

Trade and Food Security: Conceptualizing the Linkages

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1 Introduction

Traditionally, food security is defined in terms of either food self-sufficiency or food self-reliance. The former requires *production* of various food items in the quantities consumed domestically while the latter requires domestic *availability*. Based on this distinction, self-sufficiency rules out imports as a source of supply while self-reliance admits them. In modern times, given much larger worldwide capacity to produce food than consume it, few restrictions on the *exports* of food items in countries with the excess capacity, and the availability of the means of transportation that allow their rapid movement internationally, self-sufficiency makes little economic sense. Instead, what countries need is sufficient capacity to generate foreign exchange by specializing in goods of their comparative advantage and import the excess of quantities consumed over those produced.

Therefore, accepting food self-reliance as the means to achieve food security, we may ask how the liberalization of trade in agriculture including food will impact developing countries. In attempting to answer this question, we must distinguish between importers and exporters of the products as also between liberalization in the developed and developing countries. If the objective is to study the impact on the poor, much finer analysis is required since we must decompose the effects at the national level into effects on the poor and non-poor. This is clearly a complex exercise even conceptually so that our goals should be modest. Specifically, it may be wiser to focus on the impact of liberalization on broad

groups within the nation rather than go all the way down to the household level as ambitiously suggested by McCulloch et al. (2001).¹

The rest of the paper is divided into four sections. Section 2 offers some stylized facts on agricultural trade of developing countries. The objective here is to identify how many developing countries are exporters of food and agriculture and how many of them are importers. In Section 3, I successively ask how liberalization by the OECD and developing countries will impact the national welfare of the latter. In Section 4, I offer a stylized analysis of how we can translate the national-level effect into the effect on the poor. I conclude the paper in Section 5.

2 Some Stylized Facts

It is useful to begin with some stylized facts about developing countries painstakingly put together by Valdes and McCalla (1999) using FAO and World Bank data. These authors begin with a total of 148 developing countries and classify them according to a variety of criteria. For the purpose at hand, classifications along two dimensions—the level of development as captured by per-capita incomes and net trade position in food and agriculture—are most useful.

- i. Classification According to Income: The World Bank divides these countries into Low Income Countries (LIC), Lower Middle Income Countries (LMIC) and Upper Middle Income Countries (UMIC). Based on 1996 income levels, countries with per-capita incomes of \$785 or less are in the first group, those

¹ Since McCulloch et al do not provide an application of the detailed approach they recommend, it difficult to judge its practical feasibility.

with incomes between \$785 and \$3125 in the second one and those between \$3125 and \$9655 in the third one.

- ii. Classification According to Net Trade Status in Food and Agriculture: According to this criterion, countries are classified into Net Food Importing (NFIM) and Net Food Exporting (NFEX) Countries on the one hand and Net Agricultural Importing (NAIM) and Net Agricultural Exporting (NFEX) Countries on the other.

Based on 1995-97 trade data from FAO, Table 1 gives the division of the countries according to their income status and net position in food trade as computed by Valdes and McCalla (1999). Table 2 does the same according to the income status and net position in agricultural trade.

Of the 148 developing countries, 63 are LIC, 52 LMIC and 33 UMIC. The bulk of the world's poor are in the LIC so that it is important to pay special attention to the countries in that group. According to Table 1, as many as 48 out of 63 LIC are net importers of food. Even among the LMIC, 35 out of 52 are net food importers. Therefore, it is clear that any realistic analysis of liberalization must address the question how food importing countries and the poor living there will be impacted by agricultural liberalization.

Table 2 classifies the three groups of countries according to their net position in agriculture as a whole. Here more LIC countries appear as exporters—33 versus only 15 when we consider trade in food. Therefore, once we look at agriculture as a whole, export interests begin to dominate. The overall picture differs less for LMIC and UMIC when we compare them according to their trade position in food versus agriculture as a whole.

