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GTAP Annual Conference on Global Economic Analysis
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Do Developed Countries Agricultural Policies Slow The Economic Growth of Developing Countries? A Dynamic General Equilibrium Approach

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While globalization has benefited many developing countries by allowing them to increase their trade share, those that are primary agricultural exporters have been partially constrained from participating due to the trade barriers and domestic support in a few of the major developed countries. Using an inter-temporal general equilibrium model we demonstrate that agricultural trade reform in developed countries benefits developing countries, even the net food importing countries. The increase in their agricultural exports due to reform in the developed countries allows developing countries to increase imports of investment goods, which in turn increases their learning of new skills and organizational methods. This process increases labor productivity and returns to capital and land. We find the dynamic gains from the reform of agricultural policies to far exceed the static gains, and, most countries are better off.

Key words: domestic support, developing countries, general equilibrium model, trade reforms**.**

The lowering of barriers to trade in goods, services, and ideas is believed to be among the major forces behind world globalization (Baldwin and Martin, 1999). Growth in the number of countries engaged in international trade and the rise in their share of world trade has caused many to benefit, with some doubling their per capita income in a period of less than ten years. However, for many developing countries, their sources of growth from foreign investment and imports of intermediate capital goods are constrained by their capacity to export primary goods, namely, primary agricultural goods. These constraints are artificial in the sense that they stem from agricultural policies of a small number of developed countries. Domestic support of agriculture by developed countries is still quite high. These countries not only support commodities for which they are major net exporters, but they also protect their domestic agricultural markets from commodities that developing countries produce more cheaply. Since most developing countries devote a disproportionate share of their resources to agriculture, a more open world agricultural market should afford them greater opportunities to increase exports and to participate more actively in the new globalization era. Most of the potential benefits from trade reform will come from emerging and developing countries' reform on their own. Their full engagement in a global reform process could increase their welfare by $21 million annually while low-income developing countries' food aid needs will decline as their domestic food production expands (Burfisher et al. 2001). This study focuses on these linkages with emphasis

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on the impact of developed countries' domestic support on developing countries, particularly how this support affects the level and pattern of developing countries' agricultural trade.

Global negotiations on agriculture were initiated in March 2000. These negotiations are expected to press for the continuation of reforms initiated during the Uruguay Round, namely those relating to market access, domestic farm support, and export subsidies. In spite of the protection afforded producers of import-competing agricultural commodities in developed countries, there tend to be diverse and even divergent interests in the new round among countries of the South. These differences arise in part from the concern that liberalization may lead to a rise in food prices, with negative consequences for net food importing countries.

This concern may not be well founded, however. With the possible exception of rice, developing country resource endowments appear to grant many a comparative advantage in labor-intensive and semi-tropical crops (e.g., fruits, vegetables, sugar), whereas developed country endowments appear to favor low-cost production of grains and livestock. Moreover, the pattern of world agricultural trade is such that most countries in Africa tend to trade with Europe while many countries of Latin America and Asia tend to trade with the U.S and consequently elimination of domestic support is likely to have quite different impacts on countries in Africa relative to those in Latin America or in Asia. The European Union's (EU) importance in world markets and the characteristic that EU has a relatively high level of domestic support accounts of its large role (56 percent) in causing the world price distortions due to domestic support. U.S. domestic programs account for 25 percent of the global price distortions caused by domestic support (Burfisher et al, 2001).

Identifying and measuring developing countries' gains and losses (by region) due to elimination of developed countries' domestic support are important to understanding the nature of their interests in global policy reform, and the potential that might be realized from expanded traded. Our approach is three fold. First, we focus on the data pertaining to developed - developing and regional agricultural trade. This analysis suggests how domestic reform in the developed countries is likely to have differential impacts on developing countries in different regions. Then, we report the results from a global general equilibrium model in which developed and developing countries are categorized into various subgroups. Thus, the model identifies origin – destination trade, i.e., trade patterns. Based on a global database (the Global Trade Analysis Project [GTAP] database version 5, 2001), we discuss the interests of different developing country subgroups and quantify the potential impacts of a global elimination of agricultural domestic support. Then, to obtain insights into growth, we aggregate the more detailed static model into a manageable intertemporal model in which savings and investments are endogenous variables and international capital flows are permitted.

Developing Countries' Agricultural Export Markets

Forty developing country groups are identified in our developed-developing countries database. A large country, such as China or India, is itself a "group." According to the 1998 trade database, among these groups, there are seven for which agricultural exports accounted for more than 40% of their total exports; ten for which it accounted for 20 to 40%, and eight for which it accounted for 10 to 20%. Most developing countries' agricultural export markets are in the developed countries. On average, 65% of developing countries' total agricultural exports are

imported by developed countries. Figure 1 shows the importance of three of the largest markets in the world – Japan and Korea, the U.S. and Canada, and the EU – to the developing countries' agriculture.

