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Impact of the EC's Rebalancing Strategy on Developing Countries: The Case of Feed

Monika Hartmann and Peter Michael Schmitz¹

Abstract: This paper analyses the effects of a rebalancing policy for the EC feed sector on the less developed countries. The theoretical part of the study reveals that evaluation of changing world market prices from the developing countries' perspective depends on the trade position of the LDCs in the relevant markets, on home-made distortions in the poor countries, as well as on the degree of insulation of domestic markets from the world market. These findings are supported by the empirical results presented in the paper. Using the sequential approach based on the Hicksian compensated curves of the new welfare economics, the efficiency effects due to a rebalancing policy in the EC feed sector are calculated for 16 developing countries/regions. These countries/regions cover about 98 percent of the developing world. The results show that, depending on the assumed world price transmission elasticity as well as on the application or absence of national agricultural policies in the countries considered, the developing world as a group would have to bear new welfare losses of between US\$519 million and US\$789 million. These welfare effects would not be spread evenly over the countries under consideration. While most developing countries and regions would experience a substantial decrease in their net economic welfare, some countries would enjoy considerable welfare gains.

Introduction

Sustainable agricultural development is heavily influenced by national agricultural policies. Both domestic and foreign policies directly or indirectly affect the performance of a national food and agricultural sector. The efforts at international coordination of agricultural policies within GATT negotiations deserve and obviously receive serious attention, especially those policies on the agenda of the negotiations that are supposed to have the most adverse effects on other countries. The Common Agricultural Policy (CAP) of the European Communities (EC) appears to belong to that category. The EC and some other industrialized countries have been blamed for pressing, distorting, and destabilizing world market prices through their highly protective policy measures. The USA and the Cairns group are therefore asked to significantly reduce their protection levels for temperate zone food products. The EC's response to this requirement from more free-trade-orientated countries was a rebalancing proposal, which implies slightly reduced protection levels for traditional surplus products (grain, sugar, milk and milk products, and beef) provided mainly by supply control measures and the creation of new tariffs and import quotas for nongrain feed and oilseeds. The rebalancing proposal and its likely impact on developing countries is the main topic of the paper.

A vast literature exists on the effects of unilateral or multilateral trade liberalization (Goldin and Knudsen, 1990; Koester, 1982; Matthews, 1985; Parikh *et al.* 1988; and Tyers and Anderson, 1988). Only a few studies, however, concentrate on the rebalancing strategy and its external effects (Commission of the European Communities, 1988; ABARE, 1990; and Mahé and Távora, 1988). Since the focus of these contributions is not on the Third World, it seems worthwhile to analyse in more detail the price, trade, and welfare effects of this expected EC policy reform on developing countries. The paper therefore aims to develop a theoretical framework (which allows the above-mentioned effects to be calculated and assessed) and to estimate quantitatively the impact on developing countries under different policy scenarios for seven commodities.

In contrast to previous studies on rebalancing effects, this paper disaggregates the developing world into 16 countries/regions that cover about 98 percent of the developing world. In addition, cross price effects among the seven commodities are considered; the equivalent variation concept is taken as a welfare measure using a modified approximation technique; aggregation of welfare effects follows the sequential approach avoiding path dependence of the calculations; consumer price and producer price effects are calculated separately; and endogenous policy responses in the developing countries are included in the paper as well as different price policies for consumers and producers.

Theoretical Analysis

At first glance, rebalancing of the EC's agricultural protection seems to be in line with Corden's (1974, p. 367) request for harmonized protection rates and therefore a desirable strategy. To prevent intra-sectoral distortions, he advised the implementation of similar protection rates for different commodities so as to realize at least a second-best optimum. However, there are severe doubts that the EC's rebalancing proposal does meet the criteria required for this optimum. Without going into the details of rebalancing (Hartmann, 1991a), one can expect an increase of the average EC protection level across agricultural commodities to lead to a rise in distortion compared to both nonagriculture and international agriculture. Harmonized protection levels do not require eliminating imports as many politicians suggest. Rather, the nominal protection level necessary to provide complete import substitution very often exceeds the second-best level. The introduction of new protectionism on the oilseed and feed markets raises uncertainty about the future behaviour of decision makers and creates political property rights that are not that easy to remove.

