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Agricultural Policies and the GATT: Reconciling Protection, Support and Distortion

by

Harry de Gorter and David R. Harvey*

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*Harry de Gorter is an Assistant Professor in the Department of Agricultural Economics, Cornell University, New York, and David R. Harvey is a Professor in the Department of Agricultural Economics and Food Marketing, The University of Newcastle upon Tyne, England.

Correspondence on requests for additional copies of this paper should be addressed to:

Dr. Harry de Gorter
Department of Agricultural Economics
Cornell University
Ithaca, NY 14853

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Harry de Gorter,
Department of Agricultural Economics, Cornell University, NY

and

David R. Harvey
Department of Agricultural Economics and Food Marketing,
The University of Newcastle upon Tyne, England.

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ABSTRACT

This paper analyzes the relationship between the theory of protection, farm income support and international trade distortion. To parallel those of protection, a measure of distortion is derived which compares trade volumes under support policies with those which would occur under multilateral free trade. Estimates are made of these measures for the European Community and the United States for a selection of commodities. The relationship between measures of protection and economic efficiency is also highlighted. The conclusion is that present measures of protection such as the Producer Subsidy Equivalent are confusing as measures of either trade distortion or income support. Some implications are drawn for the GATT negotiations on agriculture and for the design of domestic policies which minimize trade distortion.

AGRICULTURAL POLICIES AND THE GATT: RECONCILING PROTECTION, SUPPORT AND DISTORTION

I. Introduction

Multilateral trade negotiations on agriculture under the General Agreement on Tariffs and Trade (GATT) have been stifled for over 40 years. Previous glacial progress has been the result of countries insisting on the primacy of their domestic policy objectives, especially farm income support. Nevertheless, the sector has been raised to the top of the agenda under the Uruguay round. A major impetus for inclusion of agriculture as a priority sector is that, for two of the major participants - the European Community and the United States - farm policies in the 1980s have become increasingly expensive and more questionably effective. Continued support with existing instruments depress world prices and thus become partially self-defeating. Domestic agricultural policy reform has now become a significant national issue on both sides of the Atlantic, as well as in other major trading countries (Japan and the Cairns Group).

Multilateral agricultural policy "disarmament" under the GATT potentially allows countries to achieve domestic policy goals more effectively by offering the prospect of improving world market prices. Because the GATT is the legal code governing international trade relationships, it does not have authority over domestic policies other than through their trade distorting effects. Therefore the achievable objective of the GATT negotiations is to minimize trade distortions, not necessarily to eliminate protection or domestic income support. Indeed, this objective of minimizing trade distortion has been central to the repeated declarations of intent from the GATT participants, most recently at the Economic Summit meeting in Houston.

This objective, however, raises a serious issue for agricultural policy and trade analysts. Conventional analysis provides measures of (nominal or effective) protection and of agricultural support, traditionally through measures of producer surplus gain. More recently, the Producer Subsidy Equivalent (PSE) has been (incorrectly) identified as a measure of support.[1] But the literature does not identify trade distortion specifically. This paper addresses the question of whether these concepts are interchangeable and analyzes the relationships between them.

The development of the PSE for the FAO by Josling (1973, 1975) refined and extended the more traditional measure - the nominal rate of protection (NRP).[2] The OECD has applied and

modified the PSE concept further under the Trade Mandate Study. However, neither the PSE nor the NRP are more than partial measures of trade distortion. Conventional measures of protection and support were originally designed to obtain a quantitative assessment of the *domestic* effects of government intervention. The impetus of the Uruguay Round of trade negotiations has revealed a demand for a quantitative measure of the *international* effects of protection. Much of the debate within the GATT negotiations has been concerned with the appropriate definition and possible use of an Aggregate Measure of Support (IATRC 1990a). The PSE, either in 'pure' or modified form, has been suggested as an appropriate measure and has already been incorporated in the Canada-US Free Trade Agreement.[3] The need to separate protection from trade distortion has promoted the search for alternative aggregate measures for GATT purposes. Several proposals include the Price Adjustment Gap (PAG) by Australia, the Trade Distortion Equivalent (TDE) by Canada, and the Support Measurement Unit (SMU) by the European Community.[4]

There is an ongoing debate about whether an aggregate measure is useful for the negotiating process, and if so, what an appropriate aggregate measure might be and what role it should play. If an aggregate measure has any role in GATT negotiations, it necessarily has to focus on trade distortion. Thus the primary objective of this paper is to develop the analytical framework for the explicit measurement of distortion as opposed to protection and support. In addition, since policy intervention is carried out for a variety of domestic reasons, with economic efficiency of secondary importance, such intervention will not be negotiated away, certainly not in a multilateral forum. Thus, a secondary analytic objective is to seek those forms of of intervention which minimize trade distortion while allowing for the maintenance of support.

The structure of this paper is as follows. Section II develops new measures of trade distortion to parallel those of protection. The relationship of each to traditional measures of producer welfare (support) and efficiency is also highlighted. Section III provides some estimates of the effects of current US and EC policies, and uses the measures derived by assessing the Production Entitlement Guarantee (PEG) as an example of an alternative policy instrument that can simultaneously achieve domestic and GATT objectives. Finally some conclusions are offered on the possibilities that such an analysis raises for the reform of domestic policies and on the implications and consequences for post-GATT negotiations.

II. Principles.

Protection is usually defined on the basis of a difference between domestic and border prices. So long as protection involves changes in the incentive prices facing producers and consumers from their free trade levels, resulting trade volumes will inevitably be distorted compared with free trade volumes. Thus protection normally implies distortion. But the same level of protection achieved through different instruments can result in different levels of distortion. Similarily, protection implies support to the domestic sector, usually at the expense of the consumer, taxpayer and trading partner. Again, different methods of protection for the same level can provide different levels of support. Concepts of protection and support involve considerations of price and cost differences from free trade conditions, where different definitions of the scope of free trade lead to different measures of protection and support. But trade distortion arises from differences in trade volumes compared to free trade, albeit related to price and cost differences. Thus it is possible to measure distortion directly through comparisons of trade volumes under different market and policy conditions.

Consider Figure 1, which represents stylized versions of product subsidy (deficiency payment) and export subsidy (restitution) policies for a single commodity. Ps is the domestic support price corresponding to these two policies. Pw is the current world price. The conventional measure of protection is the nominal rate of protection (Corden) which, in this case, is defined as:

$$NRP = (Ps-Pw)/Pw \quad (1)$$

which is the same for both policy alternatives.

Josling's original definition of the PSE is now more usually known as the per cent PSE:

$$\text{per cent PSE} = (Ps-Pw)/Ps \quad (2)$$

Total PSE, equivalent to Producer Subsidy Value in Josling's (1973) contribution, is defined as:

$$PSE = A+B+C \quad (3)$$

in Figure 1. The PSE thus measures the total nominal cost to consumers, taxpayers and the

economy of the policy intervention.[5] Any *nominal* measure used in this paper refers to a single country, single commodity situation with no terms of trade effects[6].

