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International Agricultural Trade  
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A Simple Measure for  
Agricultural Trade Distortion

by

Vernon O. Roningen and Praveen M. Dixit\*

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**A Simple Measure for Agricultural Trade Distortion.** By Vernon O. Roningen and Praveen M. Dixit, Agriculture and Trade Analysis Division, Economic Research Service, U.S. Department of Agriculture.

#### **Abstract**

A simple measure is proposed that estimates the volume of trade distortion caused by the agricultural policies of trading countries. The index, called a TDS (trade distorted by support), would be useful for trade analysts to compare the trade impact of agricultural support policies across countries and commodities. The TDS index can be calculated largely from existing information on agricultural support. A TDS index might also be used to assess damages in trade dispute settlement cases.

**Keywords:** indicators, producer subsidy equivalent, trade distortion, trade models, trade negotiations, trade policy, GATT.

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## Contents

	<u>Page</u>
Introduction .....	1
The Economics of Trade Distortion .....	2
Trade Distortion Viewed from the GATT .....	4
A Measure of Trade Distortion: The TDS (Trade Distorted by Support).....	5
Empirical Examples of TDS Estimates .....	8
TDS Estimates for Wheat .....	9
TDS Estimates for Sugar .....	11
The TDS as a Trade Distortion Monitoring Device .....	13
The TDS as a Tool for Trade Disputes and Trade Negotiations .....	14
Limitations of the TDS Measure .....	15
World Price Feedback Effects .....	16
Cross-Commodity Effects .....	16
Conclusions .....	17
References .....	19
Appendix 1: TDS Estimates for Selected Products and Countries .....	21

## A Simple Measure for Agricultural Trade Distortion

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### Introduction

Discussions on agricultural trade negotiations during the Uruguay Round of GATT (General Agreement on Tariffs and Trade) negotiations have often revolved around an aggregate measure of support (AMS) such as the producer subsidy equivalent (PSE).<sup>1</sup> Proposals tabled by a number of contracting parties, including the United States, the European Community (EC), and the Cairns Group, have offered some form of AMS as an instrument for negotiations (Chattin and Wise, 1989). The AMS has facilitated trade negotiations in agriculture by providing a common measure of support to agriculture across countries and products where a wide variety of complex policies are used to provide that support.

The use of the AMS for international negotiations in agriculture has not been without criticism (IATRC, 1990). Many argue that such indices measure the extent of support to agricultural producers and not necessarily the degree of trade distortion (Hertel, 1987; McClatchy, 1987; de Gorter and Harvey, 1990; Roningen and Dixit, 1989). They point out that the link between levels of aggregate producer support and impact of that support on trade can be very weak. The exclusive use of aggregate measures of support as a negotiating or monitoring device could consequently detract from a principal objective of the GATT, the minimization of global trade distortion resulting from support policies.

For international negotiations, it is important not only to measure the level of a support policy which affects trade (such as a trade barrier) in price terms, but also to provide an estimate of the effect of that barrier on world trade in quantity terms. Such estimates provide a basis for negotiating and balancing trade concessions and fixing retaliatory measures in response to GATT-adjudicated trade disputes. GATT activities include the identification of policies that affect trade, an assessment of injury from those policies, the balancing of concessions, and procedures to monitor and police an open trading system. A simple measure that addresses all these issues might help discipline the trade distortion resulting from agricultural support policies.

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<sup>1</sup> The AMS is a measure of total assistance given to producers from support policies. The AMS allows comparison of support across commodities and countries even though the support structures and policy instruments differ. The PSE is one form of an AMS and is the amount of income the producer receives from government support policies. For details on the use of AMSs in Uruguay Round negotiations and definitions of PSEs, see IATRC (1990).

This report presents a relatively simple, but practical measure of agricultural trade distortion that can be used to evaluate trade concessions and assess damages from protectionist policies. Based largely on published PSE information, the measure is designed to foster a better understanding of the trade distortionary implications of the complex mix of domestic and trade policies affecting agriculture. The proposed measure clearly labels component policies as adding to, or detracting from, the existing net trade position compared with a policy-free net trade position.<sup>2</sup> An important argument for such a measure is that, as partial liberalization occurs in major trading countries with a GATT agreement, it is crucial to document and encourage those policy alternatives that produce less, rather than more, trade distortion.<sup>3</sup>

The paper begins by explaining the differences between measures of support and trade distortion from an economic point of view. A brief historical view of the problem as seen from the GATT argues for new ways of making trade-distorting policies transparent. The paper then develops a simple algebraic expression to measure the trade distortion created by agricultural support policies. Empirical estimates for a few select commodities and countries are presented next. Applications of the approach to assess trade concessions and damages follow. The paper concludes with advantages and limitations of the measure, and suggestions for its use.

### The Economics of Trade Distortion

To see the difference between measures of support and of trade distortion, consider figure 1 which depicts a stylized situation for a small-country importer of an agricultural product.

P is the (free-trade) world price while P' is the internal market price with a tariff T ( $T = P' - P$ ). At internal price P', supply is S', demand is D', and quantity (S'-D') is imported. The PSE, defined as the payment required to compensate farmers for the loss of income resulting from the removal of a given policy measure (Josling, 1981), is area (T\*S') in value and T/P' in percent. The extent of trade distortion, measured as the change in the volume of external trade vis-a-vis a free-trade environment, is (S'-S)+(D-D').

Now consider a second PSE alternative in which producers receive a direct per unit subsidy of T while consumers face the world price P. Here the PSE would still be T\*S', but because consumption is at D, D-S' would be imported and the amount of trade distortion would be only S'-S. Hence, even though the amount of support to producers is the same in both cases, the extent of trade distortion is very different.

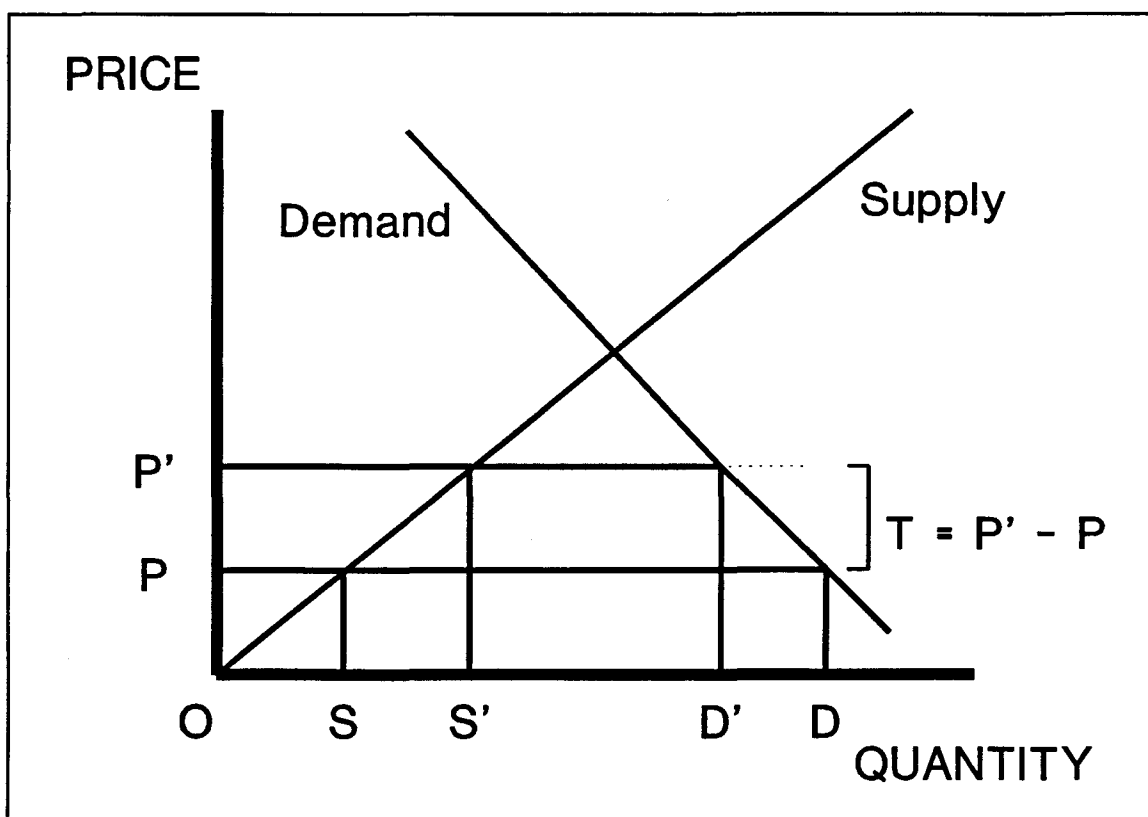
What is the source of difference between the two alternatives? The type of

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<sup>2</sup> The operational definition of trade distortion is existing trade compared with what would occur if support policies were removed (a free trade policy regime).

<sup>3</sup> Trade negotiations aim to minimize trade distortion. Complete success means the complete removal of policies that prevent specialization and trade according to the principles of comparative advantage. Pending the complete removal of trade-distorting practices, the minimization of the trade-distorting effects from existing policies is desirable.

Figure 1--Comparing measures of support and trade distortion



support characterized by  $T$  (tariffs, quotas, or export subsidies) in our first example can be labelled "market price support";  $T$  supports the domestic market by driving a wedge between the domestic and world prices. Trade distortion resulting from market support policy has both a production ( $S'-S$ ) and a consumption ( $D-D'$ ) effect. Direct (income) support in our second example, on the other hand, affects only the producer side of the domestic market ( $S'-S$ ), and therefore distorts trade less.

Trade distortion would not exist at all if producers were to receive a direct subsidy (PSE) of  $T \cdot S'$  but are not permitted to produce more than  $S$  because of supply control restrictions (the per unit subsidy to producers would be greater than  $T$ ). Now, even though the PSE is still equal to  $T \cdot S'$ , trade distortion is zero because the country is importing the free-trade quantity  $D-S$ . Here, a direct payment program is accompanied by an offsetting policy that restricts production enough to ensure that trade occurs at the subsidy-free level. Trading partners are directly unaffected by this policy mix of a PSE and supply controls (their exports are at free trade levels).<sup>4</sup>

These examples illustrate that identical measures of support (for example, the PSE) do not necessarily yield identical measures of trade distortion. Why might this be important for the trade negotiations? Because important cases exist in agricultural policies where the linkages between support and trade distortion are weak. Furthermore, if negotiations are done solely on the basis of support measures such as the PSE, countries could undertake "policy switching" to ensure

<sup>4</sup> Indirect effects on consumers from taxes paid to provide the support may still exist.

that support commitments are met without lowering levels of trade distortion (Hertel, 1987). Conversely, a TDS focus could encourage the redesign of support policies that maintained a given level of support with minimal trade distortion.

### Trade Distortion Viewed from the GATT

The principal objective of the GATT is to reduce, in a nondiscriminatory fashion, existing barriers to trade. Barriers to trade have been negotiated largely in terms of tariffs, and the GATT has been an institution which arranges for the orderly maintenance and reduction of tariffs. Tariff rates have been reduced through a series of tariff-cutting exercises following various rounds of GATT negotiations (Bhagwati, 1991).

Tariff reductions in the GATT are made on a reciprocal basis. If negotiated reductions in a country's tariffs are withdrawn, trading partners losing benefits can withdraw their own concessions as compensation. Calculations relating to trade prevented by tariffs (trade distortion) serve as informal accounting devices for negotiators. All of the calculations for negotiations and adjudication of disputes are typically done with information on tariffs and trade.

A key problem for the current Uruguay Round of trade negotiations is that many, if not most, of the important policies that affect trade are not tariffs. In agriculture, there are import quotas, variable levies (tariffs whose levels vary with world market conditions), or direct payments (sometimes with obligations) to producers or consumers. Many agricultural policies have a goal of stabilizing domestic prices which implies policy levels that vary over time.

Policy instruments such as direct payments and associated obligations have not been measured or monitored in the GATT. However, as the Uruguay Round began, the Organization for Economic Cooperation and Development (OECD) adopted a method to add up various agricultural support measures with an AMS known as the producer subsidy equivalent (PSE). This measure focuses on the total support given to agricultural producers. The virtue of the PSE measure is that it allows the adding of support from traditional market price support measures such as tariffs, quotas, and export subsidies (border support measures) as well as other support measures such as direct payments to producers and consumers (internal support measures). For the first time, the PSE afforded a simple, practical comparison of support to agricultural producers across products and countries, making the negotiation of reductions in agricultural support a real possibility in the Uruguay Round of trade negotiations.

Parties to the Uruguay Round negotiations approached the agricultural support problem in various ways. Since the GATT traditionally deals with tariffs, some proposals, such as those by the United States and the Cairns group, contain "tariffication" schemes where import quotas would be converted to tariffs and then dealt with via historical GATT procedures. These same proposals also suggest that commitments on export subsidies be negotiated separately, and that internal trade-distorting subsidies, defined as market price support, direct payments, and other internal policies, be measured by an AMS.<sup>5</sup> Other proposals,

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<sup>5</sup>Because it is virtually impossible to separate protection generated by market access policies from those created by market price support policies, some have questioned the validity of this approach.



such as that by the European Community, advocate using an AMS to deal with all forms of agricultural support including tariffs, variable levies, export subsidies, and direct payments.

From a GATT viewpoint, the levels of policy instruments are the subject of negotiation. In past negotiations, the instruments have been mainly tariffs, and the trade effects of tariff changes have served to value the negotiated reductions in policy levels. For the Uruguay Round, AMS measures are being viewed as full or partial instruments for negotiations, similar to tariffs. In and of itself, there is nothing wrong with this. Unfortunately, measures like the PSE could be considered appropriate proxies for the trade effect of their component policies. This could be misleading because PSEs do not necessarily provide a proper representation of the extent of trade distortion.

Measurement of policy levels and accompanying measurement of the resulting trade distortion are inescapable practical requirements for successful GATT negotiations. The transparency of policy levels that arises from measures like tariffs/AMSs makes negotiations possible. An accompanying focus on the trade-distorting effects of policies might facilitate the bargaining process. To date, the GATT negotiations have elicited proposals for measuring policy levels via tariffs and/or AMS measures. We believe that a simple, practical, and transparent measure of trade distortion would be a useful addition to the GATT negotiations to highlight the GATT goal of minimizing trade distortion.<sup>6</sup>

#### A Measure of Trade Distortion: The TDS (Trade Distorted by Support)

Because an AMS may not provide an accurate representation of the trade distortionary implications of agricultural policies, we propose a direct "trade distorted by support" (TDS) measure.<sup>7</sup> The TDS would measure changes in the volume of net trade from existing levels if a country completely eliminates all support to the commodity. The TDS measure would force a clear accounting of the trade distortion caused by policies in effect. Trade-offs could be measured not only in terms of policy levels, but also in terms of their contribution to the removal of trade distortion.