There are 17 agricultural and processed food commodity groups in the database. Except for rice, for which a few Asian countries' exports account for 70% of world rice trade, the developed countries, especially the U.S. and Canada, dominate world grain exports. Exports of non-grain crops, such as vegetables and fruits, cotton, sugar, and vegetable oil, are largely the domain of developing countries. Excluding intra-EU trade, developing countries account for 60 to 80% of world exports of these commodities, most of which are exported to the developed countries. Hence, the agricultural exports of most developing countries do not compete directly with the exports of developed countries.

Agriculture is still protected in many developed countries, especially in member countries of the EU and the European Free Trade Association (EFTA). The average rate of domestic support for agricultural commodities is more than 8% in EU around 3% in the United States, and almost 19% for the three members of the EFTA - Norway, Switzerland, and Iceland (ERS/USDA, 2001). Figure 2 presents the market share of developing countries' exports in total agricultural imports of Japan and Korea, the U.S. and Canada, and the EU. Compared to other developed country groups, developing countries' export shares are consistently small for most commodity groups in the EU (except for cotton). Developing countries' exports accounted for fewer than 30% of EU's imports of vegetables and fruits, but accounted for 45% and 68% in the East Asian (Japan and Korea), and North American markets, respectively.

The low shares of developing countries' agricultural exports in the EU market suggest that barriers to trade rather than domestic support payments are the cause. Most developed countries are at nearly equivalent stage of development, share a similar composition of factor endowments, and consequently trade with each other mainly in differentiated products (see Helpman, 1998, for detailed analysis of trading patterns). On the other hand, in contrast to countries of the "North," most developing countries are relatively capital-scarce. Their exports are more likely to embody the services of labor or other natural endowments, and their imports are more likely to embody capital from the "North." Thus, we expect to observe more intra-North trade in manufacturing and services, and more North-South trade in agriculture. We observe that intra-EU trade accounted for 59% of EU total non-agricultural exports. However, we also observe that the ratio of intra-EU trade in agriculture over EU total agricultural imports is higher than the ratio in non-agriculture, accounting for 72% of EU agricultural imports.

Distortions in World Agricultural Markets Are Mainly Due to A Few Developed Countries

As measured by the world price effects, we find, not surprisingly, that policies pursued by a small number of developed countries cause most of the distortions in world agricultural markets. Using the Agricultural Market Access Database (ERS/USDA, 2001), together with the GTAP database version 5, our model results suggest that eliminating developed countries' domestic support would cause agricultural prices to rise by almost 4% (relative to world nonagricultural prices). This result is obtained from a static analysis, without accounting for investment responses to price changes or the adoption and development of new technologies that would

likely be stimulated by increased price incentives. Domestic subsidies have a smaller role than tariffs in causing distortions from agricultural policies (Diao et al., 2001, and Diao et al., 2002). Domestic subsidies distort only the production decision and have only indirect effects on consumers. Also, the provision of subsidies to farmers through direct transfer payments (green box policies) has a smaller effect on farm output than production or input subsidies. The EU has a relatively high level of distorting domestic agricultural policies. This characteristic coupled with the importance of the EU in world markets accounts for the EU's larger contribution to the distortion in world agricultural prices. The decomposition of the increase in world prices shows that domestic subsidies in the EU accounts for 56% of world price distortions, while subsidies in the U.S. and Canada together account for about 25% of world price distortions. Developed countries' use of domestic support policies might, as in the case of the EU and EFTA, encourage increased production. Reducing domestic support in these countries should further decrease farm income, or more precisely, lower the returns to agriculture's sector-specific resources such as land, farm structures, machinery, and owner-operator labor. Together, these forces should place considerable upward pressures on world agricultural prices.

Most countries rely mainly on tariffs to support their farm sectors. In developing countries, tariffs are a more practical and common form of farm support because they are relatively easy to administer while also raising government revenue. Tariffs are a potentially more distorting type of farm support than domestic producers subsidies, because they directly affect consumers as well as producers (see Diao et al., 2000). The relatively large role of tariffs in global policy should be interpreted in terms of tariffs' links with domestic support. Tariffs are a trade policy that provides a margin of protection to domestic producers. By restricting imports, tariffs are also an instrument of domestic support. Tariffs can help to support domestic prices at above world price levels without the need for government outlays on price support payments or stock building. Most countries' domestic support programs have more reliance on tariffs, which increase government revenues, than on domestic subsidy expenditures, such as deficiency payments, which must be financed through government budgetary outlays. For this reason the Aggregate Measurement of Support (AMS) accounts for this link by including the effects of trade policies in the calculation of domestic support. However, in this analysis domestic subsidies include only budgetary outlays on output and input subsidies and farm payments. This is a narrow measure of domestic *support* than AMS, which also includes the effects of some trade policies.