Support to the agricultural sector is conventionally measured as the producers' surplus gain (PSG) resulting from the policy, as above in nominal terms:

$$\text{Nominal PSG} = A+B \tag{4}$$

We can now define nominal transfer efficiency (TE) as:

$$\text{Nominal TE} = \text{Nominal PSG/PSE} \tag{5}$$

Thus, PSEs do not define support to agriculture. Conventional analysis defines the compensation required as the PSG. Hence transfer efficiency converts the commonly used measure of support to the conventional economic measure.[7]

Although the measures defined in equations (1) - (5) are the same for both policy alternatives, their trade distorting effects are not. The distortion of world markets is a consequence of variations in trade volumes from those which would obtain in the absence of policy intervention. Thus, in Figure 1, the deficiency payment results in a smaller change in trade volume than the equivalent export subsidy, (holding either PSE or PSG constant), simply because the deficiency payment does not alter the demand side of the market directly[8]. Thus the definition of a nominal *rate of distortion* needs to be based on trade quantities and is here defined as:

$$\text{NRD} = \frac{(S-D) - (S'-D')}{\{\text{Abs}[S^* - D^*] + Qa\}} \tag{6}$$

where S, D, S' and D' are the 'policy on' and 'policy off' supply and demand quantities respectively, as shown in the figure, Qa is the autarkic quantity, and S* and D* are the supply and demand quantities which would occur under multilateral free-trade in all agricultural commodities. The rationale for this definition of NRD is as follows. The numerator represents the trade distortion (measured at the current world price). This is compared to the "natural" or free-trade position (S* - D* - the first term in the denominator) for that particular commodity and country, where the policy interventions in all agricultural commodity sectors and in all countries are eliminated[9]. The natural

trade position avoids biasing NRD against large *traders*, as would be the case if total world trade were used as the numeraire. In addition, the autarkic quantity is included in the denominator as a measure of country size, which avoids biasing NRD against large *countries*. This term also serves as a normalizing factor which avoids the explosion or vanishing of the measure as any of the trade volumes in the measure approach zero.

Incorporating natural trade volume in absolute terms (i.e., ignoring signs) in the denominator avoids problems arising from trade switching between policy regimes and also eliminates discrimination between importers and exporters in the measure of NRD. Note that NRD can take either sign or be zero. A positive (negative) NRD indicates that policy has increased (decreased) world trade volumes compared with 'policy-off' trade, independent of whether the country is an importer or an exporter or whether a switch occurs in its trading status. NRD is equal to zero (i.e. no distortion) only when policy intervention does not change the trading position of the country.

Associated with this definition of trade distortion is the concept of a *trade equivalent support price* (P), which is defined as the price equivalent of the policy set producing current observed trade volumes. That is, P is the support price which would produce currently observed trade volumes if the only support instrument were a uniform border tax/subsidy. In this sense P - Pw represents the "tariffied" version of the existing support and protection package. Thus, in the export refund case, P is equal to Ps. However, in the deficiency payment case, P will lie between the producer support price (Ps) and the current world price (Pw), its precise position depending on the relative domestic supply and demand elasticities. Any mixture of intervention mechanisms, such as the combination of a price support with a production quota and a consumer subsidy, results in a particular traded quantity. Given knowledge of the underlying domestic supply and demand parameters, there exists an excess supply schedule from which the price support equivalent (P) of this traded quantity can be determined. It may be that P lies below Pw, in which case the net effect of the policy set is to tax rather than subsidize agricultural trade, which is typical of many developing country and centrally planned economy policy sets.

Thus, the NRD formally identifies deficiency payments as less distorting (i.e. smaller) than export subsidies. Similar analysis identifies import levies as equally distorting (given the same level

of protection and supply and demand elasticities) as export subsidies. Thus, distortion depends critically on the nature and mixture of policy intervention. There is no unique relationship between levels of protection and distortion.

So far, the analysis has ignored a number of issues. Extension of these concepts from the partial, single commodity, single instrument case to the agricultural sector requires incorporation of cross-commodity and input effects, and of complex mixtures of intervention instruments observed in the real world. This leads to the concept of effective rates of protection (ERPs). The PSE, too, includes input and other support instruments, but without explicit use of cross commodity and input demand parameters, or of the details of the intervention mechanisms[10] (OECD, 1987). In particular, the incidence of different intervention measures is determined through arbitrary rules (Josling, 1975). Hence the meaning of the per cent PSE as a measure of the effect of protection on product supply is unclear. On the other hand, the calculation of ERPs involves explicit incorporation of cross commodity and input effects, as well as intervention in the processing sector, to determine their output price equivalents (Corden).

In exactly similar fashion, *effective* rates of distortion can be defined to take explicit account of cross commodity, input and the terms of trade effect of the *own country* only. Given S^ and D^ as the supply and demand quantities which would obtain under unilateral free trade, the *effective* rate of distortion is:

$$ERD = \frac{(S-D) - (S^{\wedge}-D^{\wedge})}{\{Abs[S^{*} - D^{*}] + Qa\}} \qquad (7)$$

Associated with the definition of S^ and D^, there is a unilateral free trade world price, P^, as that world price which would obtain if this country alone eliminates all market intervention policies in agriculture. Furthermore, for the two stylized policies represented in Figure 1, P^ lies between P and Pw. As before, ERD can take either sign or equal zero. In a single commodity case with no cross-commodity effects and for the two policies in Figure 1, NRD minus ERD (the rate of trade distortion due to domestic policies) would be positive. As will be shown in the empirical results below, cross-commodity effects or specific policy measures (eg, supply controls) make it possible for NRD to be less than ERD. Again, no distinction is made between those policies which

positively protect trade (expand exports or reduce imports) and those which provide negative protection (reduce exports or encourage imports). Both are regarded as distorting.

However, the critical factor to consider with reference to multilateral trade negotiations is the effect on world trade and prices of universal reductions in protection, that is in all commodities and countries. In addition, the conventional of support relates existing market and policy conditions to those which would obtain under perfectly competitive markets, that is, in this case, multilateral free trade. Therefore we require measures of protection and distortion support which compare the current situation with that which would occur under multilateral free trade. Effective rates of protection and distortion do not make this comparison.[11] We therefore define an *Adjusted Rate of Protection* and an *Adjusted Rate of Distortion* which do account for world market changes following from multilateral reduction in protection.

Consider Figure 2. Again, we deal with two stylized policies, the deficiency payment and the export subsidy. However, we also consider the effects of: (i) a policy which raises the price of an input (eg cereal feed for livestock); and (ii) all countries policies on world prices. Thus, elimination of all policies: (i) shifts the supply curve for this commodity from S1 to S2; and (ii) changes world price from Pw to P*. In Figure 2, we show the world price increasing towards but not above domestic support prices. It is not guaranteed that world prices will increase.[12] However, it is also clearly possible that world prices increase above domestic support prices, especially in those countries with low, zero or negative levels of protection.