The TDS measure is  $(S' - S) + (D' - D)$  if only a tariff (T) existed (refer to fig. 1). In most instances, however, a tariff is only one of many instruments in use.<sup>8</sup> Hence, the TDS in volume terms can be expressed more generally as:

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<sup>6</sup> Another way of putting it would be to say the GATT negotiations aim to isolate interventionist policy effects within the country instituting the policies. From the viewpoint of trading partners, world prices and trade should remain at policy-free levels. This would mean that trading partners or competitors of the interventionist country would not be affected by the country's policies either through world prices or trade flows.

<sup>7</sup> McClatchy (1987) discussed such a measure in the early stages of the Uruguay Round.

<sup>8</sup> The earlier examples of different trade distortion with the same PSE measurement (fig. 1) show why it is difficult to capture a trade distortion effect in price, rather than volume terms.

$$TDS_i = \frac{q_s * e_s * s_m - q_d * e_d * s_m}{\text{Domestic Market Support}} + \frac{q_s * e_s * s_p - q_d * e_d * s_c}{\text{Direct Payments to Producers/Consumers}} + \frac{q_s * e_s * s_i}{\text{Other Producer Support}} - \frac{sso}{\text{Offsets To Support}}$$

where for each commodity  $i$ ,  $e_s$  and  $e_d$  are own-price supply and demand (negative) elasticities,  $q_s$  and  $q_d$  are observed production and consumption quantities,  $s_m$  is market support ratio (applies to supply and demand),  $s_p$  and  $s_c$  are direct (income) support rates for producers and consumers,  $s_i$  is the support ratio for all other types of assistance to producers, and  $sso$  is the set-aside offset, usually resulting from direct payments to producers.<sup>9</sup> The support ratios represent support levels per unit of commodity compared with domestic prices.

The first two terms in the equation,  $(q_s * e_s * s_m)$  and  $(q_d * e_d * s_m)$ , define distortions resulting from domestic market support policies. These refer to border policies that typically tax consumers to pay for producer support. This type of support has two similar effects on a country's net trade: (1) a production effect under which higher producer prices and more production imply more exports and/or less imports, leading to more net exports (exports-imports) and greater trade distortions ( $S'-S$  in fig. 1), and (2) a consumption effect under which higher consumer prices and less consumption lead to more net exports and larger trade distortions ( $D'-D$  in fig. 1). Hence, if tariff  $T$  (or the equivalent quota of  $T = D'-S'$ ) were the only operative policy instrument, then the trade distortion would be represented by  $(S'-S)+(D-D')$ .

The third  $(q_s * e_s * s_p)$  and fourth  $(q_d * e_d * s_c)$  terms define distortions created by direct payments to producers and consumers, respectively, by the government (taxpayer). This type of payment has different net trade effects depending upon whether and how much the producer or consumer benefits from the policy. Payments to producers raise incentive prices, encouraging production and generating more exports and/or less imports (increasing net exports). Payments to consumers, on the other hand, raise consumption and discourage exports and/or encourage imports (decreasing net exports).

The fifth term in the equation,  $(q_s * e_s * s_i)$ , defines distortions created by all other types of support to producers. This includes policies such as input subsidies, infrastructural investments, and research and development expenditures. Such policies normally encourage production and generate more exports and less imports. Our approach assumes that the incidence of intervention for (producer) income support and input assistance are the same, implying that equivalent levels of support for  $s_i$  and  $s_p$  result in identical production effects.<sup>10</sup>

The final term ( $sso$ ) refers to policies which offset trade distortions. These

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<sup>9</sup>PSEs and CSEs published by the USDA (1990) and the OECD (country studies and monitoring reports) are disaggregated into various policy components. Market support (price intervention) and direct income support are two such elements. Others include input assistance, economywide policies, and regional policies.

<sup>10</sup>If policies relating to input subsidies, infrastructural investments, and research and development were to be excluded from negotiations, this term in the equation could be dropped.

are policies that require production or consumption disciplines in order for producers and/or consumers to be eligible to receive direct payments.<sup>11</sup> Offsetting policies discourage production and exports or encourage imports. The result is less net exports.

The TDS defined above is a volume measure of trade distortion created by specific forms of government intervention for a given year, country, and commodity. Josling (1991) points out that for a measure to be "desirable," it should, among other things, be comparable over time, commodities, policies, and countries. The TDS as defined above facilitates comparisons over policies and countries but not necessarily over commodities. One simple means of making the TDS a more appealing instrument for making comparisons across commodities is to express it in percentage form. An index that measures the relative trade distorted by support (RTDS) for commodity i may be expressed as:

$$RTDS_i = TDS_i / \{[(\text{Subsidy-free production})_i + (\text{Subsidy free consumption})_i] / 2\}$$

where, TDS is the volume of trade distorted by support, subsidy-free production is the production that would exist if the country did not have any support and is defined as  $(q_s + q_s * e_s * s_m + q_s * e_s * s_p - q_s * e_s * s_i - sso)$ , and subsidy-free consumption is similarly defined as  $(q_d + q_d * e_d * s_m - q_d * e_d * s_c)$ .<sup>12</sup> The RTDS index measures the distortion in a country's trade relative to its subsidy-free domestic market.<sup>13</sup> It does not tell us the country's contribution to global trade distortion. In other words, identical RTDSs across countries suggest that each country's trade is equi-proportionately distorted, not that they contribute equally to global distortion.

Another way to compare distortion across commodities is to convert the volume measure of TDS to a common currency. This value of trade distorted by support (VTDS) is obtained by multiplying the TDS by the world (border) price. The VTDS measure, as will be shown later, can also be used to assess damages to the rest-of-the-world resulting from a country's domestic and trade policies. Constant currency conversion rates could be used to make comparisons across time in "real" terms. Exchange rate conversion to dollars would facilitate comparisons across countries.

The TDS measures the first round effects on world markets from a removal of support for a single commodity. It does not reflect cross-commodity effects nor the feedback world price effects. A more complete means of calculating the trade distortions caused by policies would be to use the AMS and set-aside measures in a multicountry, multicommodity world agricultural trade model with the

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<sup>11</sup> There are many approaches one could take to calculate production/consumption offsets. Haley, Herlihy, and Johnston (1991) illustrate one method to obtain estimates for U.S. land set-aside programs.

<sup>12</sup> Choice of the normalization factor is based on the need to account for the size of a country/sector as well as the need to prevent the index from collapsing to zero or becoming undefined as trade volumes approach zero.

<sup>13</sup> In terms of figure 1,  $RTDS = [(S' - S) + (D' - D)] / [(S + D) / 2]$ .

appropriate parameters.<sup>14</sup> This has in fact been done in a number of studies, including Tyers and Anderson (1986), OECD (1987a), and Roningen and Dixit (1989).

While these empirical studies may have used a conceptually superior approach to calculating the trade distortion arising from support, most policymakers and negotiators are unlikely to rely extensively on a modeling framework in trade negotiations. Negotiators typically focus only on the first round effects of policy changes in assessing trade concessions and injuries. Under these circumstances, it is judicious to devise a measurement system that is simple to use and yet reasonably accurate. The TDS meets these criteria, thus making it a useful tool to help policymakers and negotiators gauge the distortionary implications of policies with existing data without resorting to a large economic model.<sup>15</sup>

### Empirical Examples of TDS Estimates

Several types of data are needed to calculate the TDS measure: production and consumption data, PSE and CSE information disaggregated into market support policies and direct payments, information on policies that offset trade distortions such as supply or consumption control schemes, and own-price elasticities of supply and demand. Policy support and quantity data are published in various OECD country and monitoring reports (OECD, 1990; OECD, 1987a; OECD, 1987b). Elasticity estimates and supply control information match those used in USDA's SWOPSIM model (Sullivan, Wainio, and Roningen, 1989). The same own-price elasticity estimate--the production or consumption weighted average of own-price elasticities for OECD countries--was used across countries for each commodity.<sup>16</sup>

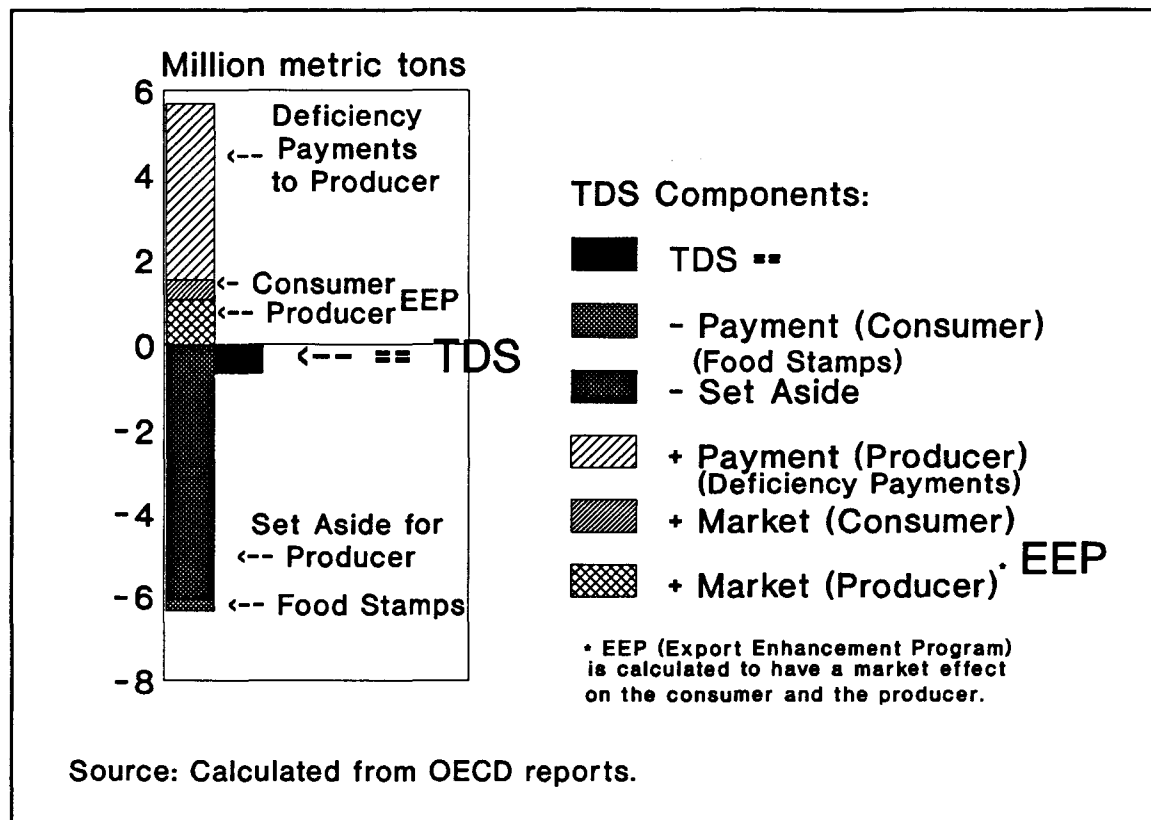
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<sup>14</sup>An AMS, in contrast to a TDS, does not contain an estimate of the subsidy equivalent of production control measures. In terms of the analytical framework in figure 1, the TDS accounts for this additional (domestic) policy-based shift in the supply schedule.

<sup>15</sup>That is not to say a model is not useful for the calculation of full economic effects resulting from a trade negotiation. Even if a TDS measure is calculated, a full modeling of the information will be useful. But there are many cases where it is practical to do simple calculations with existing data, particularly at a detailed commodity level. The performance of the simple TDS measure is gauged by comparing TDS estimates with more complex model results later in this report.

<sup>16</sup> Supply and demand elasticities tend to be similar for models of major trade countries. Since the elasticities serve as weights for adding up the trade effects from "supply" and "demand" changes, the assumption of identical weights greatly simplifies the calculation process. Then, differences in TDS measures do not derive from elasticity assumptions.

Figure 2--Program components of the U.S. TDS for wheat



TDS measures were calculated for the 13-commodity, 11-country PSE data set published by the OECD (OECD, 1991). For illustrative purposes, however, we focused only on wheat and sugar estimates for 1989/90, the last year for which published data were available. Empirical estimates for other commodities in the OECD data set are provided in Appendix 1.

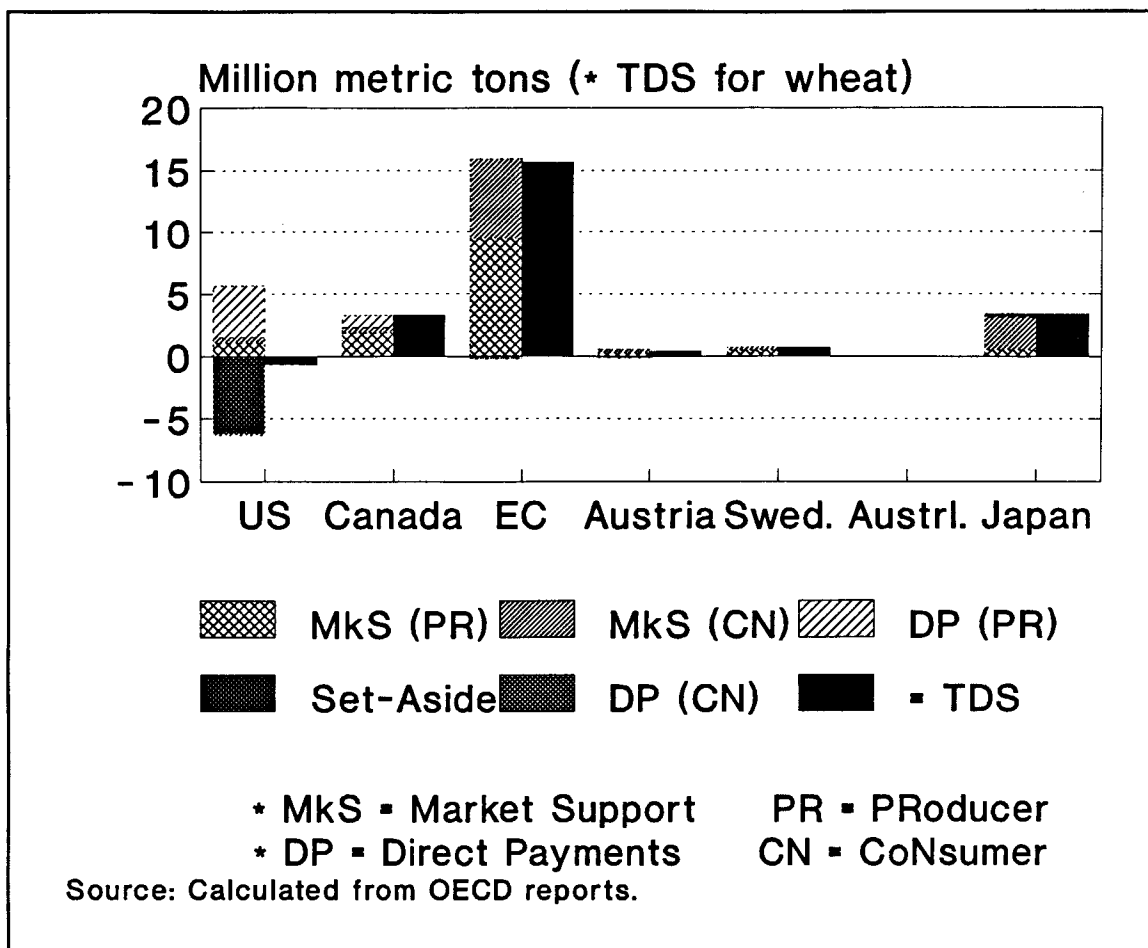
Figure 2 shows how the components of U.S. programs affect the production/consumption and therefore the net trade distortion of wheat. In this example, the net TDS (a negative number quantity of trade distorted by support) is a sum of the positive and negative components. For wheat, U.S. set-asides offset other parts of the programs such as direct deficiency payments to producers and market support via the export enhancement program (EEP).