An Open EU Market is in the Common Interest of Most Developing Countries-Static Analysis

Since world agricultural markets are dominated by a small group of developed countries, agricultural liberalization among these countries will create export opportunities for a relatively large number of developing countries. However, this generalization masks important regional linkages. For many of the developing countries, export markets are actually concentrated in a few developed countries in the North. This is due both to geographic proximity and historical linkages, and to regional integration arrangements. For developing countries located in Eastern Europe, the Middle East, Africa, and some in South America, the EU is the largest agricultural export market. The U.S. and Canada are the largest market for countries in Central and parts of

South America, as well as for some countries in Asia. Japan and Korea are the largest market for neighboring countries in Asia (figure 1). Thus, for many developing countries, the benefits of eliminating domestic support are likely to vary.

We use the change in developing countries' total exports to illustrate this linkage. Figure 3 presents the possible increase in agricultural exports of developing country groups due to elimination of EU, Japan and Korea and U.S. and Canada domestic subsidies. The results suggest that developing countries share a common interest in calling for a more open EU agricultural market.

Domestic support appears not to be a major trade barrier. With the elimination of domestic subsidies, agricultural trade rises by 2.7 percent in value but falls slightly (0.7) in volume. These results are consistent with the theory that subsidies increase exports, albeit at the possible cost of reducing exports of non-subsidized commodities. Removing subsidies can decrease total trade depending upon how consumers allocate their savings from taxes used to finance the subsidies and the extent to which the other non-subsidized sectors respond to the slight increase in resources that are released from the formerly subsidized sector. If domestic support were removed worldwide, the developing country group exports would rise 5.5 percent in value and 3.4 percent in volume, while the developed country group's exports would rise 0.9 percent in value and fall 3.4 percent in volume. These results indicate that the developed countries' domestic support policies have lessened the market shares of some developing countries that are net exporters of agricultural commodities for which the developed countries have supports, but have benefited other developing countries that are net importers of these commodities. The net importers benefit because the support policies lower the prices these countries face in world markets.

The results suggest that the elimination of domestic subsidies will have the greatest effect on world prices of wheat and other grains (which increase by 12 percent), followed by oil and oilseeds crops (increase by almost 8%) and livestock products (increase by 5.5 percent). World trade in wheat, other grains, oil and oilseeds products, and livestock and products in value terms rises 4 to 11 percent in value (for detail see Diao e al, 2001).

While Japan and Korea are well known for their high agricultural import barriers, a closer look suggests that liberalization in these two countries does not generate large export opportunities for many developing countries. The scale of the Japanese and Korean markets is small relative to the U.S. and EU (figure 1). More importantly, many of this region's import-restricted goods, such as grain and livestock products, are goods for which many developing countries do not hold a comparative advantage. Developing countries in total only accounted for 15% of world wheat exports (and more than half of that share is taken by Argentina). Even though Japan and Korea account for about 11% of world wheat imports, only 3% of wheat imports by Japan and Korea originate from developing countries. Similarly, Japan and Korea import more than 27% of the world's trade in meat and meat products, and only 17% of these imports originate from developing countries. The developing countries' largest export market share is in vegetables, fruits, and other cash crops (figure 2), commodities for which Japan and Korea's tariff barriers are relatively low. Thus, with the exception of rice, for which only a few Asian countries hold a comparative advantage, gains to the developing countries from trade liberalization in this region are small.

We also notice that for some developing countries, such as Uganda or Malawi, the increase in total agricultural exports after global agricultural reforms is quite small. One major reason for this outcome is that in the database many non-grain crops are placed in broad categories (called, e.g., vegetables and fruits, or the aggregate "other crops") in which individual developing countries are often net exporters for a narrow subgroup of these commodities. Some developing countries that specialize in the export of one or a few products in this category may not benefit from liberalizing world agricultural markets or removing distortions due to domestic subsidies. As trade liberalization causes these countries' terms of trade to deteriorate, it is possible for their exports to decline while import costs rise, thus lowering their total welfare.

Production Effects Are Small and Vary by sectors

In contrast to world trade effects, the model results suggest that the elimination of domestic support only slightly affects the level of world agricultural production. Moreover, the change in production does not always point in the same direction as changes in trade. For example, the value of world wheat trade increases almost 8 percent, while worldwide production of wheat falls 0.04 percent and developing country's wheat production increases by 3 percent (table 1).

Removing domestic subsidies would have a negative but negligible effect on developed countries' agricultural production. On the other hand, production rises in most sectors in the developing country group (table 1). For example, removing domestic support causes production of oilseeds and vegetable oil to fall 0.5 percent in the world, but almost 7 percent in the developed country group. The EU would experience the largest drop in oilseed and vegetable oil production, 19 percent, due to that region's high level of support. U.S. wheat production would fall 5 percent and other grains production (primarily corn) would fall 1.2 percent.