Quantity supplied increases from S to S* under both policies, but elimination of the policies has opposite effects on the demand side, from D to D* in each part of Figure 2. Per cent PSEs and, normally, nominal rates of protection are unchanged, since they relate to current support and current world prices. Extending the definition of effective rates of protection to include the consequences of multilateral, as opposed to unilateral, eliminations in protection, we define the *adjusted* rate of protection as:

$$ARP = (Ps - P^*)/P^* \qquad (8)$$

which is unambiguously lower than the nominal rate defined in equation 1, provided world prices rise. Notice that Ps is identical between a deficiency payment scheme and an export refund scheme.

Producers' surplus gain is now shown as the shaded portion in each diagram, following Just, Hueth and Schmitz. This is the textbook measure of producers' surplus gain from existing policies, and will tend to be smaller than the nominal PSG identified above, since the effects of world price changes will outweigh the effects of the supply curve shift in most cases. Including the world market distortion effects of all policies in all commodity sectors and countries can result in the *adjusted* PSG being substantially lower than the nominal PSG defined earlier. This emphasizes that the PSE cannot be "the payment that would be required to compensate farmers".

The *Adjusted* Rate of Distortion is defined as:

$$ARD = \frac{(S-D) - (S^*-D^*)}{\{Abs[S^* - D^*] + Qa\}}, \quad (9)$$

Figure 3 summarizes the relationships between the three measures of trade distortion and illustrates the possible signs and relative sizes of ARD to NRD and ERD.

In this Figure the excess supply representations of four typical cases are shown: (a) a positively protected importer/exporter; (b) a positively protected small size large exporter; (c) a negatively protected importer; (d) a negatively protected exporter. The excess supply curve is simply domestic supply less domestic demand unencumbered by policy. All policy instruments are assumed to be represented on the domestic market, but these representations are not carried through to adjustment of the excess supply curve. Rather they are summarized in the traded quantities and the associated trade equivalent support price, P. As before, Pw is the current world price, P^ is the unilateral free trade price, and P* is the multilateral free trade price. The following discussion deals with the single commodity case only to keep the presentation of the conceptual analysis tractable. The empirical analysis below deals with illustrative calculations for the multi-commodity case.

In panel (a), P lies well above Pw and the country is currently a large exporter (S-D), and is a natural exporter, as defined by its trade position at P*, (S*-D*). However, at observed market prices and at unilateral free trade prices this country would be an importer, S'-D' and S^-D^ respectively. NRD measures trade distortion in trade resulting from the difference between P and Pw, ERD measures distortion between P and P^, while ARD refers to distortion between P and P*. Thus the bases of the three measures of distortion are illustrated by arrows in Figure 3, but the definitions compare the associated trade volumes. Thus the arrows in the figure merely indicate the

relative prices associated with the distortion measures[13].

NRD and ERD are always positive in Figure 3 and NRD is always greater than ERD.[14] The difference between NRD and ERD shows the effect of domestic policies on world trade and prices. The difference between ERD and ARD shows the effects of other countries policies on this country's trade. These effects will be further elaborated in the next section, where estimates of the proportions of the PSE which are simply offsetting terms of trade effects (NRD-ERD) and the world price effects of other countries policies (ERD-ARD) are presented.

In panel (b), these relationships are repeated with an important exception. Again, NRD-ERD represents the effect of this country's policies on world trade and price. However, P* is greater than P, resulting in a negative ARD. The rationale is as follows. Although this country has a positive rate of protection (in the conventional sense), it has not been able to completely offset the effects of other countries policies, and hence is exporting a smaller quantity than would be the case under multilateral free trade. Hence, its adjusted rate of protection must be negative, and is here so defined.

The relationship of P^ with that of P and Pw depends on the method of support and the direction of protection. The relationship between P* and the remaining prices depends on interactions between all countries policies and the underlying market parameters. *A priori*, P* can be at any level. For positive protection cases, P is greater than Pw while for negative protection P is less than Pw, as shown in panels (c) and (d), which are typical of developing countries.

We can now summarize the effects of typical intervention mechanisms on trade distortion. First, agricultural policy sets in most countries are a complex mixture. This section has outlined the principles by which their combined effects on traded quantities and therefore on world markets and prices can be analyzed and has presented methods of measuring both the price and quantity effects of trade distortion. Second, in so doing it has been noted that PSEs (and thus their derivatives) as a modified measure of protection, do not measure support or trade distortion, while traditional measures of protection (NRP and ERP) are incomplete. Third, the analysis implies that instruments which both encourage production and discourage consumption, such as export subsidies and import taxes, are more distorting than those which affect only one side of the market, such as production subsidies. Further, instruments which curtail production while maintaining high support prices, are

less trade distorting than their unlimited counterparts (de Gorter and McClatchy), providing that these limits on production do not change trade by more than if price supports were conditional on no production limits.

Lastly in this section, the major elements of transfer efficiency can now be identified. The definition of transfer efficiency (equation 5) related producers' surplus gain (PSG) to the total PSE. The discussion of adjusted rates of distortion identifies two major leakages from the PSE in addition to the conventional net welfare costs. These can be termed the "trade offset", which captures the extra cost incurred as a result of the terms of trade effect consequences of the domestic policy set, and the "policy offset" which captures the effects of other countries policies on world prices. Thus the PSE can now be broken down as follows:

$$PSE = \text{Trade Offset} + \text{Policy Offset} + \text{Resource Cost} + \text{Real PSG} \quad (10)$$

Thus the transfer efficiency of the domestic policy set will depend on the sizes of the offsets in addition to the conventional resource cost. In particular, the policy offset can swamp the PSE and leave the transfer efficiency negative, in those cases where ARD is negative. A zero PSE will automatically be associated with a zero trade offset in the single commodity case, but a positive or negative policy offset would, in this case, result in a negative or positive PSG, in which case transfer efficiency becomes undefined according to equation (5)[15]

Cross commodity effects complicate this analysis. In a multi-commodity world, it is no longer the case that ARD is necessarily smaller than NRD. Depending on the consequences of changes in prices for other commodities, and on the price relatives ruling under the unilateral free trade scenario, it is possible that $S^* - D^*$ is greater than $S^\wedge - D^\wedge$ even though the price for this commodity has fallen. It is also possible that multilateral free trade volumes are greater (exports greater or imports lower) than current volumes for some commodities, even though $P > P^*$ and $P > Pw$ in all cases. This is especially likely for feed grains, if grain prices fall (P to P*) by a smaller proportion than those for livestock products. Under these circumstances, the feed cereal supply curve shifts to the right while the demand curve shifts to the left. Even though cereal prices fall, trade may increase, in which case the sign of ARD will be negative, as already noted above.[16]

III. Implications

In this section, we present some estimates of these various measures, for the United States and the European Community for five commodities, to illustrate the principles outlined above. Clearly, complete analysis using these concepts requires explicit models not only of the countries in question but also of the rest of the world. Any results will depend on the assumptions and parameter values of the models used. As such they will always be subject to criticism. The following results certainly suffer in this respect, but are sufficient to illustrate the concepts developed above.