#### TDS Estimates for Wheat

Figure 3 shows TDS estimates for the United States and other OECD countries. The estimates indicate that U.S. policies distort the world wheat market very little, if any, compared to other countries.<sup>17</sup> EC policies, on the other hand, distort wheat trade (16 million metric tons) more than the combined effects of all other countries shown in figure 3. This large difference between U.S. and EC wheat trade distortion occurs because of the different structure of support policies

<sup>17</sup>A negative TDS indicates that the country's policies help off-set the trade distortion created by policies of other countries. Put differently, the country's policies raise rather than depress world prices because the country contracts trade (net exports) below its free-trade level.

Figure 3--Policy contributions to the TDS for wheat



in the two countries. A market support policy that affects both consumption and production by reducing net imports is a major element of EC policies while direct income support policy, which distorts only production, is the mainstay of U.S. policies. U.S. programs also include set-asides which offset trade distortion, but no such provision exists for EC wheat programs. Almost the entire trade-distorting effect from U.S. price and income support policies are offset by set-aside requirements, making the U.S. wheat program trade-neutral in 1989/90.

These results also show the importance of distinguishing between measures of support and distortion. Figure 4 shows the distribution of the total TDS for wheat trade in 1989/89 among several OECD countries. While the United States accounts for 20 percent of wheat support, it contributed none of the trade distortion created by these OECD countries. In fact, U.S. programs offset the trade distortion caused by other OECD countries. The EC,

Figure 4--Share of trade distortion and producer support for wheat

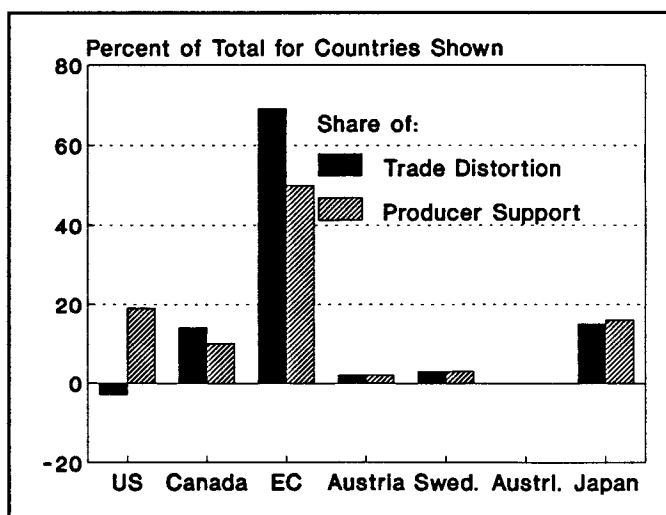
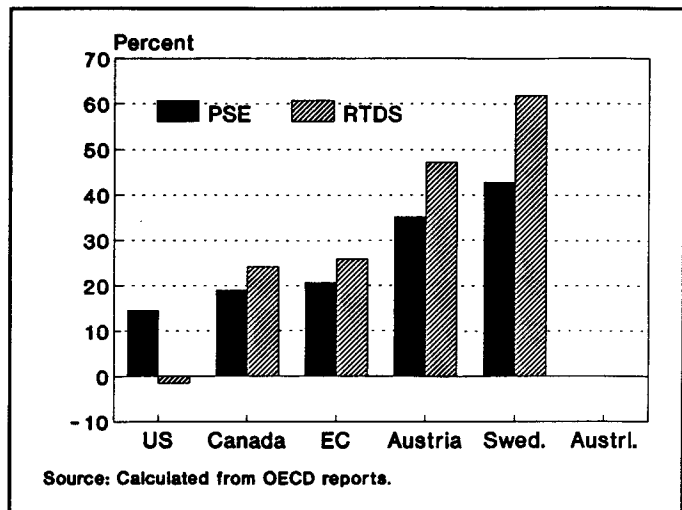


Figure 5--Comparison of PSEs and RTDs for wheat

on the other hand, accounted for nearly 60 percent of total support, but generated nearly 75 percent of the total trade distortion.

That the PSE might not be a good approximation for the levels of trade distortion is also apparent from the RTDS index (fig. 5). The RTDS index, as mentioned earlier, normalizes the volume of a country's trade distortion by the size of the subsidy-free domestic market. A comparison of the RTDS wheat index for the United States and the EC with the corresponding PSE measure shows large discrepancies between the two measures. The RTDS index indicates that EC wheat policies were much more distortionary (25.6 percent) in 1989/90 than U.S. policies (-1.8 percent), even though the wheat PSE rates for both economies are roughly similar (15-20 percent).

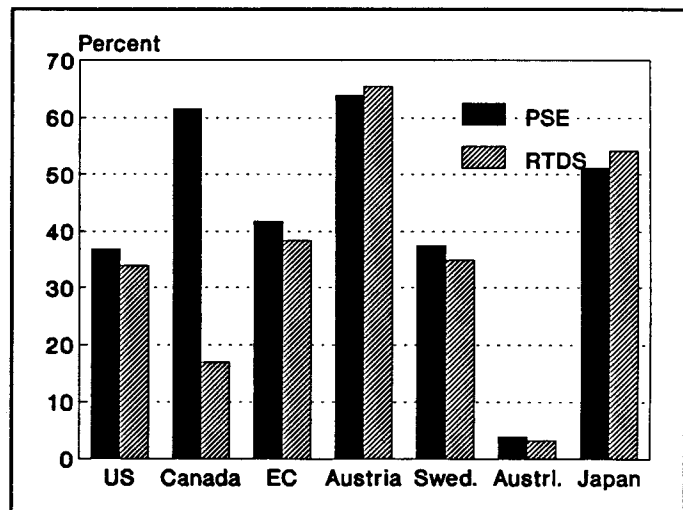


#### TDS Estimates for Sugar

PSEs provide a reasonable measure of a country's trade distortion when that country's contributions to trade distortion are very similar to its shares of support (fig. 6). To see this, consider the case of sugar.

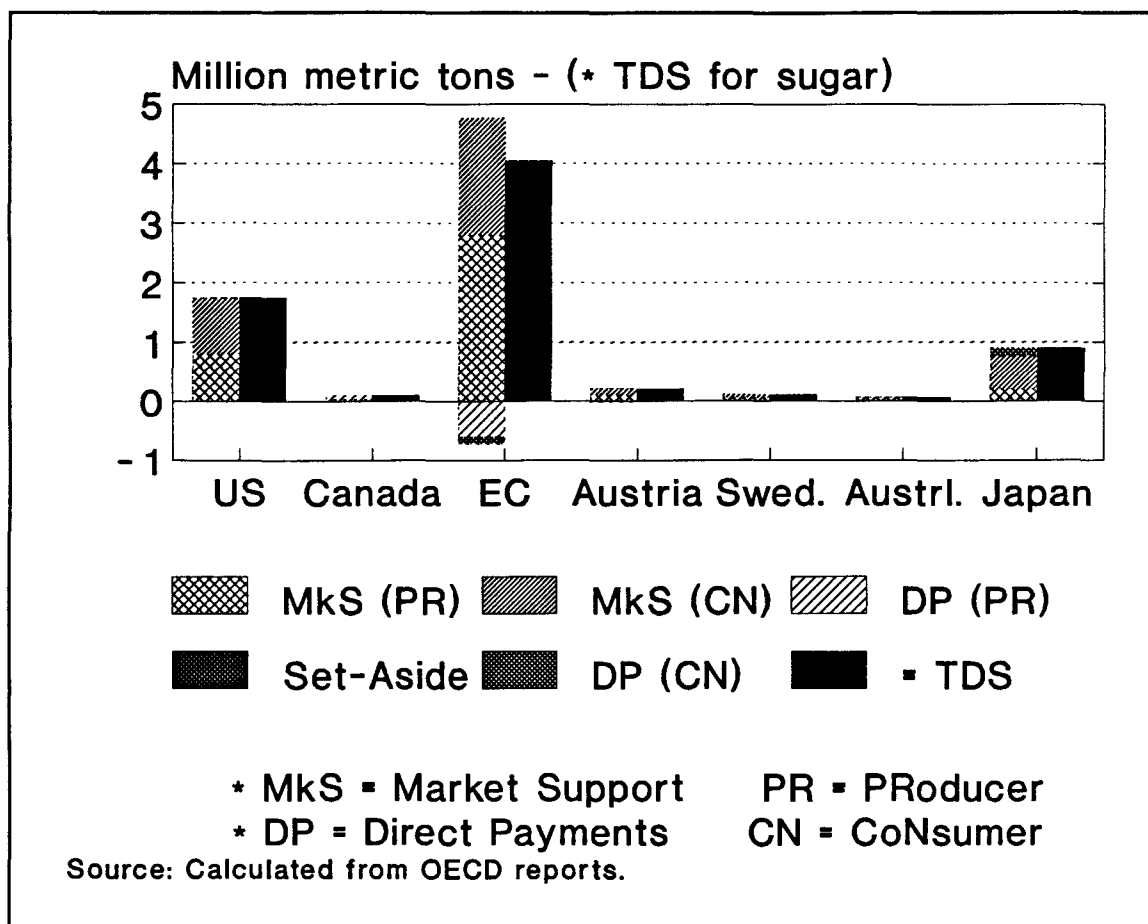
Both the United States and the EC use market support policies to assist producers, and neither use direct income support or other policies that offset trade distortion (fig. 7). Trading units like the EC and the United States provide the largest share of support to their sugar producers and distort world trade the most. On the other hand, countries like Sweden and Austria account for a small share of total support and distort the market the least. In the case of some commodities such as sugar where only market support policies exist, the PSEs appear to provide a reasonably accurate ranking of the degree of trade distortion. However, the TDS is generally a better measure of distortion for all commodities since it consistently accounts for all policies affecting trade.

Figure 6--Share of trade distortion and producer support for sugar



Some of this same information is also reflected in summary form in the RTDS index for sugar (fig. 8). The RTDS sugar indices for the United States and the EC are broadly comparable to the corresponding PSEs. This holds for most other countries as well. Remember, however, that the RTDS measures only the relative

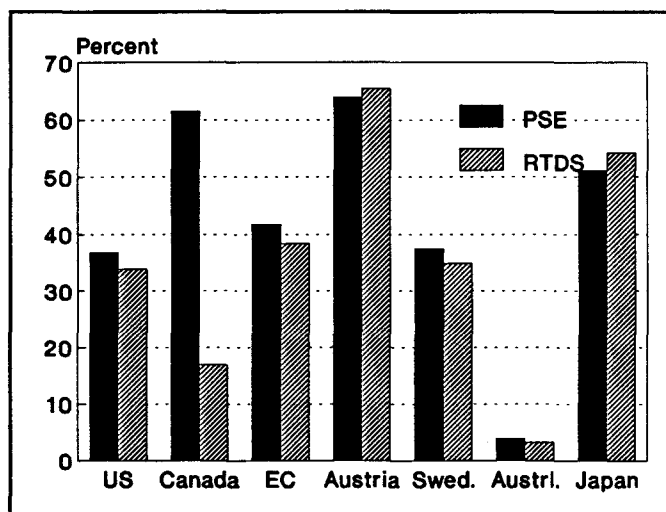
Figure 7--Policy contributions to the TDS for sugar



distortion in a country's trade, and not its contribution to global trade distortion. Consequently, high levels of the RTDS index for small countries such as Sweden and Austria do not mean that they distort world sugar trade as much as the EC and the United States, just that the distortion in trade relative to their domestic markets are equi-proportionate.

What can be concluded from these comparisons? AMSs such as PSEs, while a reasonable measure of agricultural support to producers, are not necessarily appropriate as a measure of trade distortion. Their use to measure trade distortions is highly questionable in situations where countries pursue a wide variety of policies, particularly those involving direct payments and supply controls.