Table 1

	LIC	LMIC	UMIC
NFIM	48	35	22
NFEX	15	17	11
Total	63	52	33

Table 2

	LIC	LMIC	UMIC
NAIM	30	32	23
NAEX	33	20	10
Total	63	52	33

Table 3

	NAIM	NAEX
NFIM	83	22
NFEX	2	41

A few additional relevant facts reported by Valdes and McCalla (1999) are as follows. At the time they wrote, following the U.N. classification, there were 48 Least Developed Countries (LDC). Of these, as many as 45 were net food importers. Again, if we consider agriculture as a whole, the number of net exporters rises to 15.

Table 3 offers information on the extent of overlap between importers of food and importers of agriculture and exporters of the two sets of items. Not surprisingly, the largest numbers concentrate along the diagonal: 83 countries are net importers of both food and agriculture while 41 countries are net exporters of both. Nevertheless, we are still left with large number of countries that export one but import the other: 22 countries that are net food importers are net agricultural exporters. Based on the data reported earlier, 14 of these 22 countries are least developed according to the U.N. classification. Interests across developing countries with respect to liberalization, especially by the OECD countries, are clearly spread out.

3 Trade Liberalization and National Welfare

Ideally, benefits of simultaneous liberalization in several sectors should be considered within a general-equilibrium framework. But in the interest of simplicity and transparency, in the following, I will stick to a partial-equilibrium framework. This approach ignores the possibility of substitution between two or more sectors subject to liberalization and implicitly assumes that all substitution is with a numeraire good that is not subject to policy distortions. I will assume that developing countries do not have market power, leaving the case of primary-product exports for later.

We divide the analysis into two broad parts: liberalization by the OECD countries and that by developing countries. In each case, we subdivide the analysis further into that applicable to exporters and importers.

3.1 Liberalization by the OECD Countries

The policies to be liberalized by the OECD countries consist of (i) domestic support measures, (ii) export subsidies, and (iii) tariffs. If these measures operated in the usual way, the analysis would be straightforward. But in each case, there are complications that must be taken into account. This is illustrated below starting with price supports.

The removal of a domestic price support on, say, wheat, would lower output of wheat and raise its price in the world markets. We can then infer that wheat-exporting developing countries will benefit and wheat-importing countries that continue to be importers after the removal of the support will lose and those that switch from being importers to exports may benefit or lose.

But in some cases, the support itself may be given to induce farmers not to cultivate some proportion of their land. In this case, the withdrawal of support will actually expand output, lower the price and have exactly the opposite effect: importers will benefit, exporters that remain exporters will lose and exporters that switch to being importers may benefit or lose. The critical question one must ask, therefore, is whether the removal of the support will increase or reduce the output of the supported product.

In the same vein, in the standard set-up, a reduction in tariffs by the OECD countries will increase the world price of the product, benefiting exporters, hurting importers and leading to an ambiguous effect on those turning from importers to exporters. But this standard analysis is complicated by the presence of trade preferences. The reduction in the tariff cuts into the preference margin of the beneficiary countries and lowers the profitability of their exports. Liberalization actually hurts these exporters.

Finally, in the standard setup, the reduction in export subsidies raises the world price of the product, benefiting developing country exporters, hurting importers and yielding ambiguous effect on those turning from being importers to exporters. But again, if the export subsidies were being countervailed, the net impact of the two measures is likely to be a transfer of the export subsidy from the exporting country government to the importing country government in the form of duty without significant effect on the prices and hence output. The removal of the export subsidy will also result in the removal of the countervailing duty and the world supply will be unchanged.

In all these cases, we are able to consider one intervention at a time. But in agriculture, especially in the European Union, these interventions have been used simultaneously. An especially interesting and important case is the one in which the country is a potential importer of a product but domestic support measures, tariffs and export subsidies are combined in such a way as to turn it into its exporter. This case, realistically characterizing some of the EU policies, is illustrated with the help of Figure 1.

In the figure, we show the demand and supply curves of a potential import of EU. Suppose the world price in the absence of any intervention by EU would be P^* , with EU importing the difference between the demand and supply at that price. Suppose next that EU sets the internal price at P , which generates an excess supply of the product. To eliminate this supply, it gives an export subsidy. Because EU now exports rather than import the product, the world price falls below P^* to, say, $P^{*'}$. The export subsidy that support the exports is $P^{*'}P$. At the same time, to prevent imports from taking advantage of the higher internal price, an import tariff equal to $P^{*'}P$ or higher is also imposed.