Hence, from an international welfare point of view, the risk of more welfare losses exceeds the opportunity to move towards a more liberalized world market situation. Despite this general conclusion, individual developing countries may gain or lose welfare due to the rebalancing strategy. Thus, an impact analysis will reveal the country-specific welfare effects of a change in the world market price structure due to the EC's rebalancing strategy. In contrast to the empirical part of this paper, where an advanced welfare approach is applied, the following considerations are based on a simple graphical illustration of the problem. Figure 1 shows the most important determinants of the welfare effects. Given a single market without any relation to other markets, one can derive the surplus effects (changes in producer and consumer surpluses) and the budget effects of exogenous and endogenous price adjustments. The analysis starts with declining world market prices. Three cases can be examined.

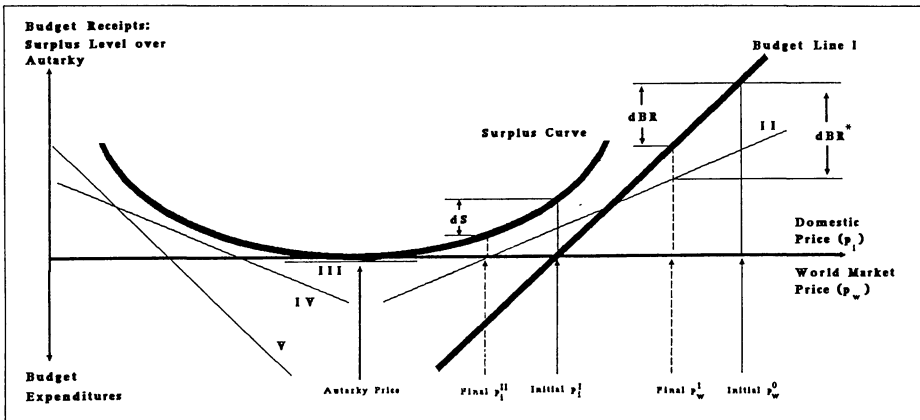


Figure 1—Welfare Effects of Exogenous and Endogenous Price Adjustments

Case 1. The country concerned does not pursue an own agricultural policy. World market prices equal domestic producer and consumer prices. If a price decrease from p_i^I to p_i^{II} is assumed, then the sum of producer and consumer surplus changes over the autarky welfare level declines by dS in the case of an exporting country. These surplus changes equal the total welfare effects since neither budget receipts nor expenditures occur. The surplus curve indicates that in the case of an importing country the private welfare effect would increase due to falling world market prices. The surplus curve is a monotonic convex function with its lowest point at the level of the autarky price where no gains from trade emerge. Its degree

of convexity depends on the supply and demand elasticities. Elastic responses of market participants induce a high degree of convexity of the surplus curve.

Case 2. The country has implemented an agricultural policy. Domestic prices deviate from world market prices. The former are fixed below the world market level at p_i^I , and the country exports the commodity. Falling world market prices from p_w^o to p_w^I then only affect the budget receipts (export taxes), whereas consumer and producer surpluses are not influenced. Export taxes decline by dBR as the budget line I indicates. The budget line is a linear function with respect to changing world market prices and depends on a certain domestic price level that determines the point of intersection with the price axis. The slope of the budget line becomes flatter the closer the fixed domestic price approaches the autarky price. Depending on the desired level of fixed national prices, one gets different budget lines I, II, III, IV, and V. Their absolute slopes are also determined by demand and supply elasticities. The more responsive the market participants, the steeper the corresponding budget line. An importing country has a downwards sloping budget line, which implies decreasing budget expenditures when world market prices decline.

Case 3. Finally, it is assumed that there is an endogenous shift of domestic prices due to world market price adjustments. In concrete terms, this implies equivalent absolute changes in the corresponding prices. Thus the absolute price gap remains constant. With falling prices, the budget line II conditioned on p_i^{II} indicates the relevant level of budget receipts at the world market price level p_w^I . Hence, receipts decrease by dBR^* . Simultaneously, the surpluses are reduced by dS , inducing an overall welfare loss of $dW = dS + dBR^*$, compared to the situation prior to the price change. If only domestic price were adjusted downwards at given world market prices, the surplus loss would be the same, whereas the loss of receipts would be lower, as the vertical difference between the budget lines I and II indicates at the world market price level p_w^o .