Figure 8--Comparison of PSEs and RTDs for sugar





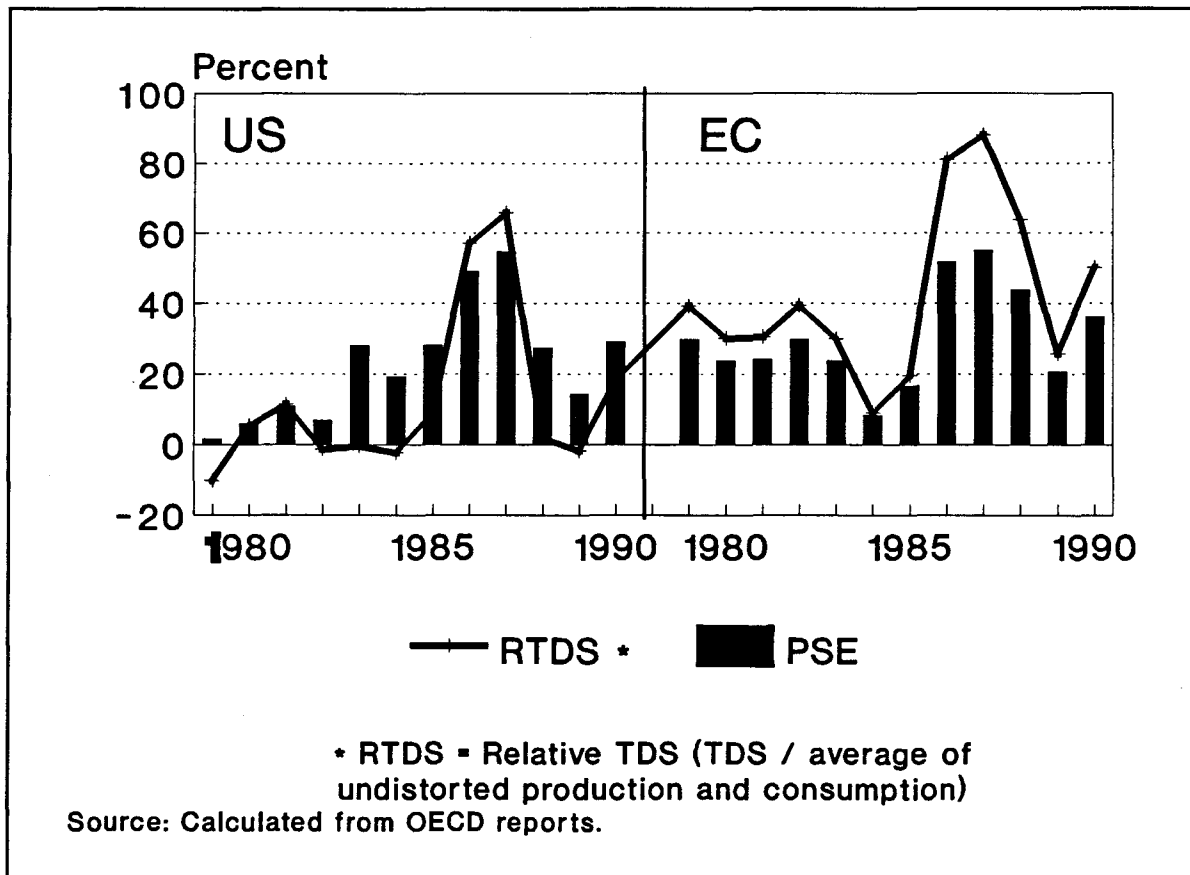
## The TDS as a Trade Distortion Monitoring Device

In trade negotiations, it is often not sufficient to establish initial levels of acceptable support or distortion for a commodity. Rather, it is essential to monitor changes in levels of distortion over time. After all, negotiations seldom lead to a complete and instantaneous removal of barriers, and choosing a base period from which to measure levels of distortion can be an important element of the negotiation and compliance process.

Since the TDS is a volume measure of trade distortion, it can measure distortion over time and countries for a commodity. The RTDS measure, on the other hand, is a unit-free measure of distortion and lends itself to cross-commodity and intertemporal comparisons. It also takes into account the size of the domestic market and could be especially appealing to countries seeking an equitable burden-sharing scheme to reduce trade distortion. Finally, the RTDS takes into account the uncertainties in agricultural production by normalizing trade distortion by the size of the domestic sector.

To use the RTDS measure as a distortion monitoring instrument over time for a given commodity, calculate the RTDS for each year assuming that the supply and demand parameters remain the same. This isolates the trade effects of the levels and/or types of policies, and also isolates trade differences resulting from changes in supply and demand parameters. Using U.S. wheat as an example, while levels of PSEs rose during 1980-87, the RTDS index was actually negative in 4 of the 8 years (fig. 9). Even though total support to wheat producers rose as

Figure 9--Wheat PSE and RTDS for the United States and the EC, 1980-90



measured by the PSE, the policy mix was altered to produce a much lower distortionary effect than implied by the PSEs. For the EC, however, the increases in the RTDS index between 1980 and 1987 were relatively larger than the corresponding increases in PSEs, indicating that changes in EC policies during this time period led to greater distortionary effect than suggested by the PSEs. Keeping track of changes in distortion can be an important element of negotiations even if concessions were to be traded on the basis of AMSs.

Another advantage of the RTDS is that it allows the extent of trade distortion to be monitored across different sectors within the agricultural economy. This information could be useful for countries seeking to harmonize distortions across products.<sup>18</sup> Our analysis indicates that distortionary implications of U.S. policies vary widely across commodity groups, being low for crops and high for livestock products (table 1). The distortionary implications for the EC are much more uniform, with less distinction between crops and livestock.

Table 1-- Relative trade distorting support (RTDS),  
by sectors, 1989/90

Commodities	United States	EC	Canada	Japan	Australia
	Percent				
Wheat	-1.8	25.8	24.2	159.2	NC
Coarse grains	5.3	53.9	24.5	411.5	NC
Rice	12.1	76.3	NC	228.2	7.2
Soybeans	.6	9.6	.2	15.3	NC
Other oilseeds	NC	43.0	13.0	NC	NC
Sugar	33.9	38.4	16.9	54.2	3.2
Milk	53.0	61.2	69.7	104.7	20.8
Beef and veal	37.5	91.6	47.1	111.9	NC
Pork	-1.0	22.6	21.5	170.3	NC
Poultry	1.1	54.1	26.3	17.1	NC

NC = not calculated.

#### The TDS as a Tool for Trade Disputes and Trade Negotiations

Damage or injury assessment is a crucial element of any international trade dispute settlement process. Numerous cases have been filed at the GATT for ruling on the damage or injury incurred by the petitioning country's commerce from policies of other countries. Australia won a ruling in 1990 that U.S. sugar quotas were GATT-illegal and cost Australia export earnings. A GATT panel similarly found that the EC subsidies to producers and processors of oilseeds violated GATT codes and discriminated against oilseed imports. Altogether, 76 cases were petitioned before the GATT between 1980 and 1988 seeking ruling on unfair trading practices. A majority of the complaints referred to the use of unfair trade and domestic policy instruments in agriculture and agriculture-related sectors (Bhagwati, 1991).

There are numerous ways in which one could assess damages in dispute settlement cases. Trend analysis and elaborate modeling are two such approaches. Trend

<sup>18</sup> Harmonization of support has been a goal of the EC and was a driving force behind the 1990 U.S. farm legislation.

analysis, while simple, does not isolate the effects of policies on trade; instead, it includes the effect of all factors affecting trade during the time period under consideration. An elaborate modeling exercise, on the other hand, takes considerable time and financial resources and may not be very transparent to parties in a dispute.

The TDS has advantages in cost, time, and transparency over these other approaches, making it a far more reasonable and useful tool in settlement cases to assess damages and establish compensation requirements. This can be done by converting the TDS to a measure of the value of trade distorted by support (VTDS), using relevant world prices. The VTDS can be calculated for the injured sector, and used to assess the countervailing tariffs required to obtain compensatory benefits in some other sectors.

The recent U.S. and EC oilseeds dispute provides an opportunity to illustrate the use of the VTDS.<sup>19</sup> The United States contends that EC subsidies to oilseed processors have systematically curtailed U.S. soybean exports to the EC. The VTDS measure indicates that such subsidies prevented oilseed imports valued at \$800 million dollars annually from entering the EC between 1987 and 1989. Because the United States accounted for roughly one-third of the EC market, assume that one-third of the trade damage, or \$250 million, was borne by the United States. This VTDS measure then could then be used to estimate the countervailing tariffs that would be imposed on EC wine, for example, to recoup the lost U.S. export earnings.

#### Limitations of the TDS Measure

The TDS measure shares two principal limitations with AMSs when compared with a more elaborate modeling approach:<sup>20</sup> (1) changes in world prices that result from removal of policies are ignored, and (2) cross-commodity effects of policy elimination are not included.

To estimate the importance of these limitations, the SWOPSIM (ST89 version) modeling framework calculated RTDS indices using both a single-commodity, world

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<sup>19</sup>For details on the exact nature of the dispute, see GATT (1990).

<sup>20</sup> The argument here is that some support to agriculture simply offsets other countries' support and should not be counted. But if reductions in support actually are carried out, those world price improvements are received by all as partial compensation for concession given. As a practical matter, however, concessions have the same market price effect for everyone, eliminating the need to negotiate over a gift received equally by all.

model (SRTDS) and a multicommodity, world model (MRTDS). The SRTDS measure takes into account the world price feedback effects while the MRTDS index incorporates both the world price feedback and the cross-commodity implications. Comparison of the indices then allows the respective effects to be isolated.

#### **World Price Feedback Effects**

To examine the effects that world price changes could have on the TDS, single-commodity world models were constructed for each commodity. Then, the PSE and CSE were unilaterally removed in each country, holding policies for all other countries constant. The ratio of the absolute change in net trade to the average of subsidy-free production and consumption from the modeling exercise (SRTDS) was then compared to the calculated RTDS index, and their difference is attributed to changes in world price.

The results indicate that the RTDS indices for the United States and the EC are generally higher than the corresponding SRTDS indices estimated from the modeling framework (table 2). This is because elimination of support in the United States and the EC raises world prices and increases production (denominator term in SRTDS) above levels that would have prevailed with fixed world prices. In the case of sugar, the percentage declines in distortion in each region as a result of world price changes are approximately the same (6 percent). This pattern holds for wheat, but not quite as strongly.

Not surprisingly, the differences between the RTDS and the SRTDS indices are very small for both sugar and wheat for most other countries. This is because these other countries are small actors in global sugar and wheat markets and their policies minimally affect world prices. Hence, ignoring changes in world price may not bias a small country's measure of distortion but may overestimate the extent of distortion attributable to large countries.

#### **Cross-Commodity Effects**

To study the effect that cross-commodity effects may have on the TDS measure, we used the full 22-commodity version of ST89 with support unilaterally eliminated for each commodity in each country. The results indicate that the consequences of introducing cross-commodity effects are minimal: the RTDS indices with cross-commodity effects (MRTDS) are no different than the corresponding indices without cross-price effects (SRTDS) (table 2). This is true for the EC and the United States.

The similarity occurs for a number of reasons. One is the use of an intermediate-run model in which the substitution relationships are not very large. Another reason is that for a price change to have a meaningful impact, it must be large enough to affect the global market and feed back into the domestic market. Third, the economic structure of the farm sectors within the OECD countries are broadly similar, and equivalent changes in price can be expected to have similar effects across countries. Finally, to the extent that a group of products with many substitutes such as cereals tend to have comparable support for all products in the group, the absence of specific attention to substitution will not cause a significant bias because reducing support from a particular AMS formula should equally affect substitutes (Cline, Kawanabe, Kronsjo, and Williams, 1978).

Table 2--Comparing measures of distortion for wheat and sugar, 1989/90

Region/commodity	PSE <sup>1</sup>	RTDS <sup>2</sup>	SRTDS <sup>3</sup>	MRTDS <sup>4</sup>
Percent				
United States:				
Wheat	29.8	23.3	17.9	13.0
Sugar	14.9	3.4	2.2	1.0
European Community:				
Wheat	11.9	11.9	6.0	6.0
Sugar	15.1	18.5	13.3	13.5

<sup>1/</sup> PSEs as reported by the USDA.

<sup>2/</sup> RTDS using USDA's PSEs.

<sup>3/</sup> RTDS using USDA's PSEs and single commodity version of SWOPSIM ST89.

<sup>4/</sup> RTDS using USDA's PSEs and 22-commodity version of SWOPSIM ST89.

### Conclusions

This paper points out the possible dangers in using aggregate measures of support as indices of trade distortion. These differences deserve attention given the recent emphasis accorded to AMSs as instruments for GATT negotiations for agriculture. As the analysis indicates, using AMSs as indicators of trade distortions can be especially misleading when countries pursue policies that offset trade-distortion effects of producer support. On the other hand, if support across countries is confined to market support policies, then an AMS such as the PSE can provide a comparable indication of the extent of trade distortion.

The TDS holds promise as an additional instrument of trade negotiation and monitoring efforts. It is a simple, volume-based method to measure agricultural trade distortion. It is consistent with the methodology pursued in previous rounds when tariff cuts were the modus operandi. And, the TDS directly addresses the trade distortionary implications of domestic and border policies, the area of primary concern to the GATT.

One very attractive feature of the TDS is that, unlike more elaborate modeling and trend analysis, the TDS provides negotiators with quick and easy access to the trade volume and trade balance effects of liberalization. In past GATT rounds, these two effects formed the basis for calculating and balancing the economic gains and losses from policy concessions. To the extent that the Uruguay Round is still likely to focus largely on the trade effects of agricultural policies, the TDS could provide a very useful gauge of potential trade effects of liberalization.

There are problems with the TDS: the information requirements are, in some cases, greater than for an AMS, and there may be controversy about the use of elasticity parameters. In our opinion, the additional information needed is

minimal and is already used in much country policy analysis.<sup>21</sup> We would hasten to point out as well that elasticity parameters have been employed in previous rounds, and as long as their use is confined to simple arithmetic, as would be the case for the TDS, the problem should not be overwhelming.<sup>22</sup>

The advantages of the TDS over an AMS should not mean that aggregate measures of support should be ignored as an instrument of negotiation. We believe, however, that aggregate measures like the PSE, provide one viewpoint of agricultural support in the Uruguay Round, and they should be used in conjunction with a trade-distortion measure like the TDS. This would ensure that GATT negotiating and subsequent monitoring efforts address the primary issue at hand, the reduction of trade-distorting support policies.

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<sup>21</sup>Information on the supply and demand elasticities may be the most problematic data requirement. As a practical approximation, standard elasticities (interpreted as weights) could be agreed upon and used by everyone in negotiations.

<sup>22</sup>Some might object to the use of an elasticity in a TDS measure since such numbers are considered the habitat of economists. However, to the layman, these can be considered "agreed upon" weights which are used to add up the likely impact of a set of policies. One could easily imagine negotiators and lawyers agreeing upon a set of weights for different policy components of the PSE. For example, there currently seems to be agreement on a weight of 1 for "included policies" (the red list), 0 for excluded policies (the green list), and something that must be between 1 and 0 for other policies.