It is evident that the removal of the three restrictions together in this case will have the effect of raising the price from $P^{*'}$ to P^* . If we did not have the knowledge of the complete picture and looked at each measure in isolation, we would end up evaluating the measures quite differently. For example, in the standard analysis, each measure by itself lowers the world price but they are not additive in the normal way in this case. For example, it is the export subsidy that holds the world price down to $P^{*'}$. The tariff by itself only plays the role of eliminating the arbitrage between the world price and the internal EU price. It does not contribute to a reduction in the world price.

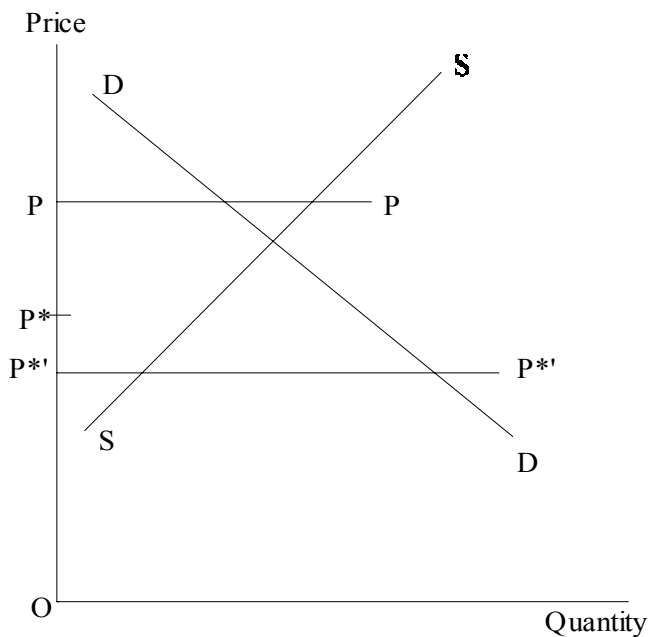


Figure 1: The Common Agricultural Policy of EU

While the specific analyses must incorporate the detailed features of the policies discussed above, one fact is clear from trade patterns described in the previous section: the effect of liberalization by the OECD countries is bound to be quite uneven on developing countries. Of the 46 least developed countries, 31 are net importers of both food and

agriculture. These countries are likely to be hurt by the OECD liberalization, which must raise agricultural prices. On the other hand, the bulk of the benefits will accrue to the relatively well-to-do developing countries in Latin America and Asia and the United States.

Thus, there is a case for transferring some of the agricultural subsidies currently given to farmers in the OECD countries to net importers of food and agriculture in the developing world. It must also be acknowledged that unqualified assertions by many, including the heads of some multilateral institutions, that subsidies and other interventions in agriculture in the OECD countries are hurting the poor countries are not grounded in facts. While there remains a strong case for the removal of agricultural protection and export subsidies on efficiency grounds, the claim that the change will bring net gains to the least developed countries as a whole is at best questionable and at worst outright wrong.

3.2 Liberalization by Developing Countries

Maintaining the assumption that developing countries are individually small, we can expect the usual efficiency gains from their own liberalization. The main difference with the conventional argument, made in the context of liberalization of manufactures, is that adjustment costs may be slower and therefore adjustment costs higher in countries primarily dependent on agriculture. The ability of other sectors to absorb workers released by such liberalization may be limited in the short run. Therefore, there is a strong argument for adjustment assistance, which should, nevertheless, be temporary. This is because eventual adjustment is essential if liberalization is to produce efficiency gains.

In some cases, countries also impose restrictions on exports. So long as the countries are small, such restrictions make no sense from the national welfare standpoint. Exports do not affect food security adversely even from if the objective is self-sufficiency rather than

self-reliance. In all likelihood, they will enhance food security by increasing the country's ability to import food items it does not produce in adequate quantity.