Extending these results to the multi-market case, one can draw the following conclusions. The final welfare effect for a single country depends on: the structure of production and consumption of the seven commodities for which world market prices adjust; the initial trade status of the country concerned in each commodity market; the application or absence of national agricultural policy measures driving a wedge between world market prices and domestic consumer/producer prices; the responsiveness of domestic prices to changes in world market prices (price transmission elasticity); own- and cross-price elasticities of demand and supply across agricultural commodities; and absolute level of exogenous and endogenous price changes that can reverse the trade position from one of exporter to importer or vice versa. Since the structure of the impact of these driving forces is of such a complex nature, one cannot arrive at simple theoretical conclusions. Hence, a first assessment of the EC's rebalancing strategy must and can only be given on the basis of an empirical analysis, which is the subject of the next section.

Empirical Analysis

Method and Data Used

To measure the international effects of policy changes in several different food commodity markets, a global multi-commodity model is required. In this paper, the world price effects due to a policy of rebalancing EC agricultural protection are taken from a simulation run of the SWOPSIM (static world policy simulation) model (ABARE, 1990, p. 14).² In this policy run, the average level of discrimination faced by consumers in the EC remains similar to the base case, while producer protection declines slightly. Table 1 summarizes the assumptions as well as the European and world price effects of this policy simulation.

Given these multiple world market price changes (Table 1), the welfare effects in LDCs can be calculated. An adequate framework for policy evaluation in the case of multiple-price changes and market interdependencies is the sequential approach based on Hicksian com-

pensated curves. This new welfare economics approach is also an exact welfare measure in the case of existing and/or changing market distortions. This latter aspect is very important, since in many developing countries the agricultural sector is directly and indirectly affected by a complex set of policies (Krueger, Schiff and Valdés, 1988; and World Bank, 1986, p. 61).

Table 1—Assumptions and Results of an ABARE Study on an EC Rebalancing Strategy using the USDA SWOPSIM Model of Percentage Change

Commodity or Commodity Group	Assumptions		Results		Change in World Market Price
	Change in the EC's				
	CSE	PSE	Consumer Price	Producer Price	
Wheat	-41.7	-43.5	-23.6	-26.4	9.0
Maize	-57.4	-58.2	-24.8	-28.6	3.0
Other coarse grains	-20.0	-20.0	-12.7	-11.3	-0.5
Soyabeans	46.1	—	44.7	—	-2.5
Soyabean meal	46.1	46.1	41.5	41.5	-7.5
Other oilseeds	46.1	—	44.1	—	-5.0
Other meals	46.1	46.1	39.3	39.3	-12.0

Source: ABARE (1990).

Using this extended applied welfare economics framework, the efficiency effects on LDCs due to a multiple world market price change consist of three components (Just, Hueth, and Schmitz, 1982, pp. 338–341). First, the benefits to consumers can be measured by a special approximation of the Hicksian equivalent variation.³ Second, the welfare effects on producers are equal to the changes in producer rent. Both welfare measures are calculated sequentially. This implies that the resulting supply and compensated demand curves are successively conditioned on previously considered price changes. For the single-market case, the sum of producer and consumer surplus changes can be found in Figure 1 as dS . In addition to these total private welfare effects of an externally induced multiple price change, one has to consider the change in the government budget in the developing country (the budget line in Figure 1). This third component must be calculated on all markets where internal distortions exist in the initial situation or are introduced or altered as a consequence of the EC policy reform. The calculation of the budget effects does not follow the sequential procedure; rather, it is derived as the difference between the initial and the final situation after all adjustments have taken place.