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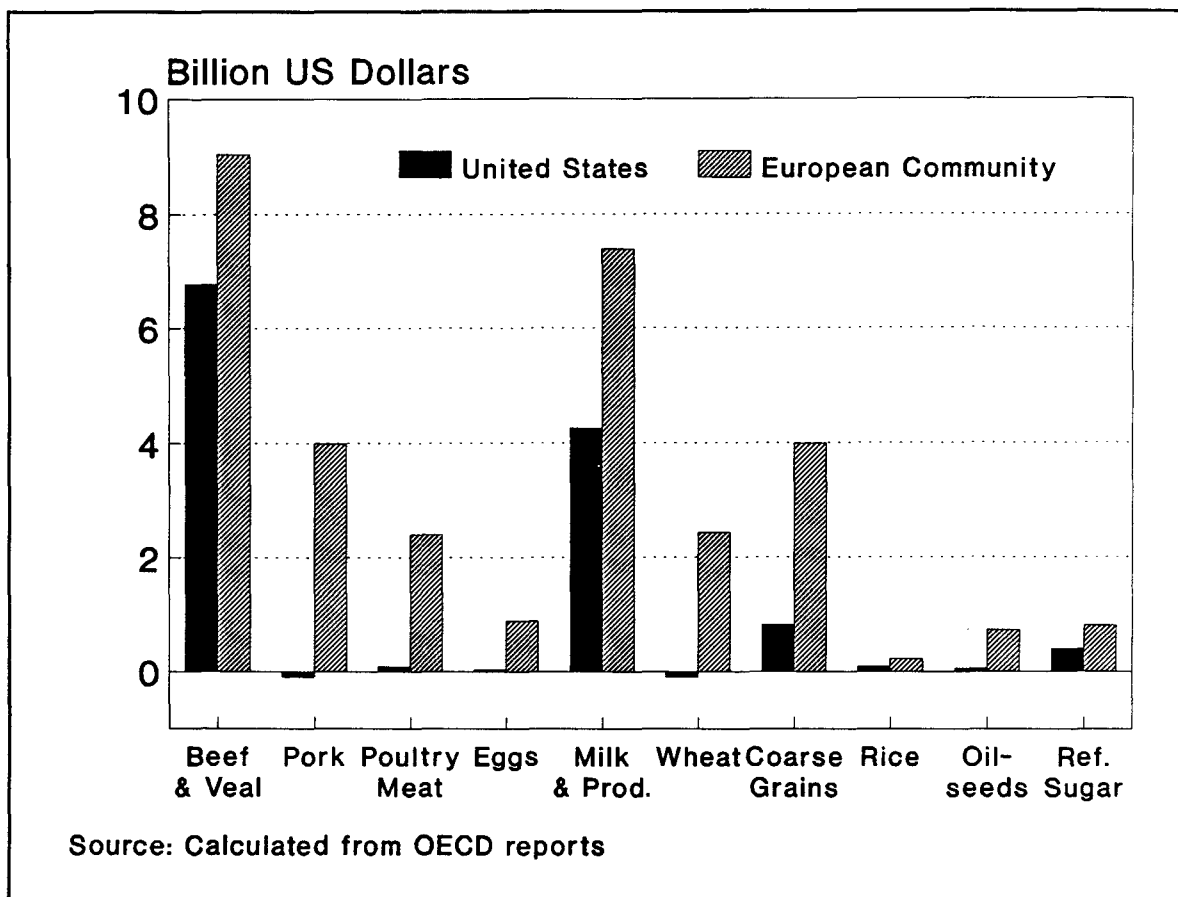
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## Appendix 1: TDS Estimates for Selected Products and Countries

This appendix presents TDS estimates for several products and countries (in graphical and numerical form) made from OECD data on support. Figure A1 shows the VTDS measures implicit in the OECD support data for the United States and the European Community.

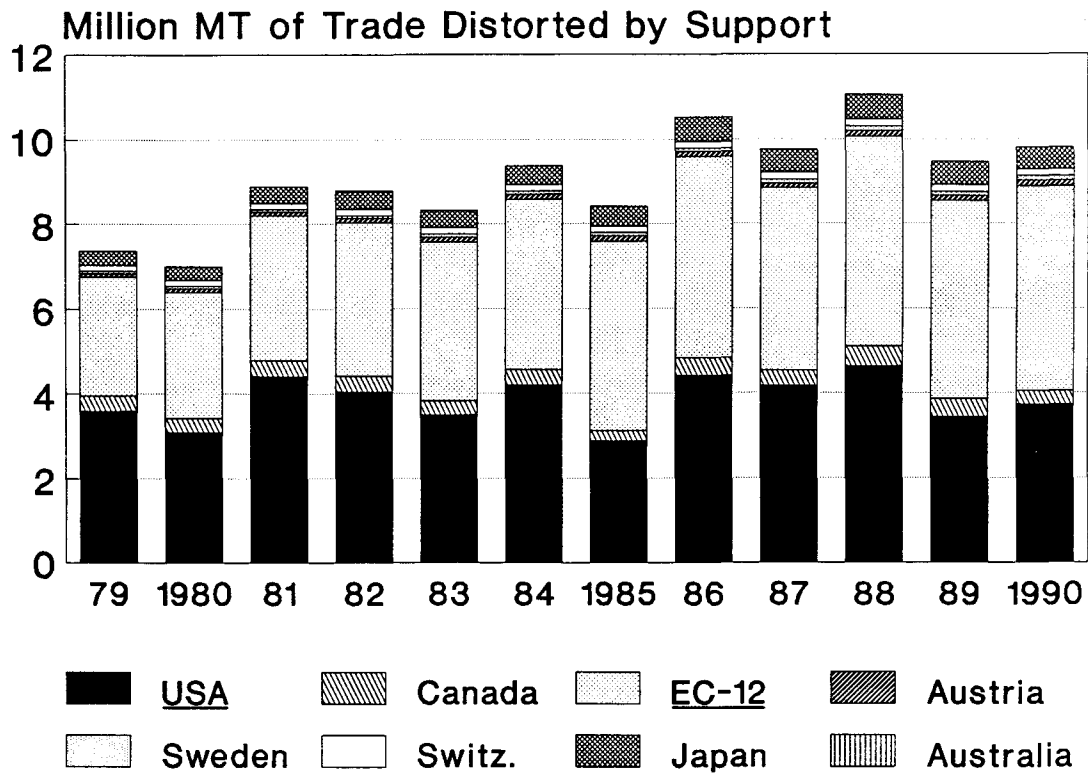
Figure A1--Estimated value of trade distorted by support (VTDS), 1989/90



The following pages present graphs and data for a series of products over time. The graphs are stacked bar graphs with the components representing the estimated trade distortion contributed by each country. The height of all of the contributions is the total distortion for a year. The upper graph on each page is in quantity units and gives a sense of movement of trade distortion (or the lack of it) over time. The quantity axis is kept the same for products groups meat and eggs, grains, and oilseeds to facilitate comparisons across products with these groups.

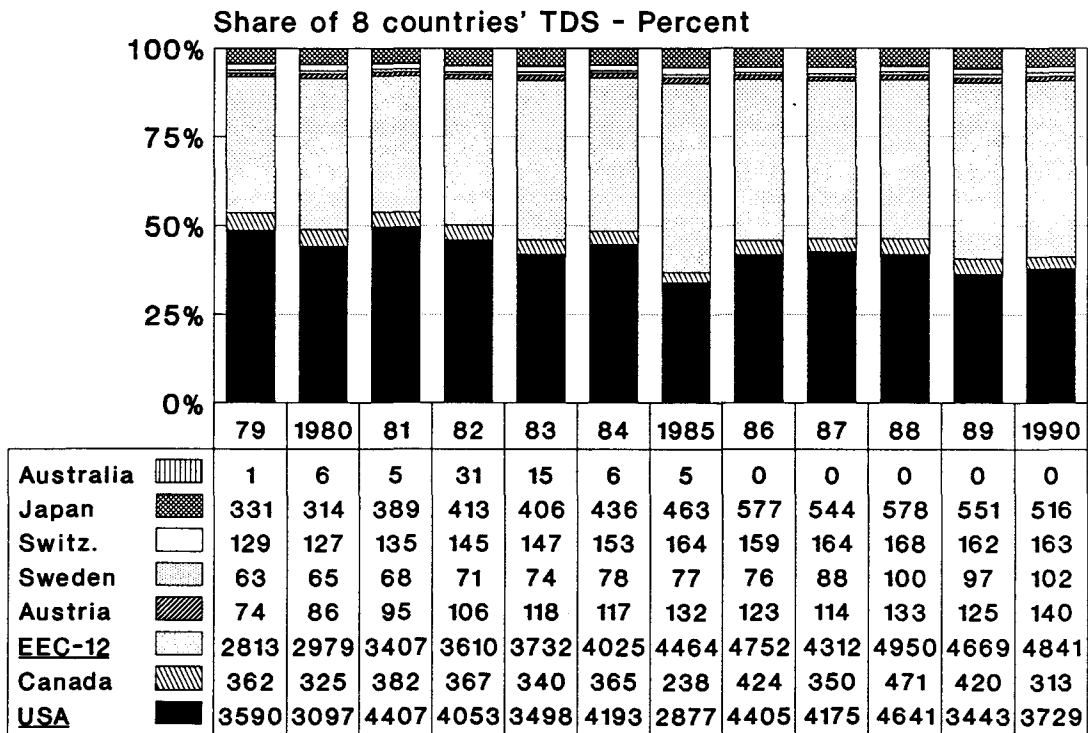
When policy support levels, such as those for cereals for the EC and United States, depend on world market prices, the graphs show changes in trade distortion over time. As world prices drop, as they did in 1986/87, trade distortion increases.

The bottom graph on each page (data are shown below the graph) shows the share of trade distortion (from the top graph) contributed by each country (the totals equal 100%).

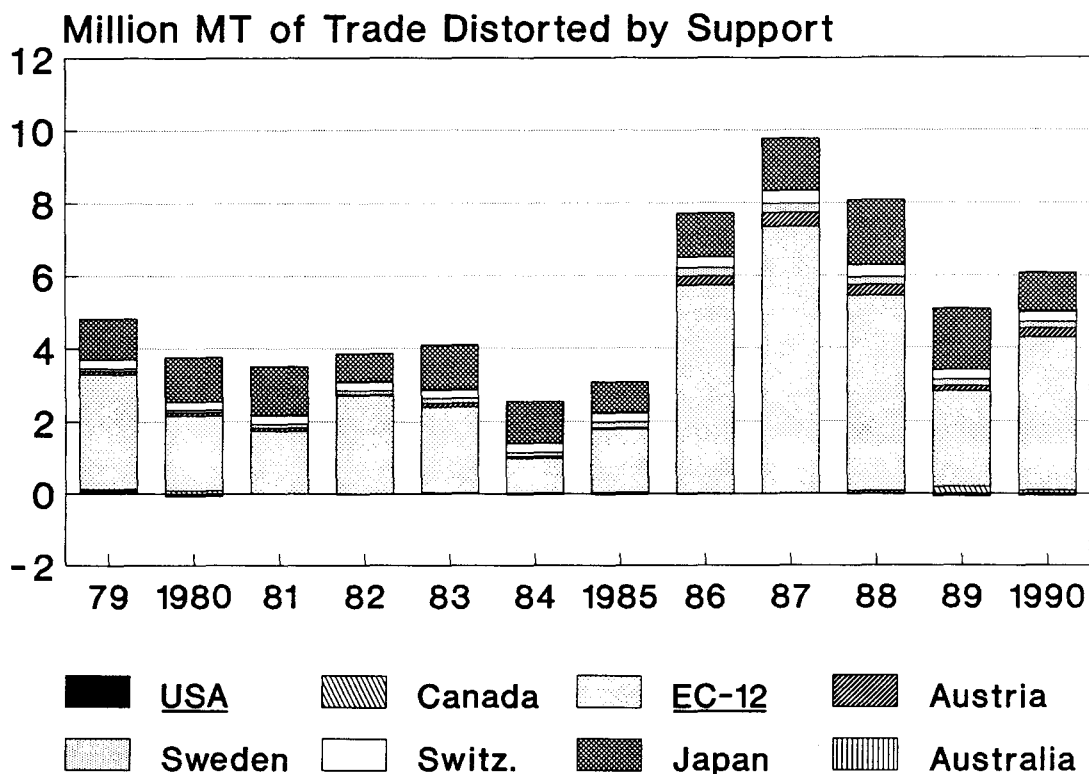


Source: Calculated from OECD reports.

## BEEF and VEAL

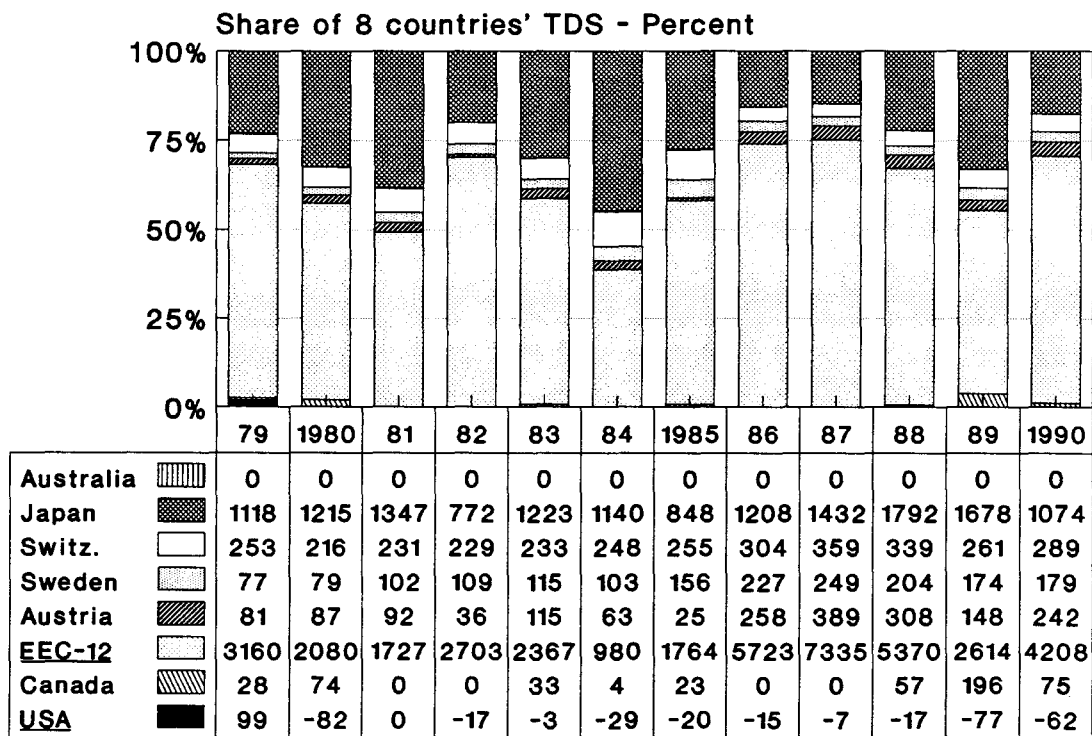


TDS data in table is in 1000 Metric Tons

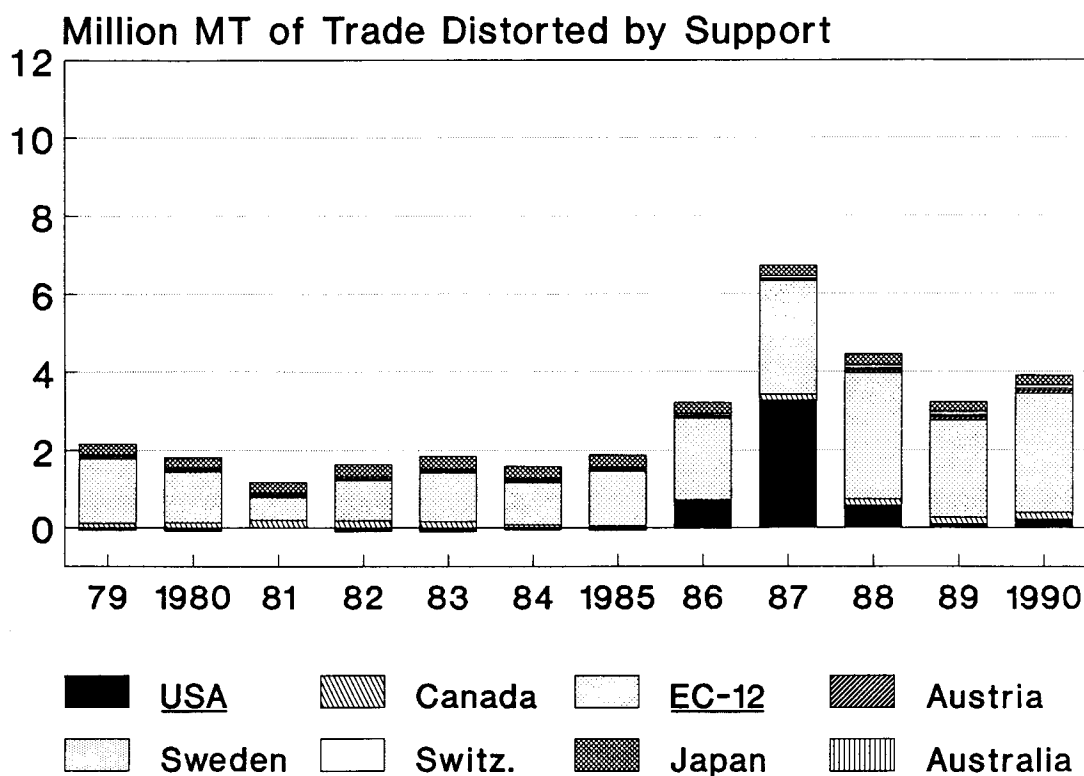


Source: Calculated from OECD reports.