Multilateral and unilateral free trade prices are those produced by Roningen and Dixit, while the base PSEs for those policies analyzed are as calculated by the USDA (US) and the OECD (EC). The results are derived from partial models of each commodity sector, including cross commodity effects. The features of the models, data and its sources are briefly described in the Appendix.

Table 1 shows estimates of rates of protection and distortion. The PSE shows the same relative values between commodities as the NRP, but, as Peters notes, the values are noticeably different and the relationship is non-linear because the base of the PSE is current support price while that for the NRP is current world price. The relationships between NRP, ERP and ARP, defined on the basis of the difference between Ps and Pw, P^ and P* respectively, show the expected relationships. That is, the rates of protection fall as we move from current world prices through unilateral free trade prices to multilateral free trade prices. Input and cross commodity effects on these prices are included in the estimates. Notice that for beef in the United States and sugar in the European Community, ARP is negative because the multilateral free trade price (P*) is above domestic support price (Ps). In the case of milk on both sides of the Atlantic, the effect of world price increases on measures of protection is especially marked. Nevertheless, for both countries, rates of protection are broadly comparable, albeit the ranking of commodities changes, especially between PSE and ARP measures of protection.

The relationships between NRD, ERD and ARD described in the previous section are also illustrated in these estimates in Table 1. There are several cases where the rates of distortion are negative; this reflects the fact that the trade position moves such that the world price increases under the particular free trade scenario for these commodities. These estimates are negative because of the

large cross price effects or because of the supply control measures currently in place that affect the change in trade in a unique manner upon their removal.

Comparison between ARD and ARP shows the importance of taking specific policy instruments into account. Rates of protection employ the support price in comparison with the relevant reference price. Rates of distortion compare traded quantities, which in turn reflect changes in trade equivalent prices, incorporating the detailed mechanics of the support mechanisms. This is especially important in United States wheat and corn, with the mixture of set-aside, deficiency payments, diversion payments and loan rates, and in EC milk and sugar, where production quotas and co-responsibility levies limit the effect of the nominal support price. In all these cases, reliance on any of the measures of protection give a false impression of the relative distortion arising from the policies.

The contrast between cereals and dairy in both countries shows the differences between rates of protection and rates of distortion. While the PSEs for these two commodities is very similar, the adjusted rates of protection show that protection on dairy is twice that of corn in the United States and half that of barley in the European Community. Adjusted rates of distortion tell a quite different story, and one which appears to conform to *a priori* expectations. Relative distortion rates are different again, being in the opposite direction in the United States compared with the European Community, except for dairy which are almost identical for the two regions. This emphasizes the importance of measuring distortion directly rather than attempting to infer it from rates of protection, however carefully measured, and also powerfully illustrates the potential for being misled by treating PSEs as if they measured world market distortion.

Table 2 shows the proportional breakdown of PSEs into Trade Offset, Policy Offset, Resource Cost and Adjusted Producer Surplus Gain, the latter being an indicator of how much better off producers of a given country are, with the current set of policies for all commodities in all countries, than they would be under multilateral free trade. The relative importance of the trade and policy offsets is particularly notable, and demonstrates the potential gains to be made through multilateral reduction of agricultural distortion. Many traditional economic welfare studies present only the deadweight loss triangles due to policy intervention (analogous to column 3 in Table 2) and argue that they are very small and insignificant (Schmitz). The true inefficiency of current policy

measures in transferring consumer and taxpayer dollars to the agricultural sector is better measured by the Adjusted PSG given in the final column of Table 2. These figures indicate that the social costs of policy intervention are very substantial.

Finally in this section, we turn to the implications of this analysis for the twin principle targets of agricultural support policies - improvement of farm returns, here measured by Producers' Surplus Gain compared with the multilateral free-trade position, and the burden of support borne by taxpayers. Traditional economic analysis usually recommends the substitution of direct income payments for current support policies on the grounds of economic efficiency. The efficiency gains result from the supposed minimization of distortion of domestic markets under direct income payments, which also results in minimum distortion of trade volumes and hence world price distortion. Two major criticisms of this recommendation are commonly encountered by policy advisors: the potential tax cost of direct payments versus instruments which often place much of the burden on consumers; the practical difficulties of designing and delivering direct income payments in a manner which is acceptable through existing political processes to producers.

Blandford, de Gorter, Gardner and Harvey have advanced the Producer Entitlement Guarantee (PEG) as a workable alternative to present support policies which incorporate most of the advantages of direct income payments while retaining at least a notional link to production, in deference to the political necessity for farmer acceptability. Under their proposal, all support would be paid through Treasury support or deficiency payments on a pre-set limited quantity of production per farm. For each country, the total quantity which could be supported would also be limited at a pre-set, fixed quantity, defined to be no greater than that quantity (the PEG) which would be produced under multilateral free-trade. All other forms of market intervention would be eliminated under this proposal. Under these conditions, conventional analysis maintains that the limited quantity receiving support payments would not affect the incentive prices facing either producers or consumers, which would be the free market world price, and hence would be non-distorting.[17] The estimates above allow the implications of such a policy alternative to be examined, both in terms of the potential cost to the Treasury and through a comparison of present levels of production with those which would obtain under multilateral free trade - the PEG as a percentage of current production. Table 3 shows these results.

In the first column, the estimated PSG is expressed as a proportion of current taxpayers expenditure on existing policy instruments, and thus representing the fraction of current tax spending which would be necessary under a PEG system to maintain existing levels of producer support (ignoring any differences between administration costs for the two policy sets). Although tax spending would need to be increased for dairy in the US and for all five illustrated commodities in the EC, cereal and beef support in the US would be cheaper for the taxpayer than current support policies. In addition, the PEG system is amenable to explicit targeting of support to the larger number of smaller producers (who produce a proportionately smaller fraction of total production), which could both be socially attractive and also reduce taxpayer commitments. Furthermore, the PSG itself is an imperfect measure of the compensation necessary for farmers because producers' surplus includes policy-induced rents to all owners of factors in less than perfectly elastic supply[18]. Thus, if farm income is the ultimate target of support, the cost is further reduced.

The second column in Table 3 shows the production levels under multilateral free trade as a proportion of current production. With the exception of dairy and sugar in the US, a substantial fraction of current production levels could be supported under a PEG scheme without distorting world markets. With the exception of sugar, EC production levels under the PEG scheme receiving support payments would have to be some fifteen percent below current production, for these five commodities, in order to be non-distorting. Given the reduction in production associated with the introduction of milk quotas in the EC, this need not raise insurmountable objections by the EC farm sector nor would the associated PEG result in excessive tax costs compared to current expenditures.

IV Conclusions

The purpose of this paper has been to demonstrate the theoretical principles according to which it is possible to separate agricultural support from agricultural trade distortion and, in so doing, clarify the meaning of protection. The need for such clarification is generated by the current GATT negotiations which have as their primary objective the reduction (elimination) of trade distortion in the face of domestic pressures which (on the basis of history) require continued support of the agricultural sector. It has been demonstrated that it is possible to separate these different concepts in the face of complex mixtures of farm policy instruments, and also possible to devise practical and acceptable methods of delivering support while minimizing trade distortion.

