to have much effect on actual domestic subsidies. The necessary reductions may be even larger, according to a 2005 study by the World Bank, because of an unintended consequence of the way that amber-box support (the category considered most distorting to trade and therefore limited by the Uruguay Round Agreement) is calculated—unless the Doha Round Agreement changes the method of calculation.[1]

One component of amber-box support is market price support (MPS). MPS programs typically involve tariff protection of the product in question accompanied by some kind of support payments to maintain a country's internal market price for the product at a target level—called the administered price—that is higher than the price that would otherwise prevail. In the calculation of a country's amber-box support, the value of its market price support is calculated by multiplying the quantity of the product whose price is being supported by the difference between the administered price and a fixed external reference price. (The reference prices for the various agricultural products are based on international prices in a historical period.)

Not all of the difference between the administered price and the external reference price arises from the MPS payments. Part of it stems from the tariff protection, and that is what gives rise to the unintended consequence described in the World Bank study. A country can reduce to zero the MPS component in its amber-box support while

maintaining substantial support for the agricultural sector in question by eliminating its administered price and MPS payments but leaving the tariff protection in place. If there is enough slack between its tariff on the product and the bound value for that tariff, it might even raise the tariff to make up for the elimination of the MPS payments; or it might find other ways to make it up that do not count in the amber-box calculation. If support bounds are reduced sufficiently in the Doha Round negotiations to actually restrain countries' amber-box support, countries may use this general procedure to meet their obligations without substantially reducing the support they grant to their agricultural sector.

The Doha framework agreement calls for substantial reductions in trade-distorting domestic support using a tiered formula by which countries with higher levels of such support must make larger reductions. The 2005 World Bank study contains an analysis to determine how much such a formula could be undercut by the current difference between bound and actual levels of support in combination with the elimination of MPS programs as a means of reducing calculated amber-box support without substantially reducing the benefit to the agricultural sectors the MPS programs support.

The World Bank analysis assumes that countries do not reduce their calculated amber-box support until the formula cut in the trade-distorting support bound forces them to and that the first thing a country does to accommodate the cut is to eliminate its MPS programs in such a manner as to avoid eliminating the benefit to the agricultural sectors those programs support. Only after a country has completely eliminated its MPS programs does it begin cutting its non-MPS amber-box support. The purpose of the analysis is to determine how much non-MPS amber-box support must be cut.

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1. See Hart and Beghin and Jensen and Zobbe in the bibliography.

The subsidy-reduction formula posited in the analysis requires 75 percent cuts in the trade-distorting and amber-box support bounds of each developed country whose trade-distorting support bound is greater than or equal to 20 percent of the value of its agricultural production, 60 percent cuts for other developed countries, and 40 percent cuts for developing countries. In addition, the limit on de minimis support is reduced from the current 5 percent of the value of production for developed countries and 10 percent for developing countries to 2.5 percent for developed countries and 5 percent for developing countries.

Despite the aggressiveness of the cuts posited in the World Bank analysis, countries' levels of support are so far below their bounds that only 10 of the 29 countries that provide amber-box support must make cuts in their actual levels of trade-distorting domestic support. Of those 10, four can accommodate the entire required reduction by cutting only their MPS programs. Only six

countries must make cuts in their non-MPS support, and those cuts are not nearly as large as the cuts in the formula: Thailand's cuts equal 30.4 percent of its trade-distorting domestic support, the United States' equal 28.1 percent, Norway's equal 18.4 percent, the European Union's equal 15.9 percent, Australia's equal 10.4 percent, and Iceland's equal 0.9 percent. Of those countries, Thailand, Australia, and Iceland are insignificant in terms of the total dollar value of their trade-distorting support, and Norway is of borderline significance.

Those results represent the maximum degree to which eliminating MPS might be used to mitigate the required cuts in amber-box support. Especially if tariff protection does not currently provide a large fraction of the calculated MPS support, a country might not have other methods at its disposal to offset the reductions in MPS payments when the MPS program is eliminated. (For example, tariff bounds may prevent it from raising its tariffs by enough to offset the reductions.)
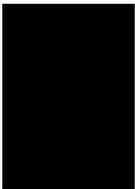
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