## PORK

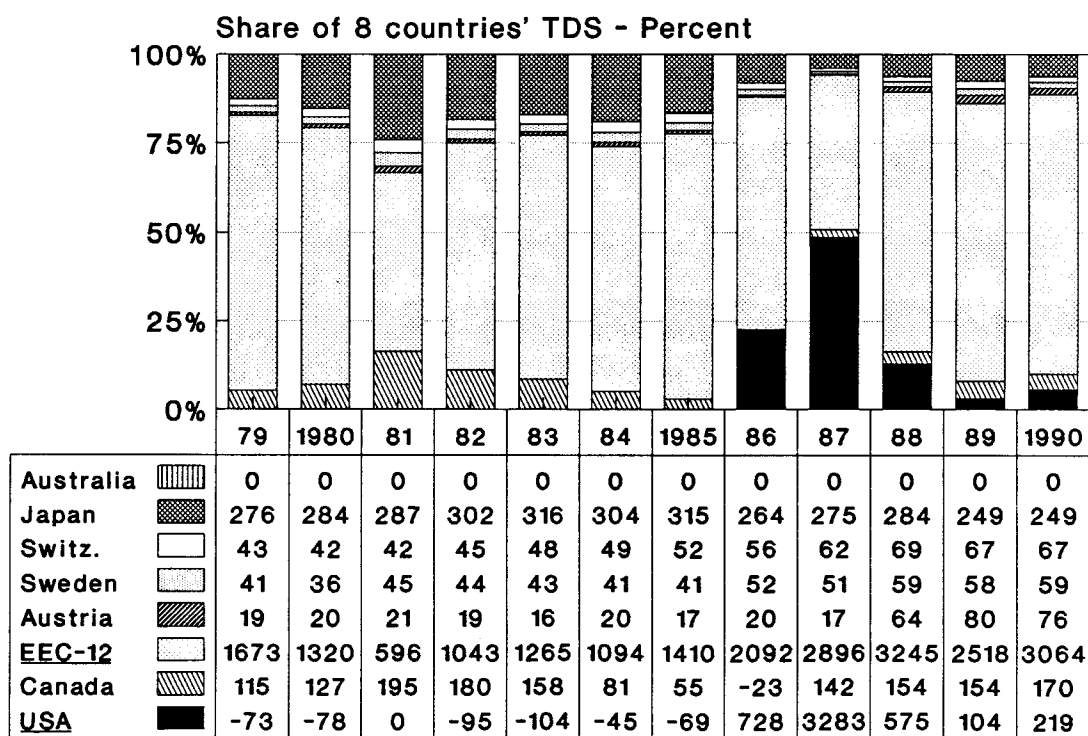


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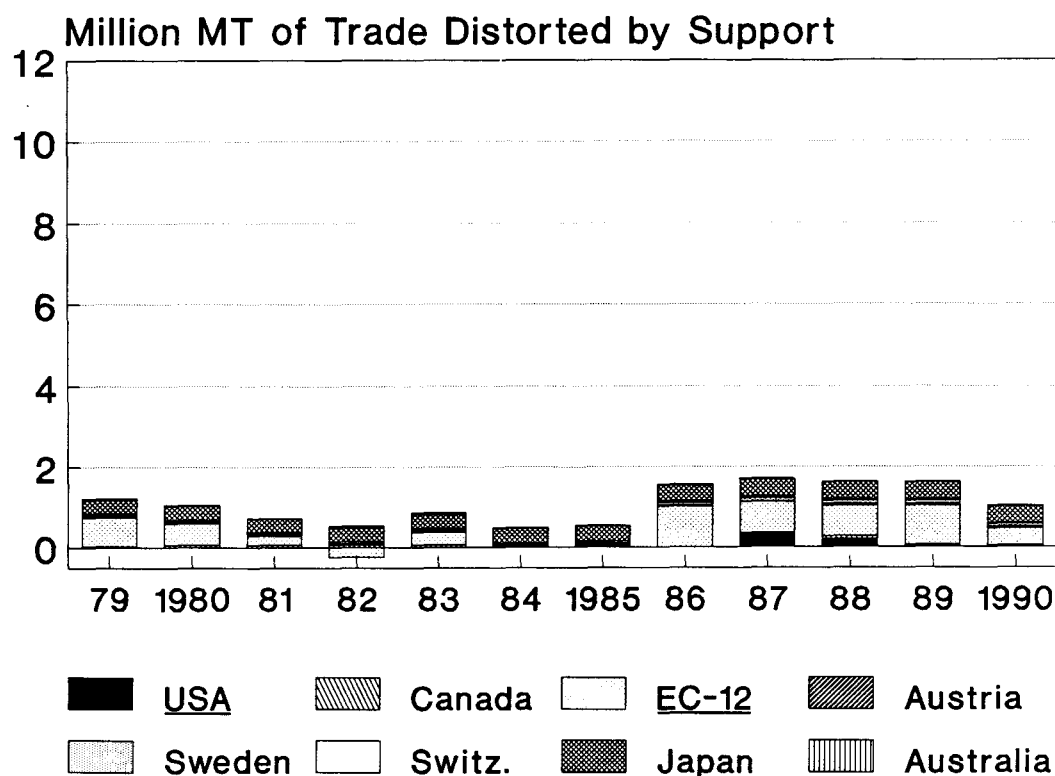


Source: Calculated from OECD reports.

## POULTRY MEAT

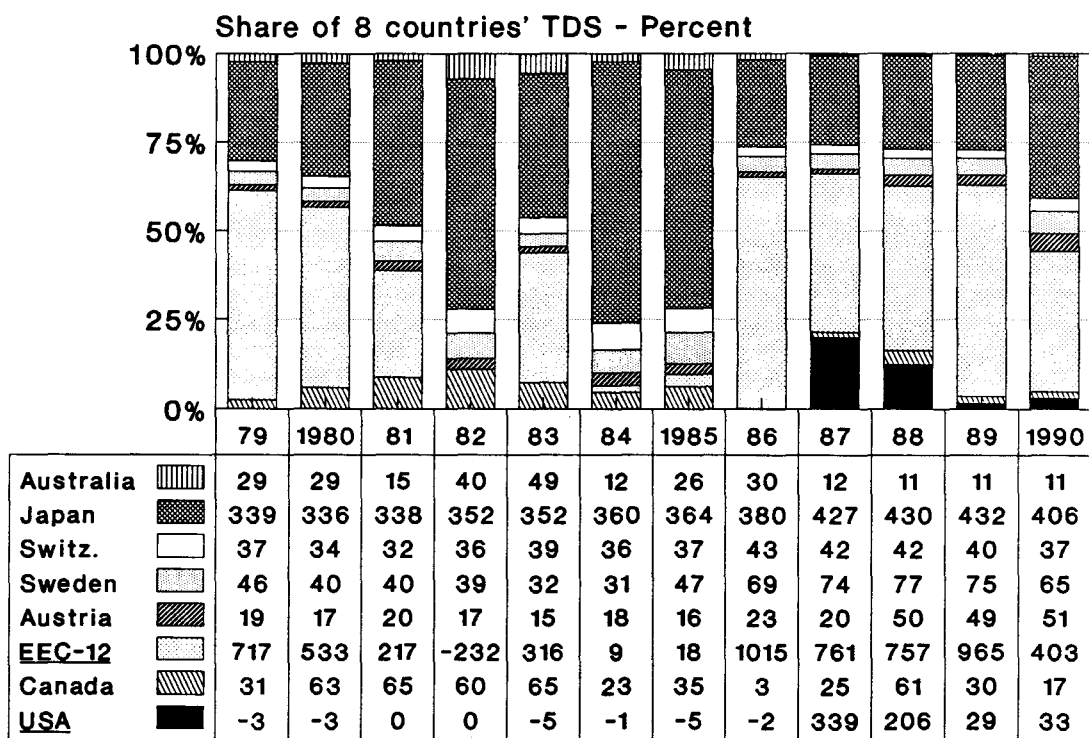


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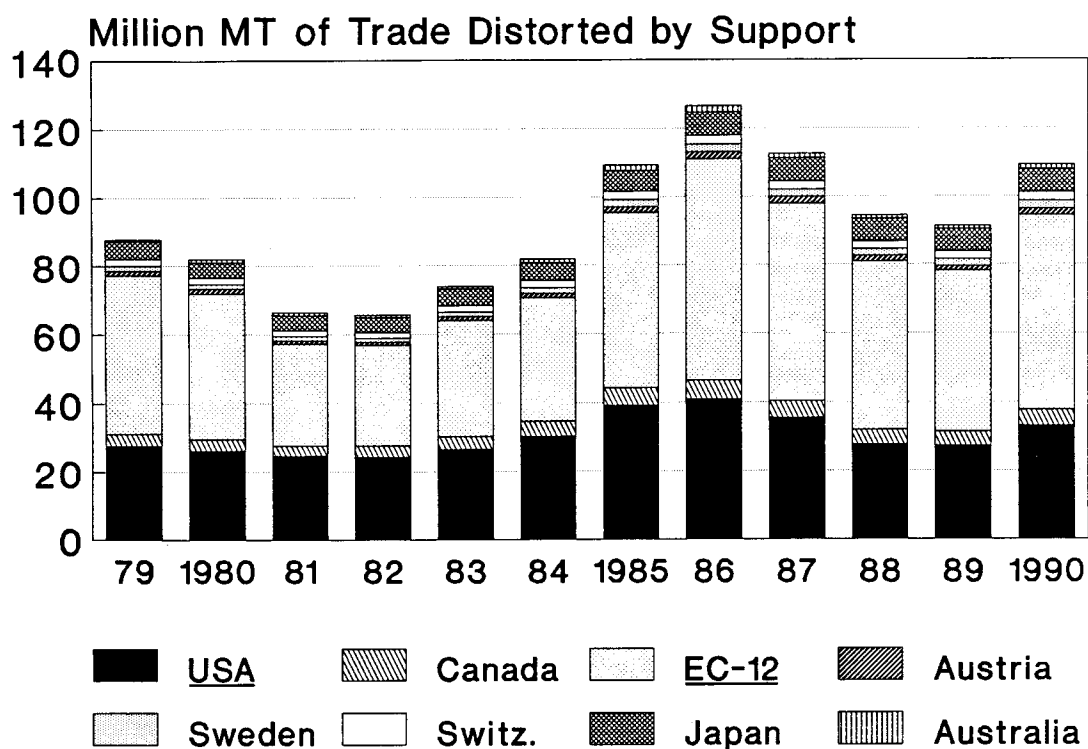


Source: Calculated from OECD reports.