A more open world agricultural market would surely increase export opportunities among developing countries, but as importers of food grains and meats, some of these countries are more likely to experience a rise, though modest, in food prices. Many of the net food importing countries are among the less developed, in which case food expenditures account for a large share of their household budgets. Some of these countries have expressed concern that the elimination of domestic subsidies by developed countries may cause a deterioration in their food security. If these countries' terms of trade do not deteriorate, then their concern is not well founded for two reasons. First, the increase in world prices causes them to increase their production of grain and meat, so they are more able to use their own production for a larger share of their consumption needs. Second, their foreign exchange earnings increase due to expanded trade. Export expansion allows them to finance imports of food and other goods.

Welfare Effects on Developing Countries Are Mixed

Removing support or trade protection is expected to benefit consumers, however, welfare effects vary across countries, and particularly when the world price is affected by agricultural policies. That is, if the prices of the export goods fall relative to the prices of imports, consumers can be made worse off.

Small one-time welfare gains

This analysis uses the widely accepted equivalent variation (i.e., consumers' willingness to pay) to measure the social welfare gains or losses due to agricultural policy reform (see Diao et al.,

2001). It is important to note that most developing countries experience smaller total welfare gains than developed countries because agricultural production in developing countries is distorted by more than just agricultural policies. While the level of domestic support and trade protection in nonagricultural sectors is quite low among most developed countries, many developing countries still protect their import-competing manufacturing and service sectors. This protection tends to implicitly tax agricultural producers. In extreme cases, removing agricultural protection in such countries (such as Morocco) can actually lower social welfare because the implicit tax imposed on agriculture by policies in other sectors actually increases when protection is taken from agriculture. Thus, in these countries, agriculture is not only distorted by the agricultural protection policies in high-income countries, but also by domestic manufacturing policies and distortions in service sector markets.

The result that policy reform increases world prices of most agricultural goods means that the returns to sector-specific resources in developing countries should rise. Even in low-income and net agricultural importing countries that experience a decline in their terms of trade, returns to their agricultural resources (land, labor, farm machinery, and buildings) rise. Consequently, agricultural households that are net suppliers of agricultural goods, are likely to be made better off as the result of trade reform.

Removal of domestic support can lead to welfare losses

Removing domestic support results in a small welfare gain worldwide. The aggregate world welfare gain from removal of domestic support is $2.8 billion. Developed countries gain $4.7 billion from elimination of domestic support while developing countries experience a welfare loss of $1.9 billion (table 2). This negative effect is mainly caused by deterioration in their terms of trade (table 2). The elimination of domestic subsidies increases world prices for grain and livestock products, which most developing countries import (Latin American countries are a exception, exporting livestock products as well as other primary agricultural products). Thus, for most developing countries/regions, welfare measures tend to deteriorate due to the hike in world agricultural prices.

Collectively, Japan and Korea experience the largest welfare decline ($3.7 billion) in the world when the developed countries remove their domestic support, even though the domestic support rate in Japan and Korea on average is much lower[2] than that in Canada, the United States or the EU. This result occurs because Japan and Korea are net agricultural importers, and agricultural prices rise in the world because agricultural supply declines in the United States and the EU due to the removal of domestic support. If only the United States or the EU eliminates its domestic support to agriculture, the social welfare in Japan and Korea falls by $2.1 and $0.55 billion, respectively. If Japan and Korea eliminate their domestic support only, their welfare falls by $0.66 billion due mainly to deterioration in their terms of trade.

The extent to which so called direct, whole-farm payments affect production is the subject of debate. Tielu and Roberts (1998) describe how whole farm payments or so-called decoupled payments may stimulate aggregate production through their effects on farm investment, by increasing wealth and lowering risk, reducing farm exit by raising land values, or

[2] While market barriers are very high.

encouraging continued output by creating expectations of future payments. The effects linked to wealth and risk are more likely to be small (Young and Westcott, 2000; Burfisher et al., 2000). We conduct a sensitivity experiment to test the robustness of our results to the assumption that whole-farm, land-based payments have minimal output effects. We analyze and compare the effects on production and trade of the full elimination of domestic subsidy payments, under two alternative assumptions: that they have minimal effects on production, and that they behave as fully coupled output subsidies (table 3). We find that the decoupled assumption has relatively small effects on the results. The change in the world agricultural price index from a full domestic subsidy removal by developed countries would be about 4.8 percent if the direct subsidies are considered to be fully coupled, compared to 3.6 percent if they are minimally coupled (table 3). Returns to farmland would fall by less due to the smaller decline in world prices. When domestic support is assumed to be fully coupled, welfare gains from removal of support would be larger for the United States and Canada but slightly smaller for the EU and EFTA.

Does reform affect growth?

The earlier analysis ignored the effect of reform on saving, investment, and the pattern of growth in a country's capital stock. The analysis of these effects requires assumptions regarding households' willingness to forgo consumption and invest, the functioning of capital markets and international capital flows, as well as technological spillovers and improvement in total factor productivity that seem to accompany growth in countries' trade. While these are critical assumptions, we believe the analysis captures the direction of change in the long run in a reasonable way.