There are obvious advantages to the development of and agreement to some aggregate measure of protection in the GATT negotiations on agriculture (Tangermann, Josling and Pearson, 1987a,b). There is also a superficial attraction for using some modification of the PSE as such an aggregate measure, largely stemming from the fact that these data have now been prepared for the major (industrial) participants in the negotiations by an independent and multilateral agency (the OECD). This attraction leads to the search for simple rules to establish the appropriate modifications to these multilaterally accepted (if not agreed) measures for GATT purposes. The major argument of this paper, however, is that such simple modifications are bound to be grossly inadequate as measures of trade distortion.

This paper has demonstrated that, in principle, there is no necessary direct relationship between the level of protection and either the level of trade distortion or income support to farmers. In addition, our framework of analysis shows that the true inefficiency costs of intervention can be much higher than the traditional deadweight loss triangle. Furthermore, it is shown that policy offsets can easily reduce any implied gains in the trade offset for countries trying to exert their market power on world markets. Thus there are substantial gains to be made through multilateral reduction in government intervention in agricultural markets.

The measure of trade distortion, the principal contribution of this paper, illustrates the vagaries of relying on an aggregate measure such as the PSE or its derivatives. These arguments do not deny the utility of employing aggregate measures as monitoring devices for progress during the implementation phase, although such use still requires considerable interpretation and judgement as to the progress indicated[19]. But the principles of trade distortion developed in this paper can help the international community in their debate as to what proposed aggregate measure is best and in what role it might play in future negotiations. This analysis provides a basis for the GATT negotiations to condition the choice of aggregate measure of protection commitments, and help keep expectations about the results of their reduction more realistic.

Figure 1 Stylized Representation of Different Support Instruments [Single Commodity, Small Country Case]

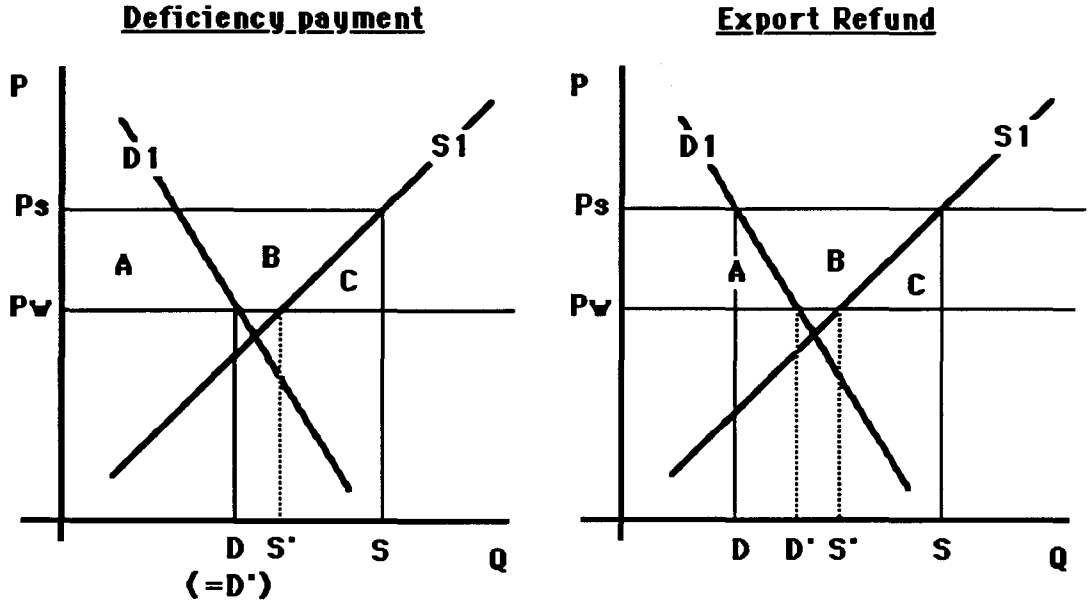

Figure 2 Stylized Representation of Different Support Instruments [Multi-Commodity, Large Country Case]