The case of exports in which the country has market power such as cocoa and coffee, an economic case can be made for a modest export tax to exploit market power (Panagariya and Schiff, 1991). But countries need to be careful here since these taxes have frequently created internal bureaucracies in the form of marketing boards that make exporting very costly. The bureaucracies can also result in a substantial part of tax revenues being used up in the so-called rent-seeking activities.

4 Impact on the Poor

Translating the impact at the national level into impact on the poor remains a tough task and room for error here is greater. Here the best hope would be to identify the major sources of income of the poor and ask how liberalization would impact these sources. For example, for a large chunk of the poor population, the principal source of income is likely to be labor. We can then ask how the liberalization will impact the real wage. Some of the poor may own small amounts of land and, thus, earn a part of their income from producing and selling agricultural products. In that case, we must taken into account how the profitability of what they produce is impacted.

It is too much to expect that theory will give an unambiguous answer even after we have narrowed down the context of the question this much. We must still decide the specific model we wish to employ to determine the likely impact on the factor prices. For example, if we rely on the two-factor, Heckscher-Ohlin model and think of agriculture as being labor intensive, the rise in agricultural prices will lead to a rise in the real wage and hence a reduction in poverty. But if we think in terms of the specific-factors model with

land being specific to agriculture and capital to industry, the rise in the price of agricultural products will increase the wage in terms of industrial products but reduce it in terms of agricultural products. And in so far as the poor spend the bulk of their income on agricultural products, they are likely to be worse off.

Personally, for the specific context at hand, I lean on a hybrid of the Heckscher-Ohlin and specific-factors models. In this hybrid model, we can think of industrial sector as using labor and capital and agricultural sector as using land and labor. The agricultural sector is further divided into two sub-sectors: food and non-food agriculture. This set-up allows us to distinguish between two broad types of agricultural products. We can then ask what happens to factor returns if the OECD countries liberalize agriculture.

To illustrate how the model can be used, let us introduce the construct of unit-cost curve, which is particularly suitable for the study of the impact of the changes in goods prices on factor returns. This curve plots different combinations of factor prices that yield a given, fixed level of per-unit cost of production when resources are employed efficiently. Thus, letting w and r_K represent the wage and rental rate on capital, respectively, different points on the curve labeled $c^1(w, r_K)$ in Figure 2 are associated with the same unit-cost of production of the industrial good, which we label 1. Moreover, the slope of the curve at each point equals the optimal ratio of capital to labor at the factor prices associated with the point. The curve is strictly convex to the origin indicating that as the rental-to-wage ratio rises, the optimal capital-to-labor ratio declines.

Letting the level of the unit cost vary, we can draw an entire family of unit-cost contours (not shown in Figure 2). As we move in the northeasterly direction, each successive contour is associated with higher and higher unit costs. The curves exhibit

constant returns to scale in the sense that doubling the wage and rental rate on capital doubles the associated cost at a constant capital-labor ratio.

In Figure 3, I reproduce the unit-cost curve of the industrial good, good 1, in the second quadrant. The specific contour we choose is the one that equates the unit cost to the domestic price of the industrial good. Thus, the unit-cost curve shows combinations of w and r_K that allow us to equate the average cost to price when labor and capital are used in the optimal combination.

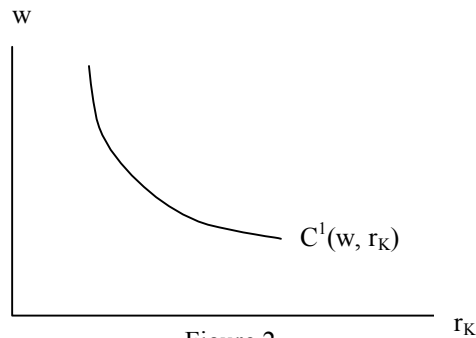
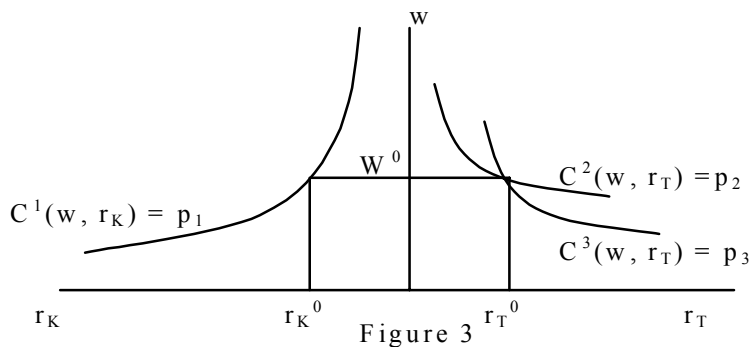