The distributional and efficiency effects of externally induced world market price changes on developing countries depend very much on the existing home-made distortions and the degree of insulation of the poor countries. To incorporate the former determinant, the analysis considers internal agricultural policies where data on protection/distortion levels were available (Sullivan *et al.*, 1989).⁴ To capture the latter argument, the calculations are done using two different sets of world price transmission elasticities (WPTE). One extreme case assumes that world market price changes are fully transmitted into the developing country (WPTE=1). This implies that the absolute change in world market prices equals the absolute change in domestic prices (Figure 1). In an alternative scenario, no internal price adjustments due to externally induced world market price changes (WPTE=0) are considered. The analysis thus covers the whole range of possible adjustment policies in the LDCs due to an EC rebalancing policy.⁵

The effects of policy intervention are calculated for 16 developing countries and regions⁶ for 1986. All data, price elasticities, and protection rates are taken from the USDA's SWOPSIM database (Sullivan *et al.*, 1989) and therefore coincide with the database used to identify the world market price effects due to an EC rebalancing reform. In accordance with the Slutsky-Schultz relationship for food products, income elasticities are set equal to the negative value of the sum of the own- and cross-price elasticities. Unfortunately, the data concerning the internal sector-specific distortions in the developing countries are very incomplete. Furthermore, all calculations are based on official time-series data and are therefore limited to the formal sector of the economy. The restriction of this analysis to only seven commodities is due to a lack of information concerning the world market price effects for other products as a consequence of an EC rebalancing reform. Given these limitations, the picture presented should be seen only as indicative of the effects a rebalancing policy in the EC feed sector would have on the agricultural sector and the overall economic performance of the developing countries.

Results

The distributional and efficiency effects of an EC rebalancing reform on the developing countries are summarized in Table 2. Examination of these results shows that the net welfare effects are quantitatively and qualitatively very unevenly spread over the developing countries and regions. While, for example, Brazil and China are the major losers from an EC rebalancing reform, India might enjoy substantial welfare gains.

The welfare effects of an EC policy reform on a developing country depend heavily on the trade position of the LDC in grain on the one hand and oilseeds and oilmeals on the other. While exporters of wheat and maize and importers of oilseeds and oilmeals tend to gain in net economic welfare, the opposite holds for those countries that have an inverse trade structure. Thus, the substantial welfare losses to Brazil, China, and other sub-Saharan Africa, documented in Table 2, are not surprising, since these countries import considerable quantities of grain while they are at the same time exporters of oilseeds and oilmeals. For most of the countries/regions considered, the sign of the overall welfare effects is not that easy to identify, since these countries are more or less general exporters (importers) of the commodities considered, or have a very complex trade structure. In this case, the welfare effects depend on the size of the deficits, surpluses, and EC-induced world market price effects on the relevant markets (Figure 1).

In addition to the trade position the degree of internal agricultural protection/discrimination in the LDCs plays a considerable role in the determination of the welfare effects, if world market price changes are transmitted to the domestic market. Table 2 reveals that an omission of own agricultural policies in the countries considered not only changes the results relating to the distribution of welfare effects over consumers, producers, and taxpayers but might even be misleading with respect to the sign of the net social welfare effects due to the policy of rebalancing EC agricultural protection (India, Nigeria, and other South Asia).

A third major finding and confirmation of the theoretical analysis is that the impact of an EC-rebalancing policy on LDCs depends very much on the assumed world price transmission elasticity (Figure 1 and Table 2). If developing countries' governments fully transmit the EC-induced world market price changes to their domestic markets, three countries/regions (India, other South Asia, and Nigeria) will enjoy substantial welfare gains, while the majority of developing countries/regions will lose in net economic welfare terms. Besides Brazil, the main losers in this policy scenario are other Latin America, China, other low and middle-income Asia, Middle East, and North Africa oil producers, and other sub-Saharan Africa. The net social welfare loss per year to the developing countries as a group amounts to \$519 million under the given domestic agricultural policy.