## EGGS

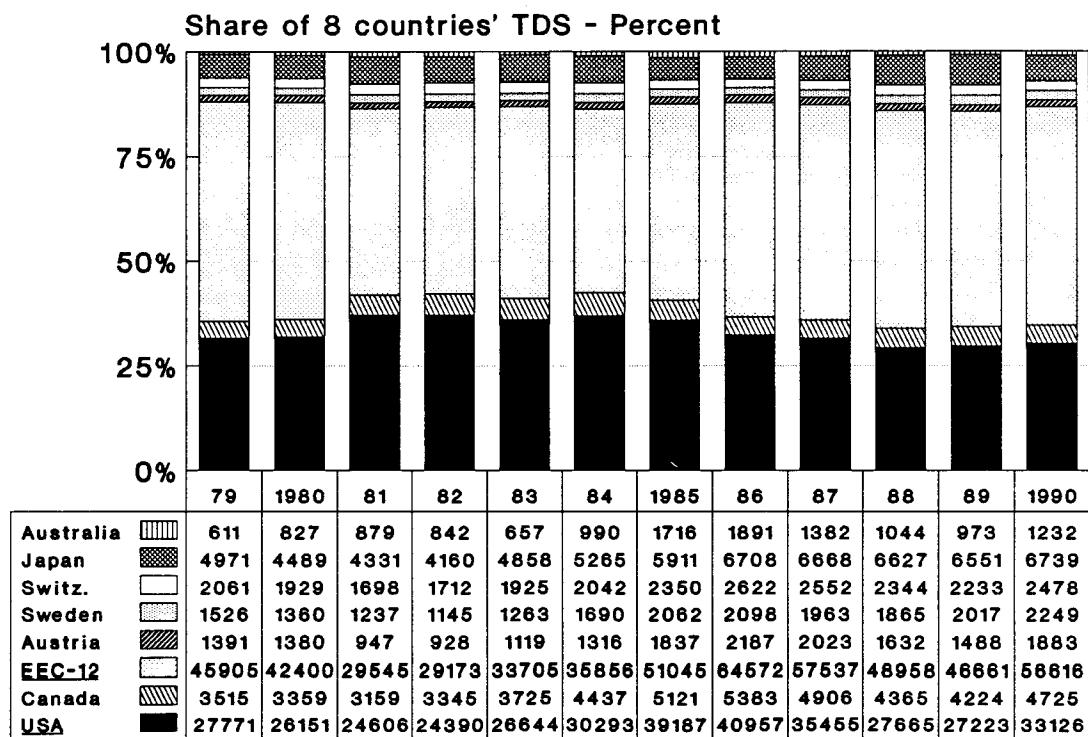


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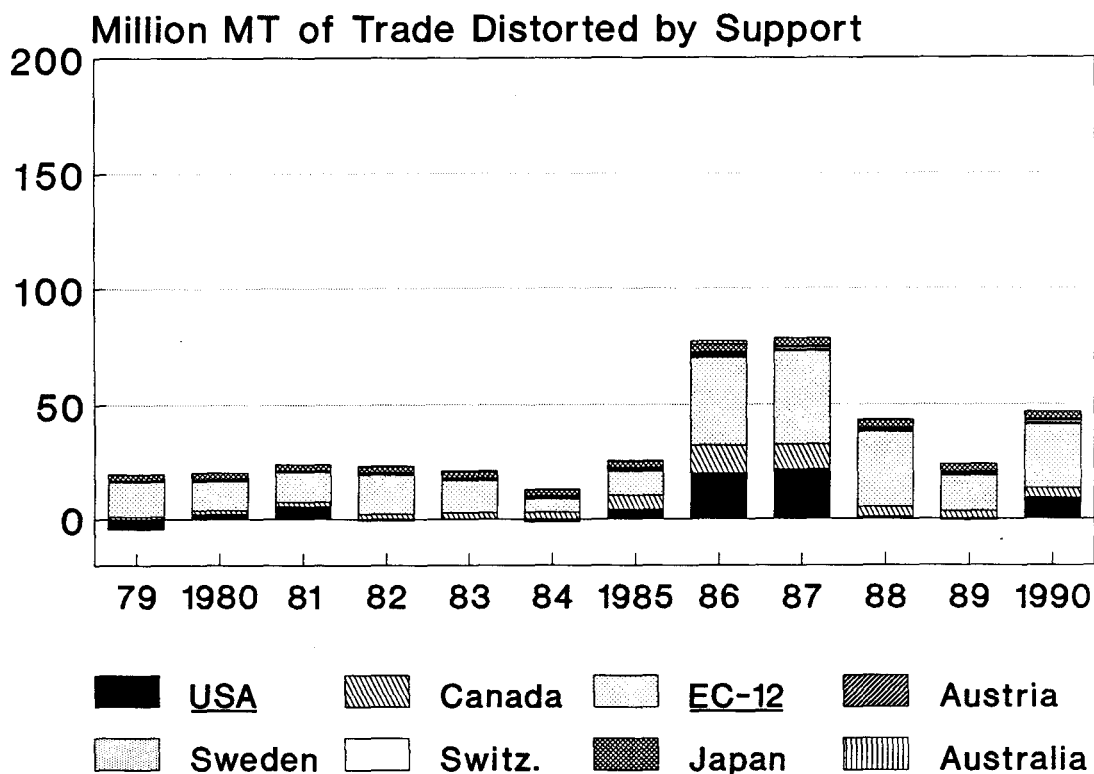


Source: Calculated from OECD reports in fluid milk equivalents).

## MILK PRODUCTS

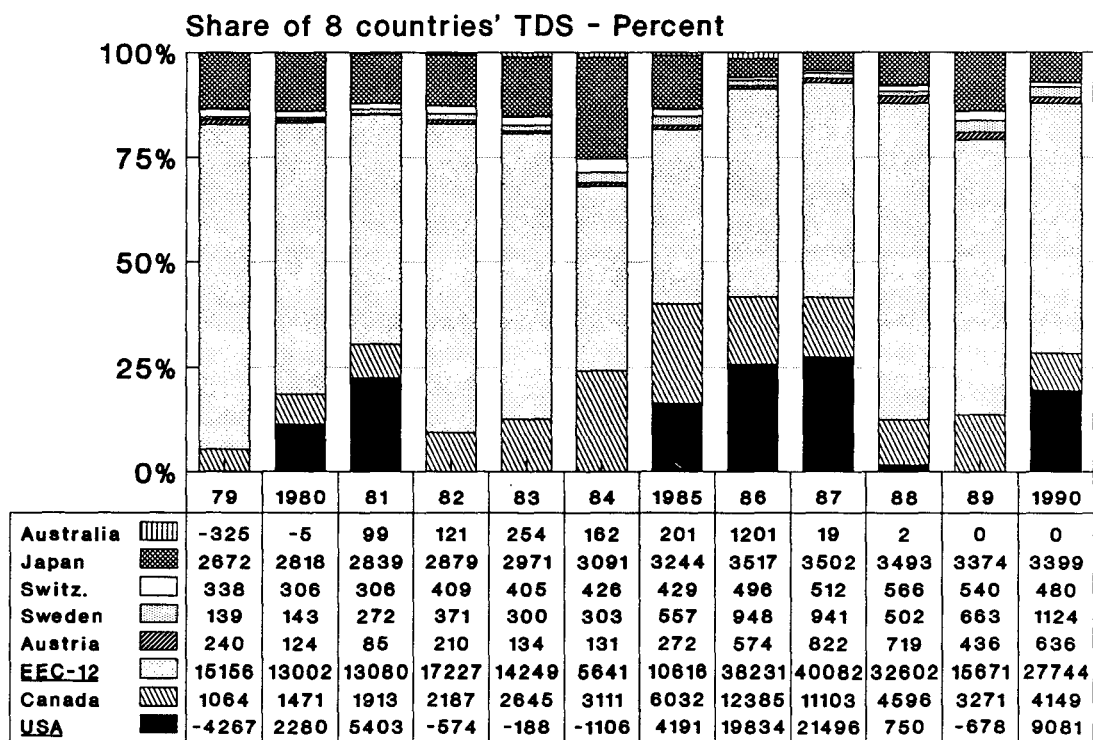


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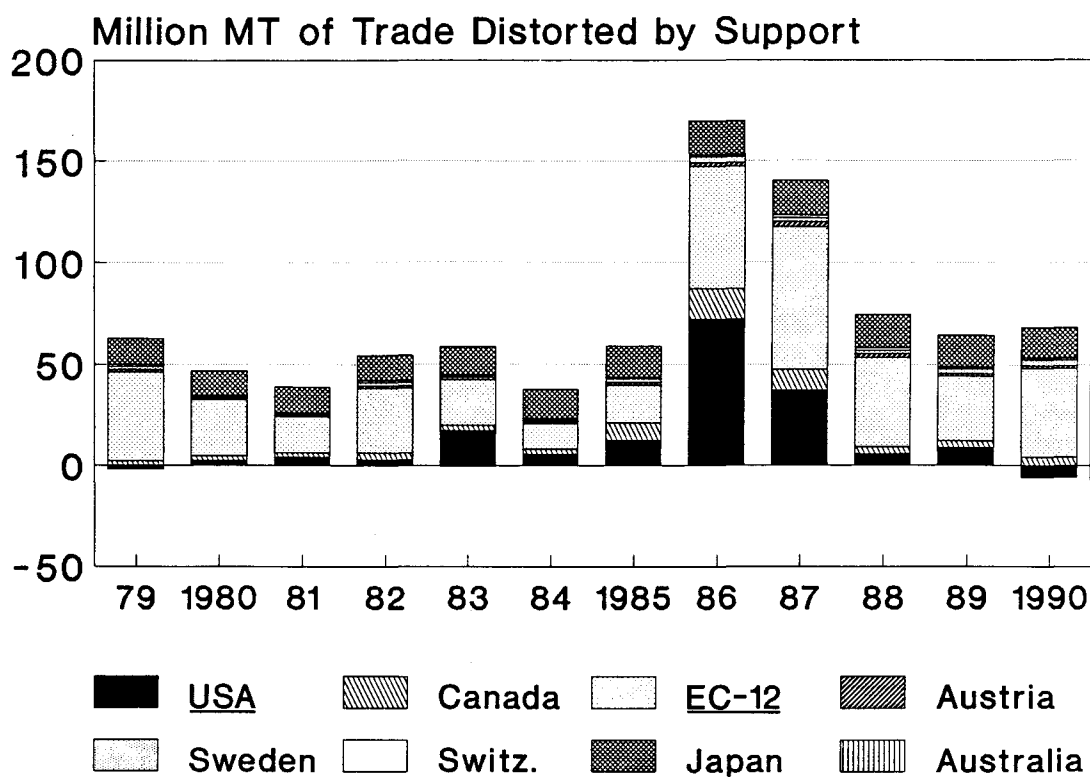


Source: Calculated from OECD reports.

## WHEAT

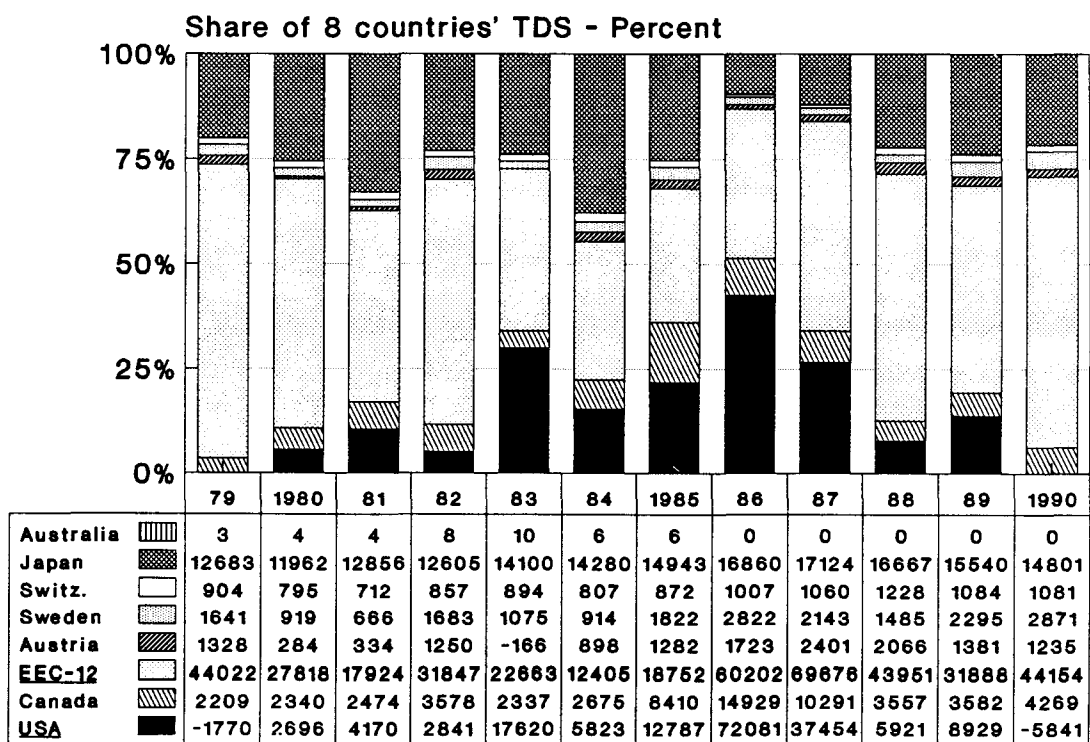


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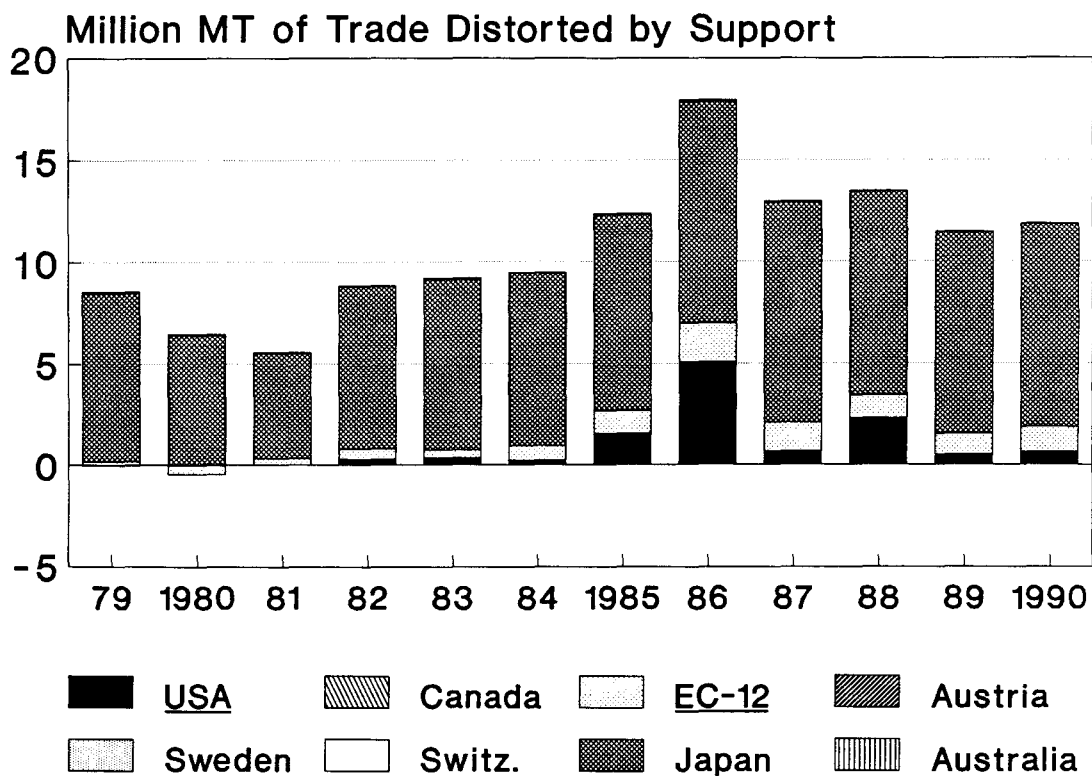
Source: Calculated from OECD reports.