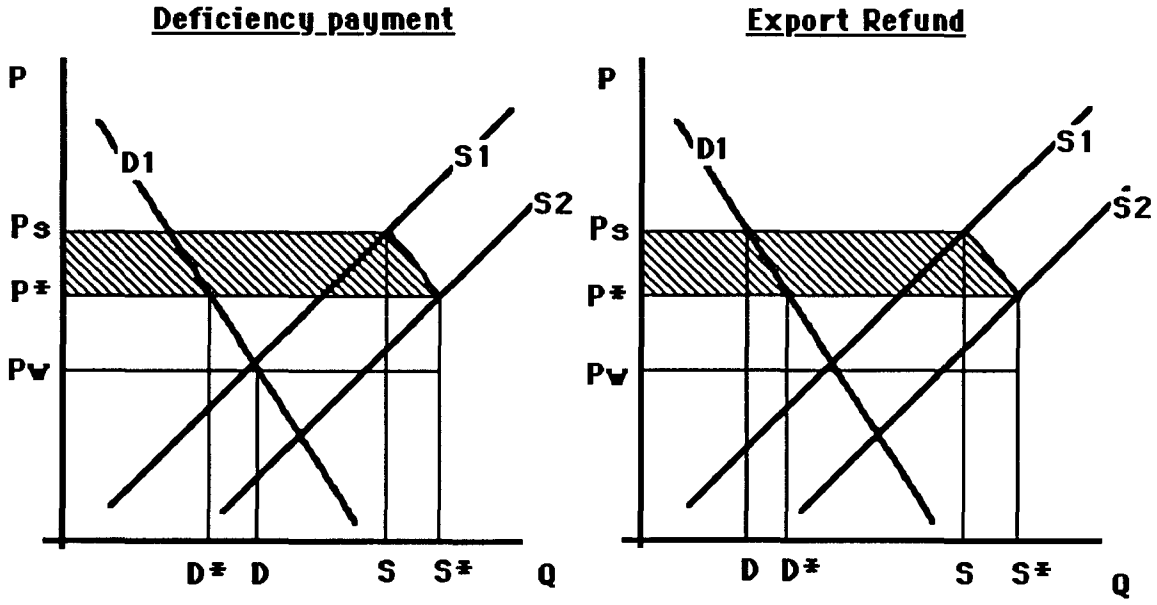

Figure 3(a) Positively Protected Importer/Exporter

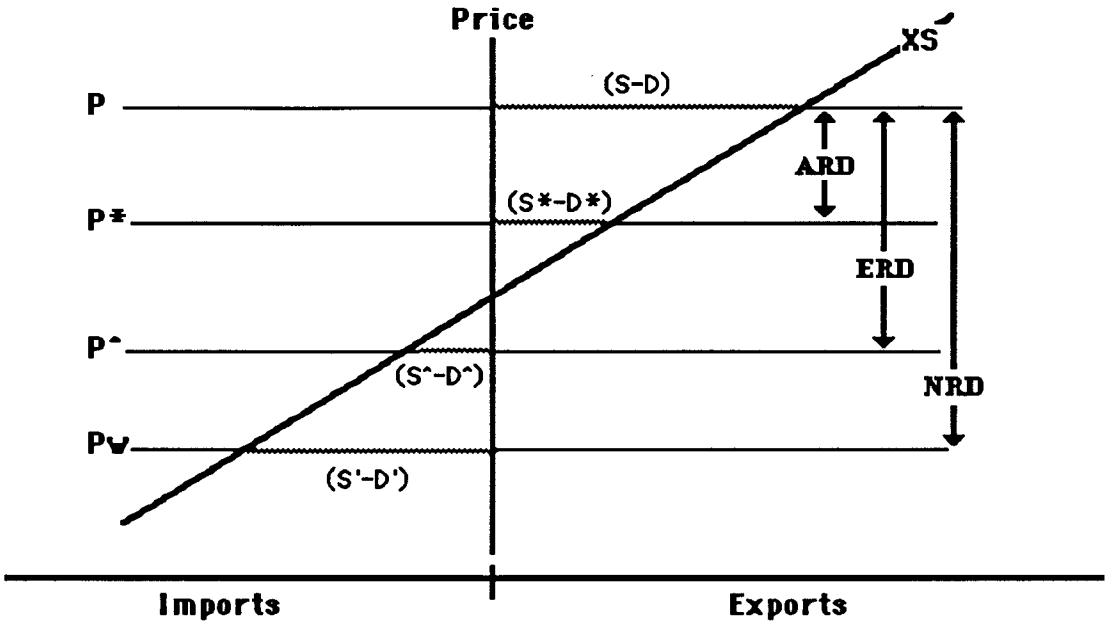

Figure 3(b) Positively Protected Small Size Large Exporter

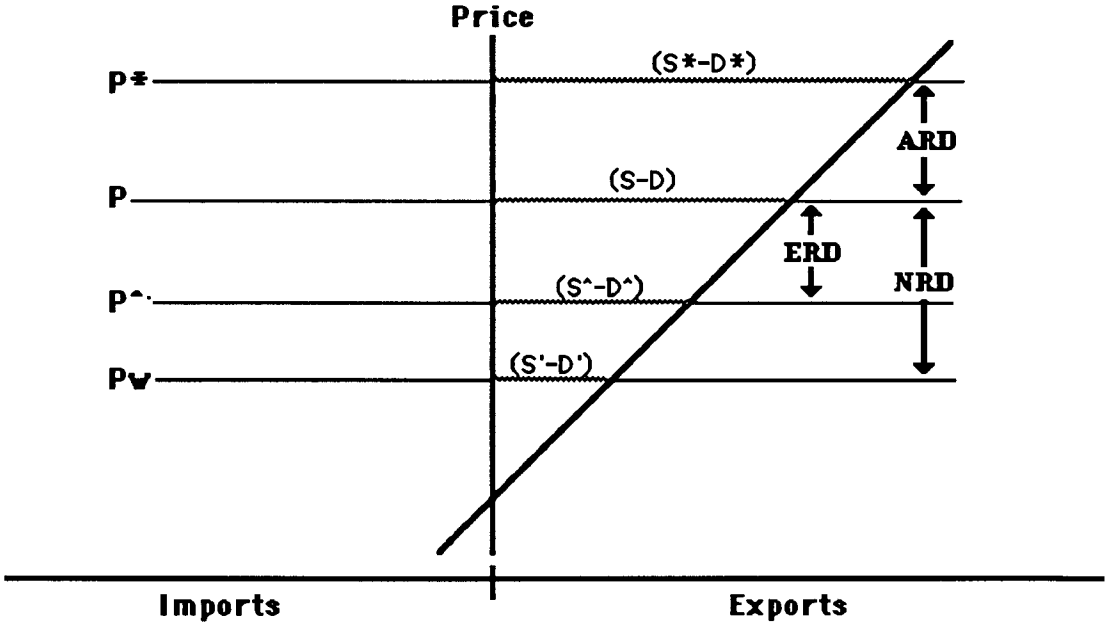

Figure 3(c) Negatively Protected Importer

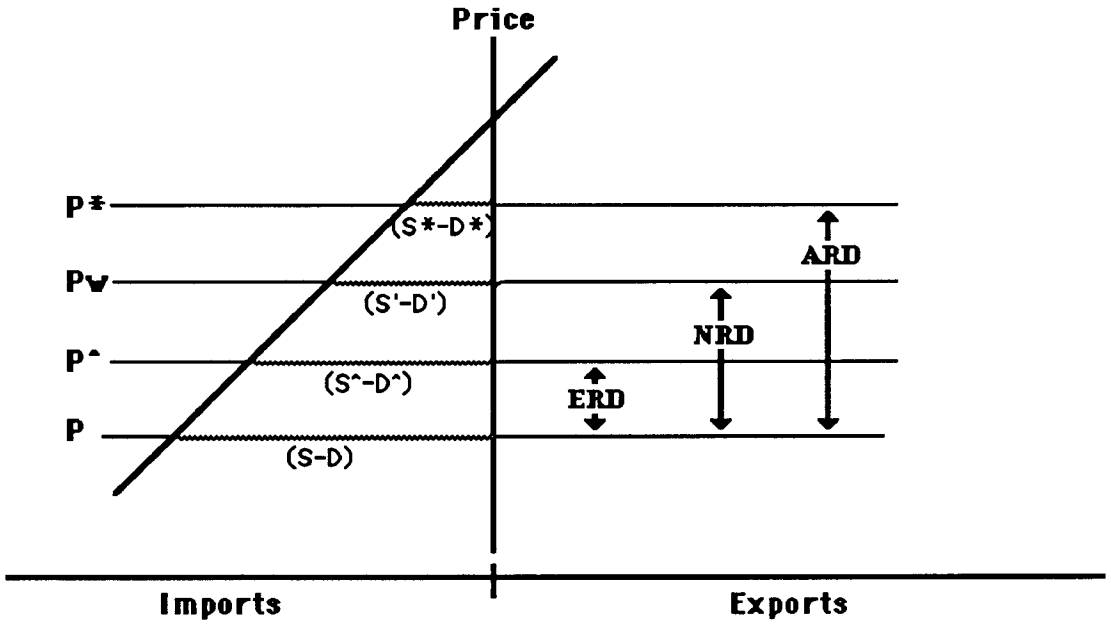

Figure 3(d) Negatively Protected Exporter

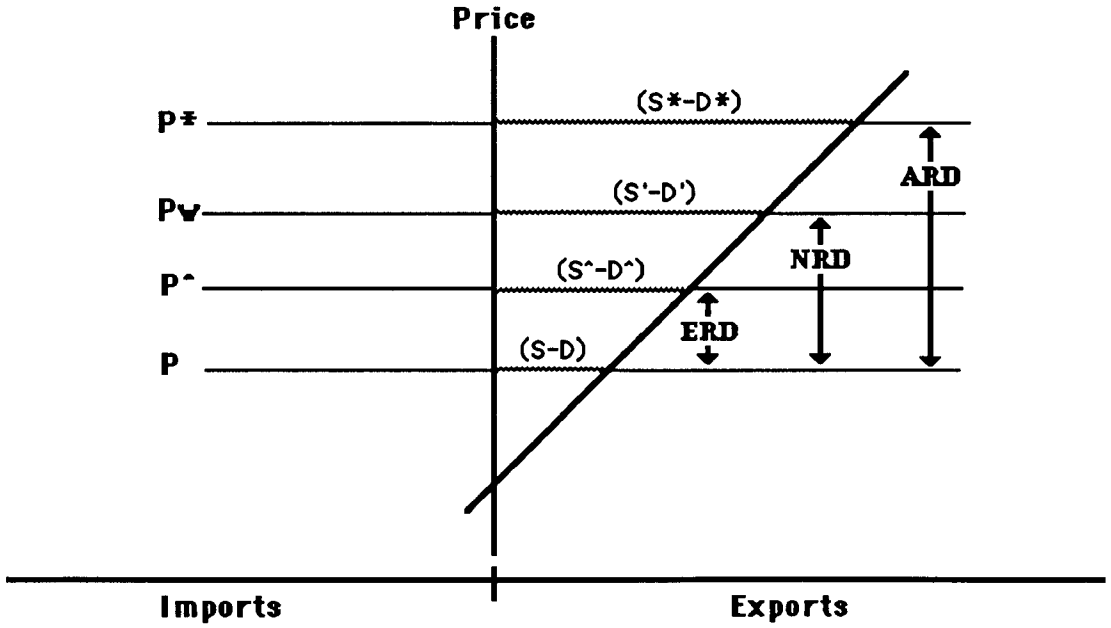

Table 1. Rates of Protection and Distortion: Illustrative Results for the US and EC (1986).

Commodity	Rates of Protection				Rates of Distortion		
	PSE	NRP	ERP	ARP	NRD	ERD	ARD
US							
Beef	8.3	9.0	4.8	-8.9	11.4	7.9	-8.4
Corn	42.6	74.3	55.1	34.7	-5.2	-11.6	-16.8
Dairy	71.9	255.4	187.2	105.4	74.9	59	35.4
Sugar	55.1	122.9	81.5	46.0	31.7	25.6	19.4
Wheat	49.2	96.7	77.8	43.9	1.7	-1.4	-11.1
EC							
Beef	47.7	91.2	71.0	59.7	78.5	63.9	55.2
Barley	63.5	173.9	158.6	124.6	32.6	37.0	32.4
Dairy	72.8	267.8	171.5	74.3	61.6	48.0	35.4
Sugar	41.7	71.41	44.5	-34.51	22.2	11.9	-2.5
Wheat	57.6	135.8	98.1	72.5	25.3	16.4	10.3

Source: calculated.

Table 2 The Component parts of PSEs for the US and EC (1986)

Commodity	% of Total PSE accounted for by:			
	Trade Offset	Policy Offset	Resource Cost	Adjusted PSG
United States				
Beef	42.3	174.4	4.0	-120.8
Corn	18.1	26.1	11.0	44.8
Dairy	6.2	14.7	13.8	65.3
Sugar	13.3	18.9	15.7	52.1
Wheat	11.4	29.9	16.2	42.5
Average US (5 Coms):	18.3	52.8	12.1	16.8
European Community				
Beef	8.6	12.9	10.4	68.0
Barley	9.2	3.4	8.1	79.2
Dairy	14.0	13.2	7.0	65.7
Sugar	47.7	26.1	3.5	22.7
Wheat	13.0	14.1	2.5	70.5
Average EC (5 Coms.):	18.5	13.9	6.3	61.2

Source: calculated.

Table 3 PEG policy costs and PEG quantities compared with current levels (1986).

Commodity	Real PSG/ Tax Cost	S*/S
United States		
Beef	0.	1.04
Corn	43.3	1.17
Dairy	337.4	0.83
Sugar	0	0.82
Wheat	35.5	1.15
Average US (5 Commodities)	83.2	1.002
European Community		
Beef	205.6	0.73
Barley	298.5	0.82
Dairy	263.6	0.71
Sugar	21.7	1.09
Wheat	298.5	0.93
Average EC (5 Commodities)	217.6	0.85

Source: calculated.

Footnotes

1. Josling (1973,1975,1980,1981), Tangermann, Josling and Pearson (1987a,b) and the OECD (p. 25) define the PSE as "the payment that would be required to compensate farmers for the loss of income resulting from the removal of a given policy measure".

2. An earlier study by de Gorter and McClatchy argues that the PSE is a modified rate of protection measure. More recently, however, Peters provides a densely argued analysis not only on the similarities but also on the differences between rates of protection and PSEs.