Figure 2

We can similarly draw unit-cost curves for food and non-food crops, which we label 2 and 3, respectively, in the first quadrant of Figure 3. Because these goods both use land and labor, their unit costs depend on w and r_T , where the latter denotes the rental rate on land. We show those unit-cost curves of goods 2 and 3 that yield unit costs equal to their respective domestic prices. Thus, the average-cost-pricing condition holds for the two goods along these unit-cost curves. Along a ray through the origin, the land-labor ratio in sector 3 is higher than in sector 2 indicating that non-food crops are land intensive relative to food crops (recall that the slope of the unit-cost curve at a point equals the optimal land-labor ratio at the factor prices represented by that point). This is most conveniently verified by comparing the slope of the two unit cost curves where they intersect.

In equilibrium, the unit-cost-pricing conditions must be satisfied simultaneously for all three goods. For goods 2 and 3, this is true at wage w^0 and rental on land r_T^0 . Given wage w^0 , the condition is satisfied for good 1 provided that the rental rate on capital is r_K^0 . Thus, given the domestic prices as in Figure 3, the equilibrium factor prices are w^0 , r_T^0 and r_K^0 .

Suppose now that liberalization by the OECD countries increases the domestic food and non-food prices by 10 percent relative to industry. The new unit-cost curves for goods 2



and 3 consistent with the higher prices are placed exactly 10 percent to the northeast of the curves shown in Figure 3. It is then immediate that the wage and rental on land both rise by exactly 10 percent. The value of the two factor returns is unchanged in terms of food and non-food products but rises by 10 percent in terms of industry. Thus, real returns to labor and land rise unambiguously. By the same token, the real return to capital declines in terms of all goods.

The effects of asymmetric price increases can be analyzed similarly. For example, suppose the price of food products rises by 10 percent with no change in the other two prices. The unit-cost curve for good 2 shifts out by 10 percent in Figure 3. Not surprisingly, since food products are labor intensive by assumption, this change increases the return to labor by more than 10 percent in the spirit of the Stolper-Samuelson theorem and lowers the return to land in terms of industry and therefore also food and non-food products. In

addition, the return to capital declines in terms of all three products. In sum, labor is strictly better off and land and capital strictly worse off. If poverty is measured by the wage received by workers, the OECD liberalization in food, which increases the price of food, actually reduces poverty even though the food importing countries are worse off overall. Thus, there can be tension between the effect on the poor and the country as a whole.

5 Concluding Remarks

Precisely how developing countries and the poor will be impacted by trade liberalization in agriculture under the Doha Round is a complex issue. The presumption that such liberalization will broadly benefit the poor countries, implicit in the allegations that agricultural subsidies in the rich countries hurt the poor in developing countries, is unlikely to be supported by closer scrutiny in its unqualified form. In so far as such liberalization will raise food prices and the poor spend a disproportionately large amount of their income on food items, the opposite is entirely possible. The lion's share of benefits of such liberalization is likely to accrue to potential exporters of these products, which happen to be relatively richer developing countries concentrated in Asia and Latin America. As such the case for agricultural liberalization must be made more on the ground that the current system is hugely inefficient, resulting in very substantial deadweight losses and transfers to the relatively rich farmers in the OECD countries. Redirection of even a small fraction of these subsidies towards the poor in the Third World will go a long way towards alleviating poverty.

References

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