Turning to the alternative case in which LDCs are assumed to isolate their domestic market from world market price changes, all countries/regions except Mexico and South Africa have to bear welfare losses. The net loss of \$789 million per year to the Third World is much

Table 2—Welfare Effects of a Rebalancing Policy in the EC Feed Sector for Selected Developing Countries and Regions (\$ million)¹

Country/Region ²	World Price Transmission Elasticity (WPTE) = 1							WPTE = 0
	Equivalent Variation		Producer Surplus Change		Net-Budget Income Change	Welfare Change		Welfare Change
Mexico	-28.97	(-28.67)	36.10	(35.63)	(-8.50)	7.13	(-1.54)	5.32
Brazil	-7.74	(-7.54)	-142.18	(-142.30)	(-1.80)	-149.92	(-151.64)	-155.06
Argentina	34.20	(34.05)	-60.75	(-61.70)	(-14.31)	-26.55	(-41.96)	-34.35
Venezuela	0.75	(0.71)	-0.72	(-0.73)	(-3.02)	0.03	(-3.04)	-0.49
Other Latin America	-57.49	(-57.49)	-0.12	(-0.12)	-	-57.61	(-57.61)	-61.05
Nigeria	-0.84	(0.01)	-8.95	(-8.95)	(36.30)	-9.79	(27.36)	-10.27
Other sub-Saharan Africa	14.48	(14.48)	-66.37	(-66.37)	-	-51.89	(-51.89)	-54.94
Egypt	-71.20	(-70.62)	8.32	(8.30)	(16.34)	-62.88	(-45.98)	-64.18
Middle East and North Africa non-oil producers	-163.88	(-163.88)	130.53	(130.53)	-	-33.35	(-33.35)	-37.79
Middle East and North Africa oil producers	-225.70	(-225.70)	129.94	(129.94)	-	-95.76	(-95.76)	-99.39
South Africa	-20.08	(-20.08)	28.23	(28.14)	(-3.17)	8.15	(4.89)	7.30
India	-175.88	(-174.88)	174.80	(176.99)	(98.77)	-1.08	(100.88)	-14.82
Other South Asia	141.60	(-140.22)	120.96	(122.12)	(61.12)	-20.64	(43.02)	-28.23
Indonesia	17.88	(17.72)	-34.64	(-34.65)	(8.38)	-16.76	(-8.55)	-19.05
Other low- and middle-income Asia	4.73	(4.73)	-88.14	(-88.14)	-	-83.41	(-83.41)	-86.03
China	-697.30	(-697.30)	576.83	(576.83)	-	-120.47	(-120.47)	-135.96
All developing countries	-1,518.64	(-1,514.68)	803.84	(805.52)	(190.11)	-714.80	(-519.05)	-788.99

¹Values in parentheses include own agricultural policies for those countries where data were available. ²For the country composition of the regions, see Note 6. Source: Own calculations for 1986. Data are from Sullivan, Wainio, and Roningen (1989); and ABARE (1990).

greater than in the above scenario. Since, in the past, developing countries very much isolated their domestic markets from international price changes (Anderson and Tyers, 1990, p. 50), this scenario might be closer to the real welfare effects in the developing countries.

The effects on foreign exchange earnings in LDCs due to an EC rebalancing policy are shown in Table 3.

Table 3—Change in Foreign Exchange Earnings (\$ Million)¹

	WPTE=1	WPTE=0
Mexico	150.50	5.32
Brazil	-143.14	-155.06
Argentina	-32.63	-34.35
Venezuela	-3.61	-0.49
Other Latin America	-55.99	-61.05
Nigeria	27.34	-10.27
Other sub-Saharan Africa	-34.29	-54.94
Egypt	-23.48	-64.18
Middle East and North Africa non-oil producers	24.69	-37.79
Middle East and North Africa oil producers	-33.07	-99.39
South Africa	15.09	7.30
India	345.86	-14.82
China	20.17	-135.96
Other South Asia	148.43	-28.23
Indonesia	-38.46	-19.05
Other low- and middle-income Asia	-109.55	-86.03
All developing countries	157.86	-788.99

¹Values include own agricultural policies in the country considered.

Source: Own calculations for 1986. Data are from Sullivan *et al.* (1989); and ABARE (1990).