In addition to the typical Ramsey-type growth model specification, a growth factor related to trade is also added. The effects of this factor are reported separately. This factor is added because numerous studies find an empirically strong and positive linkage either between a country's growth rate and its openness to international trade (Easterly and Levine, 2000; Frankel and Romer, 1999), specifically between growth and trade with more advanced nations (Coe et al., 1997), or between the improvement in a country's total factor productivity and reduction in its barriers to openness (Parente and Prescott, 2000). In our study, the effect of openness on economic growth is modeled by adding a technological spillover variable to a region's total factor productivity function. This spillover variable is the share of a country's trade over its GDP, i.e., virtually the same variable used in most of the econometric analysis cited above.[3] The presumption is that following worldwide agricultural trade reforms, trade volumes of developing countries should grow. Growth in trade volume should increase the rate of learning new skills, and improve organizational methods as more advanced product and process technologies are embodied in imported investment goods from developed countries. This process should increase labor productivity and returns to capital and land, and it should be particularly strong for developing countries in the process of catching up with technologies already in use in more advanced countries. Thus, this longer-run type of analysis allows for agricultural trade reform to yield broader economy-wide benefits.

[3] Detailed description about the dynamic model used for the study can be found in Diao and Somwaru (2001).

We factor in the trade-technological spillover-growth effect of policy reform. In this case, the intertemporal welfare gains increase significantly (see details in Diao et al, 2001). We conduct a sensitivity analysis to evaluate the effects of trade liberalization on developing countries total factor productivity (TFP) growth via technological spillovers embodied in trade with developed (figure 4). This analysis highlights that short run benefits for developing countries may be small or negative but the long run effects are larger and positive.

Given the limits the large model imposes on computational capacity, we only include a few selected developing countries in the dynamic model while all other developing countries are aggregated into large groups and account of complete agricultural trade reforms or removing trade barriers, subsidies and other trade-distorting forms of support (see Diao et al, 2001). The results suggest that all developing country groups are better off after worldwide agricultural reform. Further, as the volume of trade between developed and developing countries grows, so do the welfare gains experienced by even the poorest of the developing countries.

In sum, these long-run results may be "optimistic" for the case of some countries. Observation suggests that technological spillovers are uneven, and there are areas untouched by the global changes that have taken place. In particular, countries in South Asia and Sub-Saharan Africa have a far lower share of the world's trade and capital inflows and they remain among the poorest in the world. In the case of these countries, it is possible for the poor people living in remote rural areas to be more marginalized by the process of trade liberalization. To spread the benefit of globalization to them is a major challenge.

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Table 1-- Effects on agricultural production due to removal of OECD domestic subsidies

	World	DCs	LDCs
	Pecentage change from the base year		
Wheat	-0.04	-5.07	2.92
Rice	-0.21	-1.19	0.15
Other grains	-0.49	-3.18	2.13
Vegetable and fruits	-0.10	0.04	-0.20
Oil and oilseeds	-0.49	-6.99	4.28
Sugar	-0.64	-2.72	0.27
Other crops	-0.44	-1.44	0.27
Livestock and products	-1.90	-3.47	0.67
Processed food	-0.96	-1.51	0.26

Source: Model results, estimated by ERS.

Table 2. Static welfare effects and decomposition of tems of trade due to elimination of domestic subsidies in the model

	Welfare Effects			Terms of Trade
	U.S. billion ($)	% of GDP	% of agricultural consumption	% from the base
World	**2.80**	**0.01**	**0.11**	
Developed country group	**4.74**	**0.03**	**0.34**	**0.03**
Australia and New Zealand	0.24	0.07	0.69	0.37
Japan and Korea	-3.66	-0.11	-1.02	-0.32
united States	0.97	0.01	0.22	0.29
Canada	0.28	0.06	0.76	0.22
European Union	6.06	0.09	1.18	0.01
EFTA	0.83	0.28	3.54	-0.21
Developing country group	**-1.94**	**-0.04**	**-0.16**	**-0.07**
China	-0.28	-0.04	-0.14	-0.04
Other Asian countries	-0.09	-0.01	-0.03	0.05
Mexico	-0.27	-0.09	-0.41	-0.15
Latin America	0.68	0.05	0.31	0.32
South African countries	-0.22	-0.07	-0.26	-0.20
Rest of the world	-1.76	-0.10	-0.56	-0.28

Source: Model results, estimated by ERS.