3. Other institutions using the PSE measure include the United States Department of Agriculture (1990) and the GATT mid-term review. It should be pointed out that there are many empirical studies that measure rates of protection in agriculture on both sides of the Atlantic, even before the PSEs became popular in the 1980's. For example, see Strak and Harling and Thompson.

4. Other proposals include the "Effective Rate of Assistance" (ERA) by Australia and the "Producer Incentive Equivalent" (PIE) by Rausser and Wright. The majority of comprehensive proposals by member countries of the GATT have also alluded to the use of an aggregate measure of protection (see the IATRC 1990a for details).

5. We use the term nominal in recognition of the fact that it is the free trade equilibrium price, rather than the current observed price, against which the consumer and economic costs of the policy should properly be measured.

6. The terms of trade effect can be and are sometimes included in a NRP. (Corden, p. 21). However, terms of trade effects are excluded from most empirical measures of NRPs and are also excluded from its definition here.

7. Note that this a different definition than the one used by Gardner 1983, who defines transfer efficiency as the economic or welfare cost of transfers to producers. This welfare efficiency of redistribution relates to the deadweight cost of policy, and has been defined (Wallace, Josling, 1969, Gardner, 1983) as the Harberger welfare triangle costs as a proportion of the producers' surplus gain. These authors also distinguish between the average and marginal efficiencies of policies. Here we are concerned with the average measures.

8. The fact that export subsidies (border protection) are more distorting than production

subsidies (deficiency payments) is already recognized in the GATT negotiations. This paper formalizes the recognition.

9. Strictly speaking, such a concept should embrace the full general equilibrium specification of the multilateral free trade position, yielding what might be termed 'general' rates of protection and distortion. However, for the purposes of the argument, we here restrict attention to the case of multilateral agricultural or sectoral free trade.

10. OECD explicitly adjust livestock PSEs for the protection of associated cereals sectors.

11. Corresponding to the effective rate of distortion are measures of effective rates of protection and effective producer surplus gains, definitions of which are not formally presented here but for which empirical estimates are given in the following section.

12. Roningen and Dixit and OECD, for example, show that world prices increase in most, though not all cases under agricultural multilateral free trade.