In the case of total domestic isolation (WPTE=0), the foreign exchange effects equal the net welfare changes in the last column of Table 2. These effects are similar to the welfare changes spread unevenly over developing countries. While in some countries/regions, such as Brazil, the foreign exchange earnings will decrease by a substantial amount, others, such as India and other South Asia, might experience considerable increases in net export earnings. Here again the sign and the size of the effects depend very much on the assumed world price transmission elasticity. Assuming a full price transmission, developing countries as a group would enjoy an increase in foreign exchange earnings of \$158 million, thus easing their foreign exchange deficits by about 3 percent for the corresponding commodities. In contrast, under the assumption of zero WPTEs, net export earnings would decrease by \$789 million. In this latter scenario, developing countries as a group would experience an aggravation of their foreign exchange deficits with respect to the considered commodity markets by about 15 percent.

Many studies analysing the impact of a liberalization of EC agricultural policy on the Third World conclude that these countries as a group would have to bear a welfare loss as a consequence of such a reform (Koester, 1982; Matthews, 1985; Parikh *et al.*, 1988; Tyers, 1989;

and Tyers and Anderson, 1988). The results presented in this paper suggest that developing countries as a group would also not be beneficiaries in the case of a rebalancing policy in the EC feed sector. Thus, one may jump to the conclusion that a CAP liberalization and a rebalancing strategy point in the same direction and hence, from a developing countries perspective, it does not matter which strategy the EC pursues. This conclusion, however, neglects some important aspects.

First, some doubts that a rebalancing strategy will really reduce support on highly protected markets seem justified. It is likely that this policy leads primarily to an increase in protection for deficit products, thereby further increasing worldwide distortion and reducing the export opportunities for LDCs.

But even if one assumes that the EC really reduces protection for the CAP core commodities, there remains at least one major difference between an EC rebalancing strategy and a liberalization policy: the impact these reforms have on stability and predictability in world agricultural markets. While the latter leads to a general reduction of world market price risk (Tyers and Anderson, 1988) and future policy uncertainty, the former increases policy uncertainty and has at best an ambiguous impact on price risk (ABARE, 1990, p. 21). This holds even more if a rebalancing strategy were not the outcome of the present GATT round but the reason for its failure. In that case, world agricultural markets might be put in total disarray. Since developing countries in particular benefit from predictability, certainty, and stability in world agricultural trade (Balassa, 1988, p. 46; and Matthews, 1988, p. 32), it is in all their interests to ensure a liberalization of world agricultural markets.

Notes

¹Universität Frankfurt.

²Some additional empirical studies analyse the world market price effects of alternative EC rebalancing strategies (Commission of the European Communities, 1988; Mahé, 1984; and Mahé and Tavéra, 1988). Because of the different assumptions concerning the policy simulations and differences in product coverage and product aggregates, it is unfortunately not possible to compare the results.

³For the method to approximate the equivalent variation, see Hartmann (1991b).

⁴Because of a lack of data, the incorporation of sector-specific policies in the analysis was only possible for Mexico, Brazil, Argentina, Nigeria, Egypt, India, other South Asia, and Indonesia.

⁵Since the welfare effects in a multi-commodity model with existing distortions are not a monotonic function of the world price transmission elasticities, the two scenarios do not necessarily represent the upper- and lower-bound welfare effects in a developing country due to an EC rebalancing strategy.

⁶These 16 countries/regions encompass about 98 percent of the developing world. Virtually all the countries classified by the World Bank (1986, p. 180) as low-income and lower middle-income economies are included in the analysis. The country composition of the regional aggregates is: other Latin America—Belize, Costa Rica, El Salvador, Honduras, Guatemala, Nicaragua, Panama, Bahamas, Bermuda, Cuba, Dominican Republic, Haiti, Jamaica, Trinidad and Tobago, Barbados, Bonaire, Curaçao, French West Indies, Guadeloupe, Martinique, Turks and Caicos Islands, Cayman Islands, Aruba, British West Indies, Leeward-Windward Islands, St. Kitts, Netherlands Antilles, Antigua, Nevis, Montserrat, British Virgin Islands, Grenada, St. Vincent, St. Lucia, Dominica, Guyana, French Guiana, Surinam, Bolivia, Chile, Colombia, Ecuador, and Paraguay, Peru, and Uruguay; other sub-Saharan Africa—Angola, Benin, Botswana, Burkina Faso, Burundi, Cameroon, Cape Verde, Central African Republic, Chad, Comoros, Congo, Cote d'Ivoire, Djibouti, Equatorial Guinea, Ethiopia, Gabon, Gambia, Ghana, Guinea, Guinea-Bissau, Kenya, Lesotho, Liberia, Madagascar, Malawi, Mali, Mauritania, Mauritius, Mozambique, Namibia, Niger, Réunion, Rwanda, São Tomé/Príncipe, Seychelles, Sierra Leone, Somalia, Senegal, Sudan, Swaziland, Tanzania, Togo, Uganda, Zaire, Zambia,