Table 3-- Effects of removing domestic subsidies in developed countries under alternative assumptions about coupling of direct payments to farm households

	World	Australia/ New Zealand	Japan/Korea	U.S.	Canada	EU	EFTA
	Percentage change from the base year						
	Remove all domestic subsidies, no direct payments removed						
World agricultural price	3.55						
Returns to farmland		4.11	-1.28	-1.38	1.93	-7.26	-21.43
Total social welfare ($ billion)		0.24	-3.66	0.97	0.28	6.06	0.82
	Remove all domestic subsidies, with direct payments assumed mostly decoupled						
World agricultural price	3.60						
Returns to farmland		3.65	-1.30	-8.71	-1.52	-14.49	-32.58
Total social welfare ($ billion)		0.25	-3.89	1.04	0.31	5.92	0.83
	Remove all domestic subsidies, with direct payments assumed fully coupled						
World agricultural price	4.78						
Returns to farmland		5.09	-0.63	-4.31	6.43	-7.20	-22.00
Total social welfare ($ billion)		0.37	-6.50	1.23	0.34	5.52	0.81

Source: Model results, estimated by ERS

Appendix 1: Country and Commodity Groups in Developed-Developing Countries Database (see Figures 1-3)

Country groups

ANZ: Australia and New Zealand; JPK: Japan and Korea; ADC: Other Asian developed countries; USA: US and Canada; E_U: European Union and European Free Trade Association; CHN: China; IDN: Indonesia; MYS: Malaysia; PHL: Philippines; THA: Thailand; VNM: Viet Nam; BGD: Bangladesh; IND: India; LKA: Sri Lanka; XSA: rest of South Asia; MEX: Mexico; XCM: Central America and Caribbean; COL: Colombia; PER: Peru; VEN: Venezuela; XAP: rest of Andean Pact; ARG: Argentina; BRA: Brazil; CHL: Chile; URY: Uruguay; XSM: rest of South America; HUN: Hungary; POL: Poland; XCE: rest of Central Europe; XSU: former Soviet Union; TUR: Turkey; XME: rest of Middle East; MAR: Morocco; XNF: rest of North Africa; BWA: Botswana; XSC: rest of South Africa Custom Union; MWI: Malawi; MOZ: Mozambique; TZA: Tanzania; ZMB: Zambia; ZWE: Zimbabwe; XSF: rest of southern Africa; UGA: Uganda; XSS: rest of sub-Saharan Africa; XRW: rest of world

Commodity groups

PDR: rice; WHT: wheat; GRO: other grains; V_F: vegetable and fruits; OSD: oilseeds; PFB: plant based fibers; OCR: other crops; CTL: bovine cattle, sheep and goats, horses; OAP: other animal products; WOL: wool and silk-worm cocoons; CMT: bovine cattle, sheep and goat meat products; OMT: other meat products; VOL: vegetable oils and fats; MIL: dairy products; SGR: sugar; OFD: other food products; B_T: beverages and tobacco products

LVK : includes CTL, OAP, CMT, OMT and MIL mention above.

Figure 1. Share of exports to Japan/Korea, USA/Canada, and EU in Developing Countries Total Agricultural Exports, 1998
(see appendix 1 for legend)