13. It would be possible to redefine measures of protection using the trade-equivalent support price, rather than actual support prices. The resulting measures of protection would then be the price equivalent versions of the measures of trade distortion developed in this paper. However, since distortion relates directly to differences in trade volumes, it is logical to define distortion in volume terms, as is done here.

14. This need not always be the case. Two cases result in negative rates of distortion (one of which accounts for ARD being negative in panel (b)): an exporter which becomes a larger exporter, and an importer which becomes either a smaller importer or an exporter, following introduction of free trade.

15. If one country imposes a policy that improves its terms of trade and no other country retaliates, then the trade offset becomes negative. For a given PSE, therefore, there is an increase in the real PSG. However, other countries rarely allow such to happen, often resulting in positive policy offsets that swamp this negative trade offset. This deleterious welfare effect is overlooked by those who advocate that governments should exert market power in world markets (eg, Schmitz, McCalla, Mitchel and Carter).

16. This is analogous to changes in sign of rates of protection as we move from nominal to effective measures.

17. The PEG proposal ignores the possible effects of such guaranteed payments on the risk of farm production and hence their possible effects on the position of the supply curve throughout its length. This can be justified on the grounds that some form of stabilization of returns is generally regarded as an improvement in economic efficiency in any event, and also on the grounds that progress towards minimizing distortion within the constraints of existing political processes is a good thing. In addition, the existence of current policies has, by the same token, already shifted supply curves. More limited support than current levels can hardly do other than shift existing curves to the left, if at all.

18. That is, rents earned by farmers through their own labor, management and risk-taking represent only a fraction of producers' surplus gain. For a good discussion on how the benefits of commodity policy is distributed to land rents and non-farm input suppliers, see chapter 4 in Gardner (1987).

19. The PSE and nominal rates of protection measures (as well as some other possible contenders for an aggregate negotiating measure such as the Price Adjustment Gap) have an undoubted advantage in that they rely solely on observed data for their calculation. However, it is precisely this feature which prevents them measuring trade distortion except by accident.

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Data Appendix

Constant elasticity supply and demand functions are specified for each commodity. These models were closed using change in inventory and trade data. All quantity and observed price data for the United States were obtained from various issues of the USDA's (ERS) Situation and Outlook Reports for Livestock and Meat, Feed, Dairy, Sugar and Sweetners, and Wheat. For the European Community, all quantity and observed price data were obtained from the OECD estimates of the Community's PSEs (OECD: PSE and CSE Tables 1979-1987 DAA/2001, April, 1989.)

The elasticity estimates used in these models are reported in Table A1. The world prices under the status quo and the unilateral and multilateral trade liberalization scenarios are given in Table A2. Data relevant to policy interventions are summarized in Table A3.

The policy coverage for the United States is as follows. The 'voluntary' export restraint for beef in the United States is estimated to increase domestic prices by nine per cent (Australian Bureau of Agricultural and Resource Economics). The effects of target prices, acreage diversion, diversion and storage payments for participating farmers are evaluated for the corn and wheat sectors. The price discrimination scheme for milk is analyzed in the dairy sector along with government removals, import quotas and the blend price received by farmers (net of the special assessment in 1986). The basic sugar price support scheme coupled with the import quota represents the policy coverage for the sugar sector.

The policy coverage for the European Community follows the stylized representation of import levy/export refund policies with two important exceptions. The impostion of milk quotas in 1984 has resulted in the 1986 support price/quantity observation lying above the underlying supply curve. Currently unpublished research by Hubbard (Newcastle, UK) and Mahe (Rennes, France) both suggest that the quota value, representing the divergence of supply from the observed support price is about 18%. Accordingly, the 'effective' supply price for milk is set 18% lower than the observed support price. For sugar, the fact that most member states of the EC produced 'C' quota sugar, which is subject to a producer levy equivalent to the difference between the support price and the world price, is reflected by setting the producer 'incentive' price equal to the world price.

Table A1
Matrix of Elasticities for the United States/European Community

Commodity	Beef	Corn*	Dairy	Sugar	Wheat
Demand					
Beef	-0.7/-0.7	-	0.03/-	-	-
Corn	-0.4/-0.35	-	-	0.01/-	0.04/0.13
Dairy	-	-	-0.11/-0.1[1]	-	-
Sugar	-	0.16/-	-	-0.24/-0.48	-
Wheat	-	0.15/-	-	-	-0.35/-0.48
Supply					
Beef	0.65/0.56	-0.09/-0.02	-	-	-
Corn*	-	0.48/0.57	-	-	-0.09/-0.31
Dairy	0.03/0.12	-0.06/-0.03	0.50/0.65	-	-
Sugar	-	-/-0.01	-	0.50/0.17	-0.09/-0.02
Wheat	-	-0.25/-0.17	-	-0.01/-	0.60/0.52

* Barley for the EC.

1. Fluid milk only in the US. The elasticities for manufacturing milk demand was -0.62 in the United States. Since the OECD estimates of PSEs, on which the EC results are based, report milk as a total, the manufacturing and fluid milk elasticities were aggregated in the EC case.

Source: Roningen and Dixit.

Table A2
World Prices ($/tonne in 1986).

	Actual[1]		Unilateral[2]		Multilateral[2]	
	US	EC	US	EC	US	EC
Beef	992.4	1571.0	1032.1	1756.4	1187.6	1880.0
Corn*	59.0	60.7	66.3	64.3	76.3	74.0
Dairy	75.2	75.2	93.1	101.8	130.0	130.0
Sugar	161.2	186.5	198.0	221.2	246.1	284.8
Wheat	80.6	80.5	89.1	95.9	110.2	110.1

* Barley in the European Community.

1. Source is the OECD PSE and CSE Tables 1979-1987 DAA/2001, April, 1989.

2. Per cent change in world prices obtained from Roningen and Dixit, and from personal correspondence.

Table A3
Policy Parameters (1986)

	Support Prices[1] ($/tonne)	Acres Diverted (million)	Diversion and Storage payments (million $)
Beef			
US	1081.7[2]	-	-
EC	3003.1	-	-
Corn			
US	119.3[3]	13.7	490.6
EC	166.2	-	-
Dairy			
US	267.1[4]	-	-
EC	226.7[5]	-	-
Sugar			
US	359.3	-	-
EC	186.5[6]	-	-
Wheat			
US	160.9[2]	21.0	385.7
EC	189.9	-	-

* Barley in the European Community.

1. Program yields for corn and wheat of 105 bu/acre and 35 bu/acre, respectively, were used to calculate deficiency payments in the US.

2. The Australian Bureau of Agricultural and Reource Economics estimate that the US domestic price increased approximately nine per cent due to the VER for beef.

3. Target prices for participant output only.

4. Producer average price net of assessment of $8.37 per tonne. Fluid milk consumption price in the US is $299.7 per tonne and the manufacturing milk price of $260 per tonne.

5. Price reduced by eighteen per cent to account for the effect of quotas on the milk supply curve.

6. Sugar price entered as the refererence price since "C" quota production occured in the majority of cases in 1986. The domestic consumption price is $345.3 per tonne.

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