and Zimbabwe; Middle East and North Africa (non-oil-producers)—Turkey, Cyprus, Lebanon, Israel, Gaza, West Bank, Jordan, North Yemen, South Yemen, and Morocco; Middle East and North Africa (oil producers)—Syria, Iraq, Iran, Kuwait, Qatar, Saudi Arabia, United Arab Emirates, Oman, Bahrain, Algeria, Tunisia, and Libya; other South Asia—Afghanistan, Bangladesh, Bhutan, Nepal, Pakistan, and Sri Lanka; and other low and middle-income Asia—Thailand, Malaysia, Philippines, South Korea, North Korea, Brunei, Burma, Fiji, Cambodia, Laos, Mongolia, and Vietnam.

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Discussion Opening—Daniel V. Gordon (Norwegian School of Economics and Business Administration)

In this paper, Hartmann and Schmitz (HS) attempt to measure a welfare change for some developing countries caused by a change in the tariff and quota structure for agricultural commodities in the EC. This is an interesting problem and a non-trivial empirical exercise.

It is common in applied welfare analysis to add up consumer surpluses associated with a price change and define this value as a money measure of a welfare change. The most favoured measures are Marshallian consumer surplus and Hicksian consumer surplus; i.e., compensating variation (CV) and equivalent variation (EV). Under the restriction of zero-income effects (i.e., indifference curves are parallel) all three measures coincide, but in general they provide different measures of welfare change. HS employ the EV index. Although no justification for the procedure is provided, this index is superior to a Marshallian approach. In the single-consumer case, EV also performs better than CV. However, EV measurement is path dependent; the way prices change matters in measuring welfare change. The problem is more serious in the HS application because many prices change simultaneously. HS assume the order of price change to be known and proceed with measurement. But, nevertheless, the welfare change calculated is not unique.

In addition to this, consumer surplus measures are seriously criticized for three reasons. First, they cannot account for income redistribution (i.e., they are silent on changes in economic inequality). Second, they suffer from the Boadway Paradox and cannot be used as efficiency indexes. Finally, they do not always represent a social binary ordering (i.e., the preference ordering may fail to be asymmetric). This criticism is so severe as to negate the use of consumer surplus measures in applied welfare analysis.

However, alternative measures are available to the applied economist. Money metric utility (i.e., the minimum income needed at fixed reference prices to acquire a commodity bundle that is at least as good as the one actually consumed) is one. Money metrics is an index of utility level, not change in utility, upon which consumer surplus measures are based. It is always a social ordering and allows inequality aversion. However, it does require homothetic preferences. Extended money metrics (i.e., the minimum expenditure a reference individual must have at reference prices to achieve the level of utility of each member of the household) is another measure. Extended money metrics improves on money metrics by accounting for the well-being of each person in the economy. However, it does require interpersonal comparisons of utility. Welfare ratios (i.e., the ratio of household income to the minimum expenditure needed for a reference level of utility) are another measure. The advantages are that family size is taken account of and the ratio economizes on interpersonal comparisons. The index is also easy to calculate with minimum data requirements. However, without homothetic preferences, it is not an exact index of well-being. Finally, equivalence scales may provide a useful methodology for making interpersonal comparisons and for applied welfare analyses. This measure requires no reference prices, has no problems of concavity, and is easily calculated from demand data.

These new welfare measures are an improvement over the old surplus measures. In applied work, the choices of index can be based on available data. Of course, it would be preferable to calculate several measures of well-being. Hartmann and Schmitz have an interesting problem and by including the new welfare measurements they would allow a comparison to the surplus measurements already calculated and add to the paper itself.

[Other discussion of this paper and the authors' reply appear on page 69.]