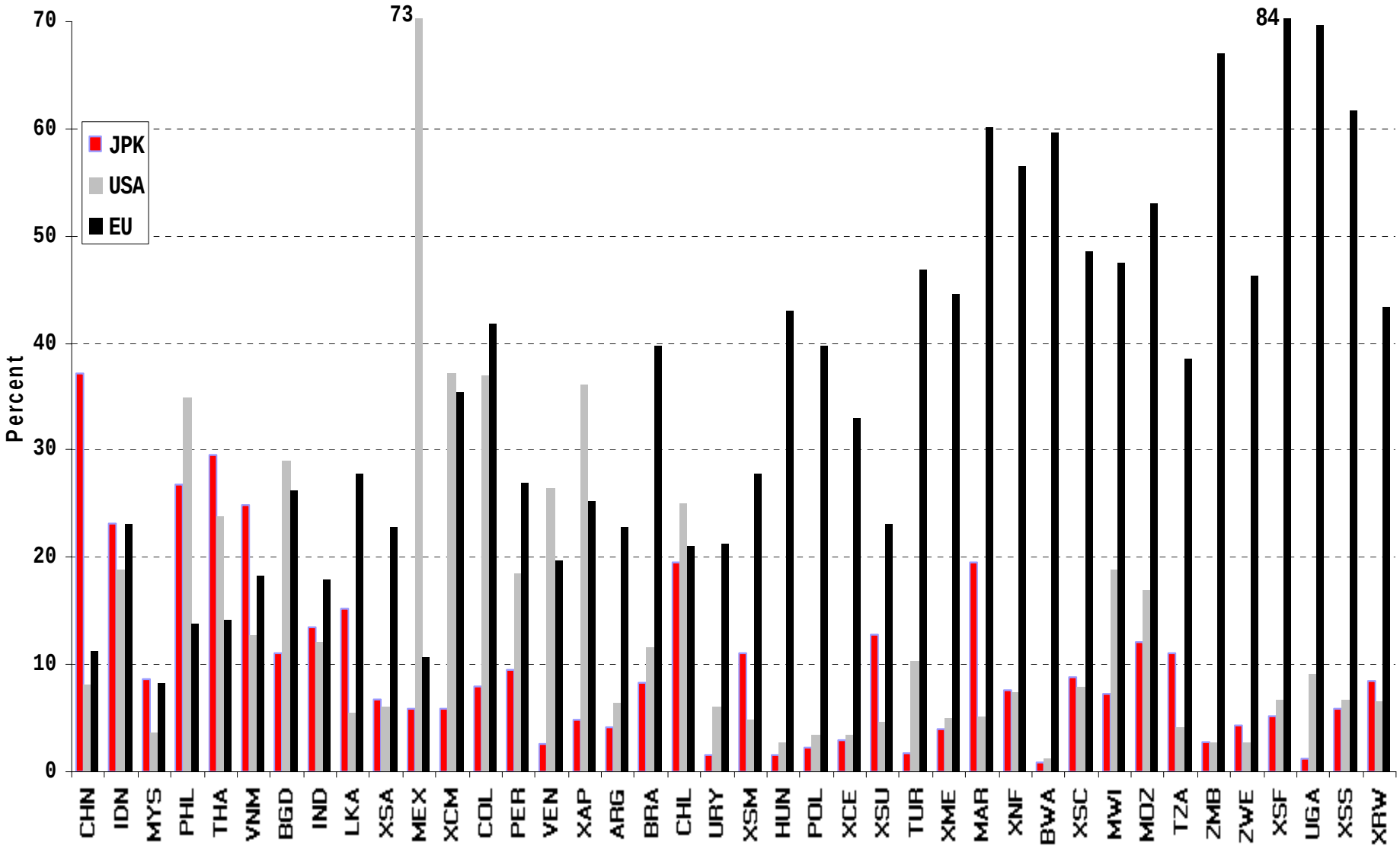

Figure 2. Share of Developing Countries' Exports in Japan/Korea, USA/Canada, and EU's Total Agricultural Imports, 1998 (see appendix 1 for legend)

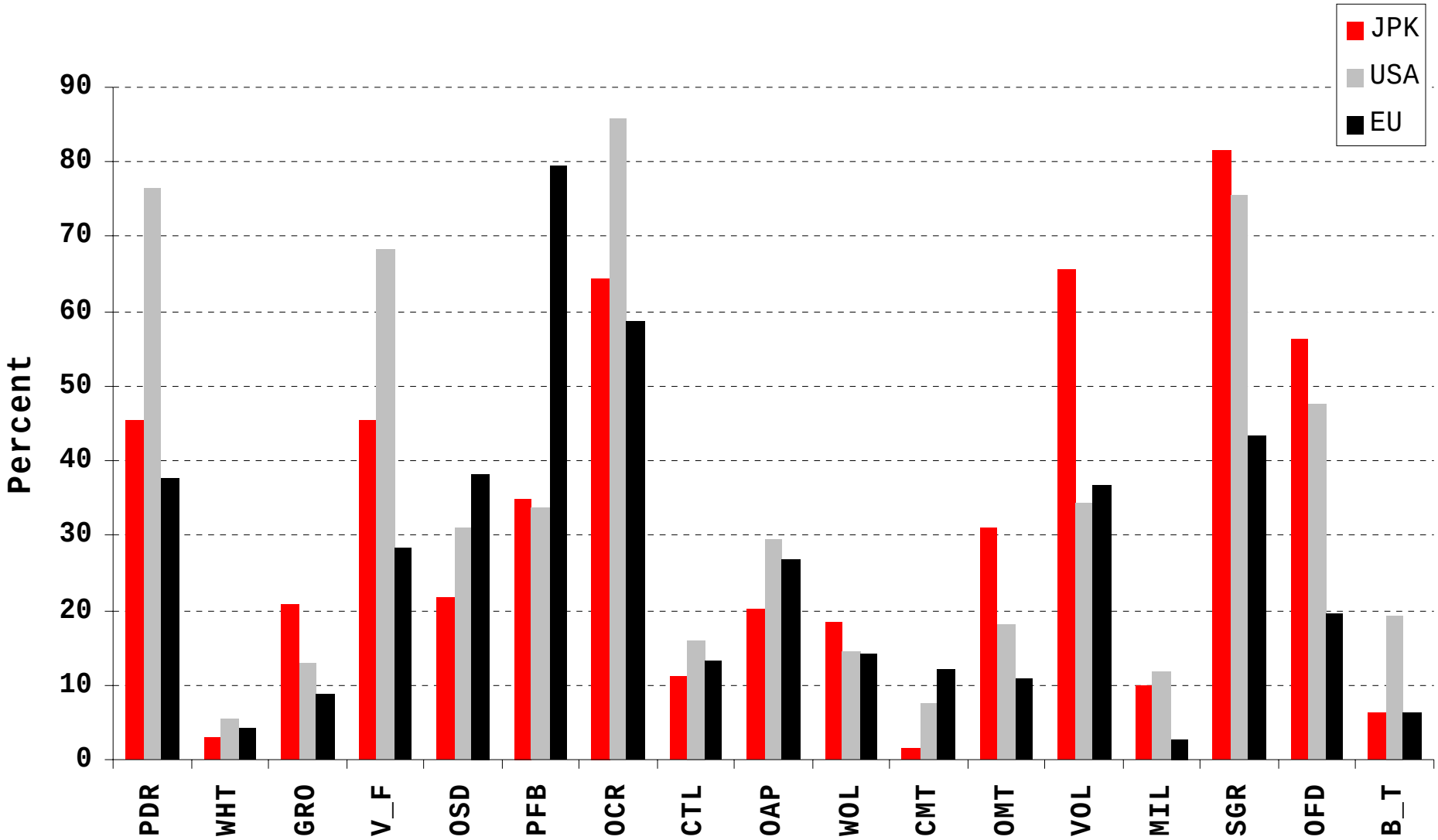

Figure 3. Change in Developing Countries' Agricultural Exports in the Model by Destination
(see appendix 1 for legend)

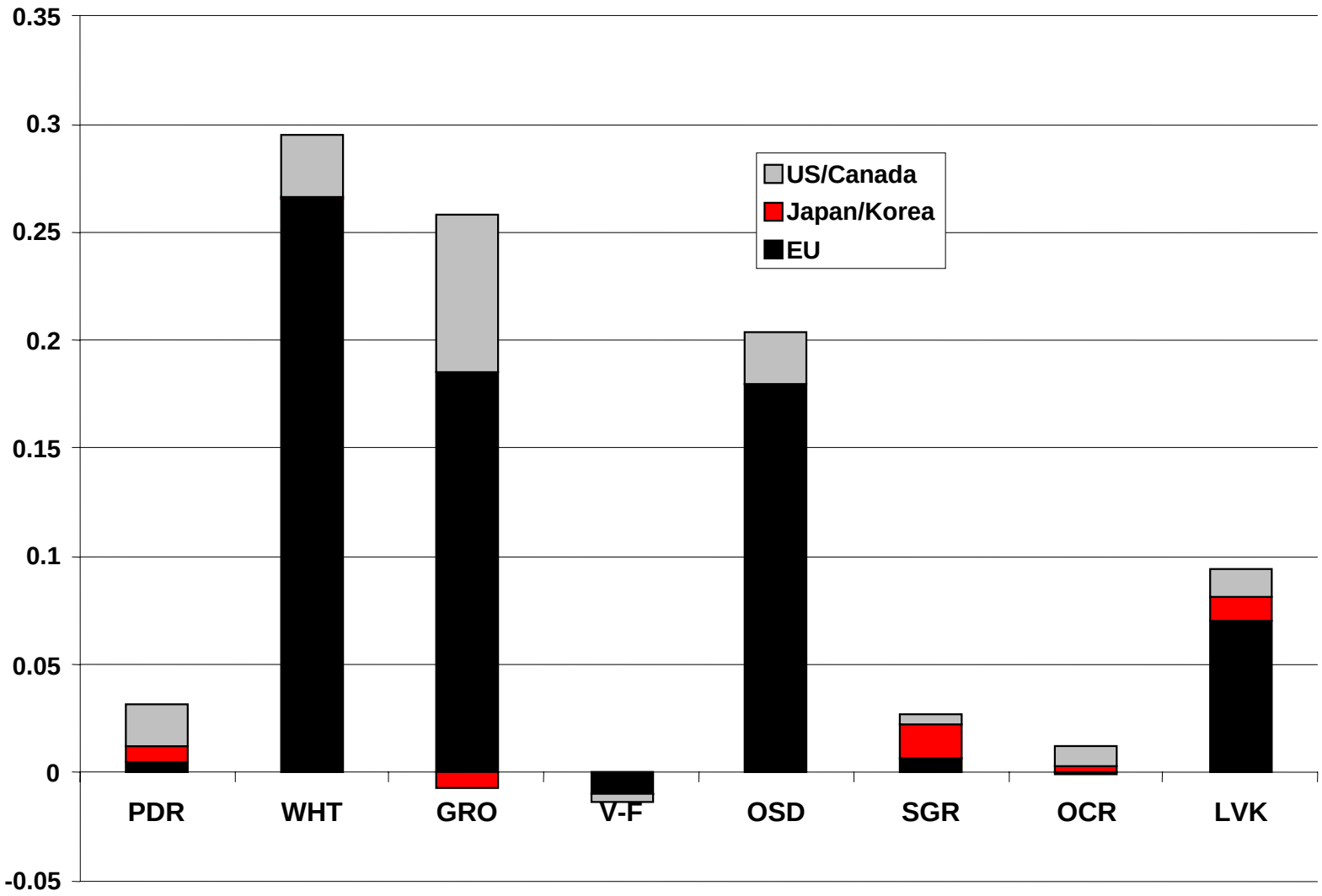

Figure 4. Sensitivity Analysis: Dynamic Effects of Global Agricultural Liberalization Under Alternative Agricultural TFP Levels of Developing Country Group