## COARSE GRAINS



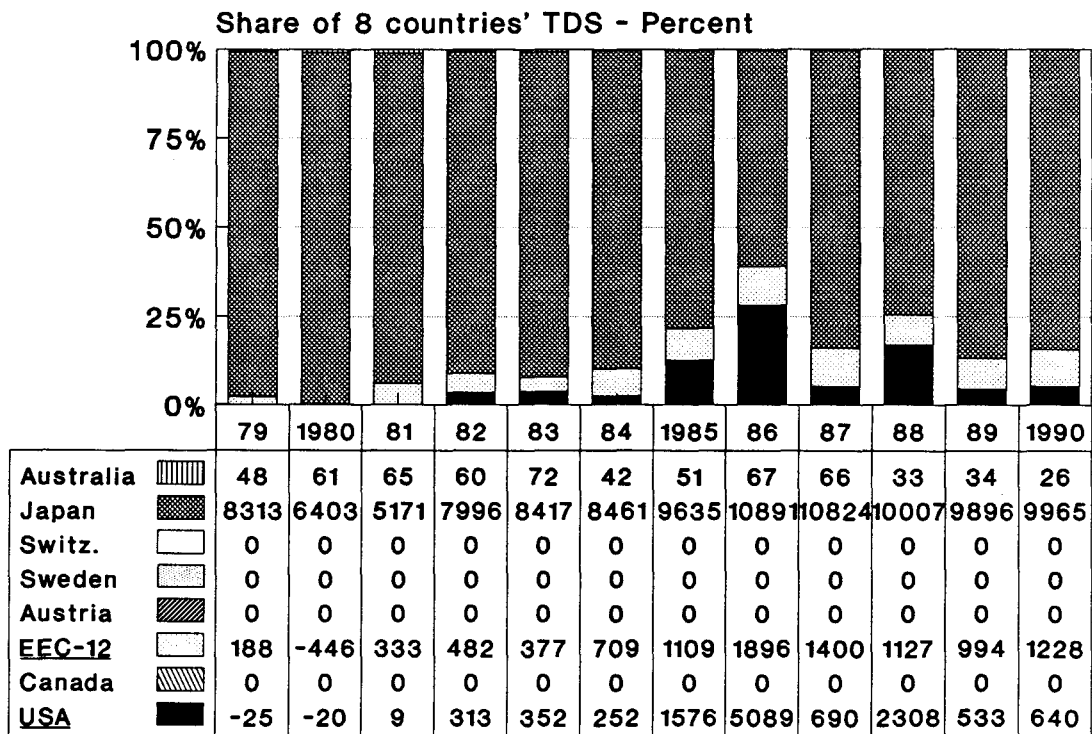
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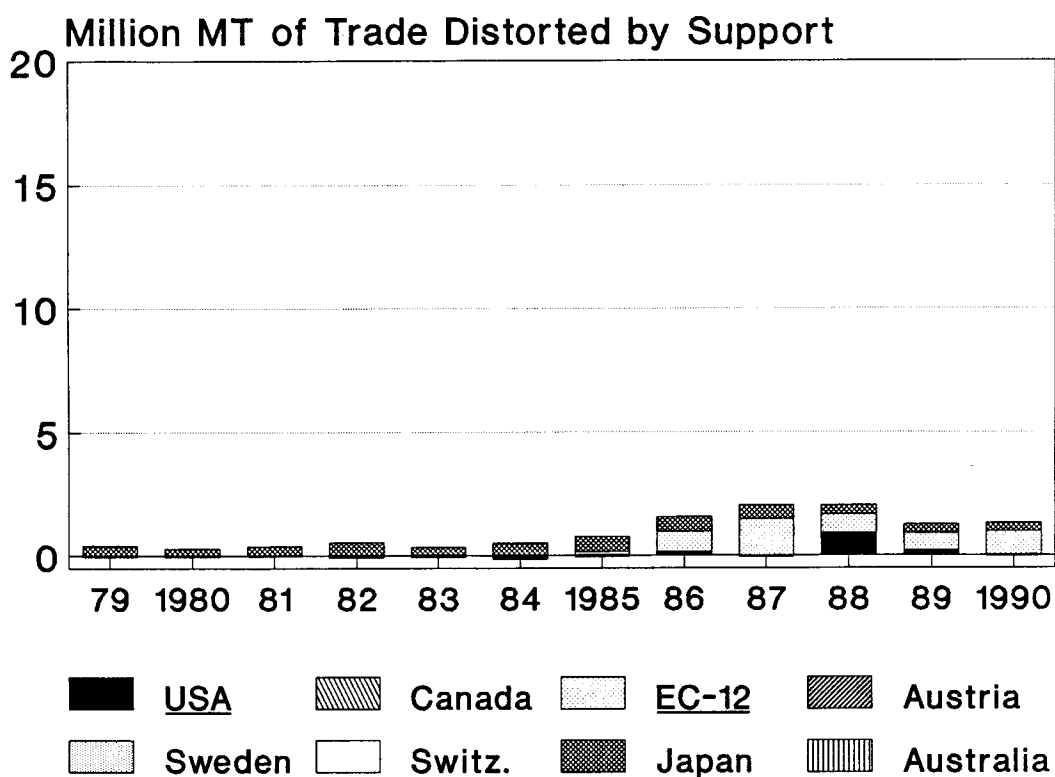


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## RICE

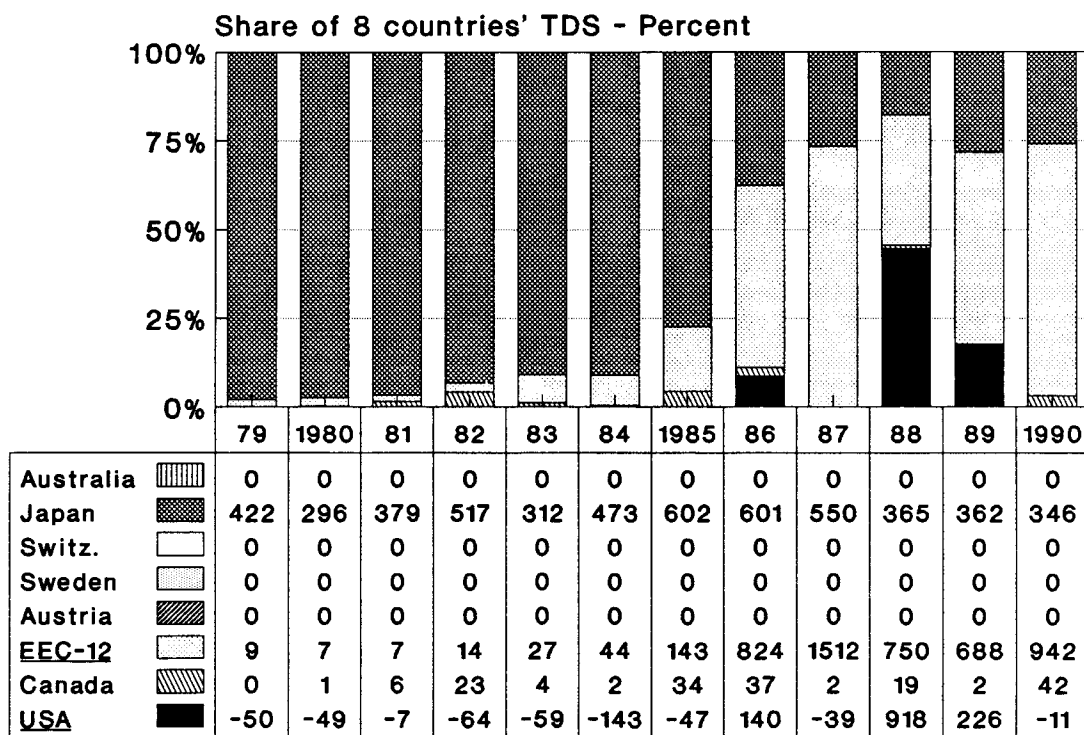


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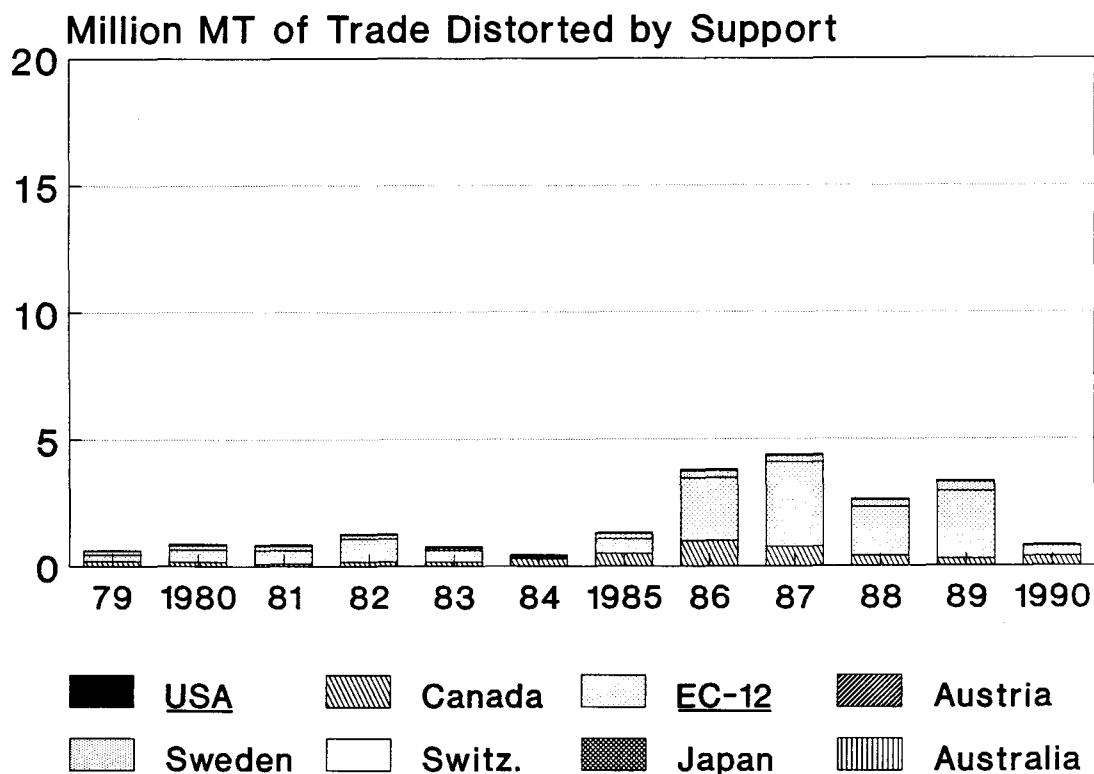


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## SOYBEANS

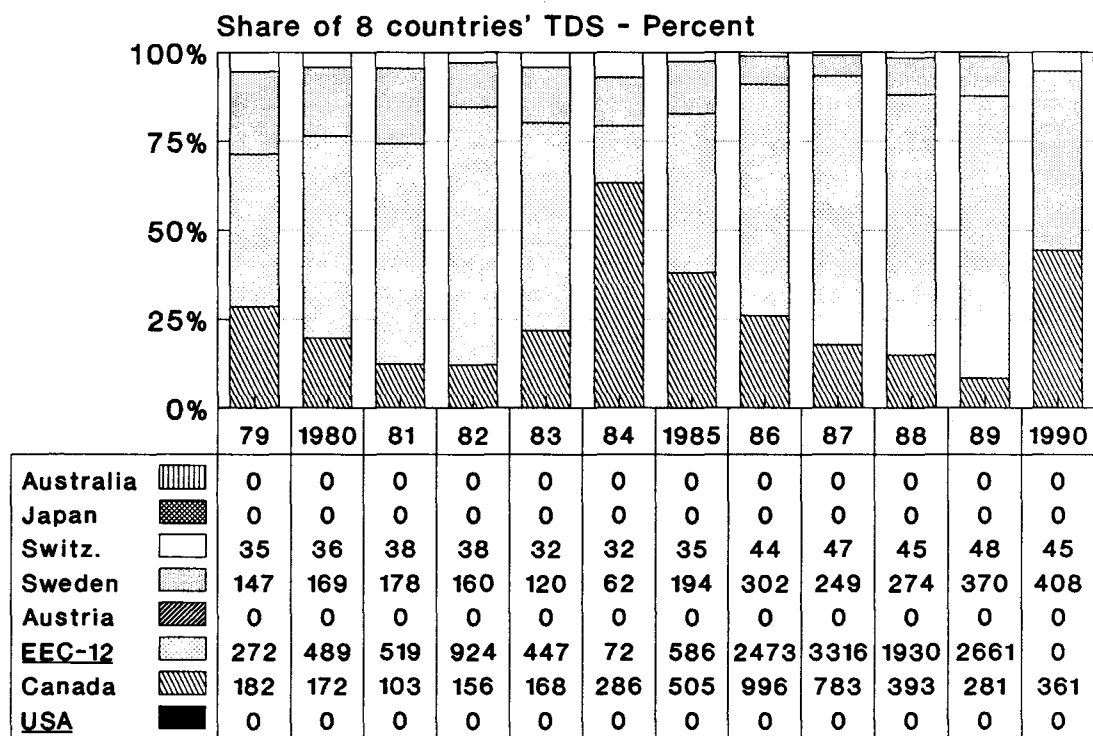


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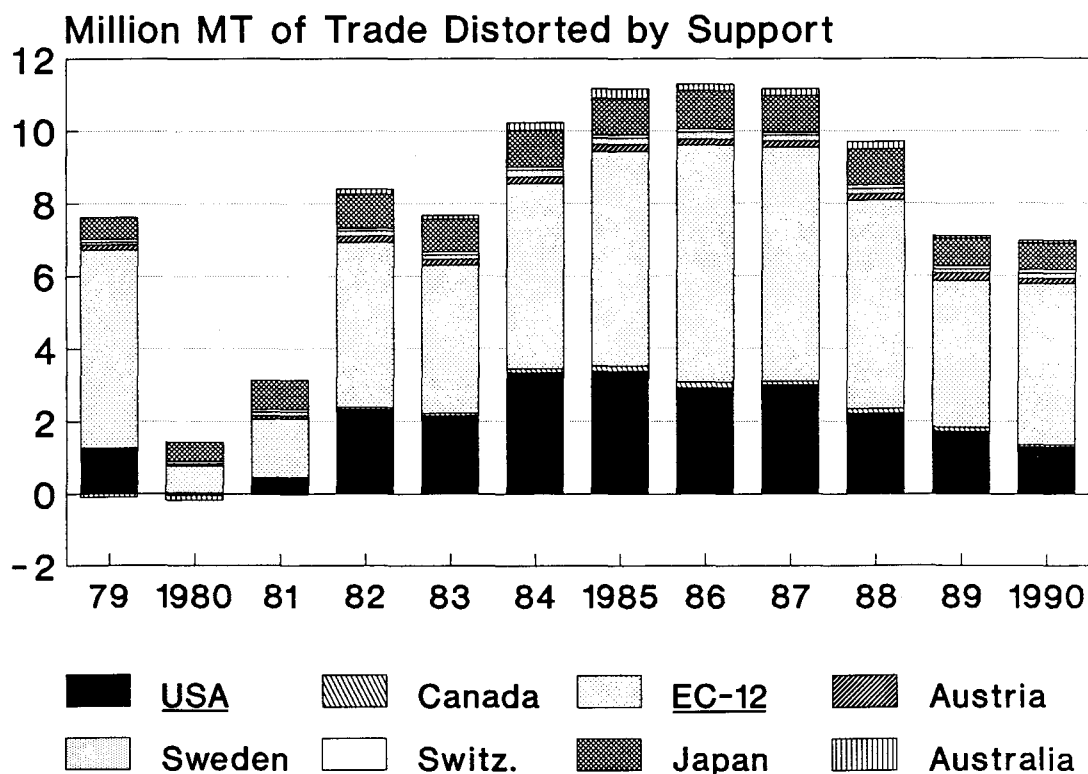


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## RAPESEED

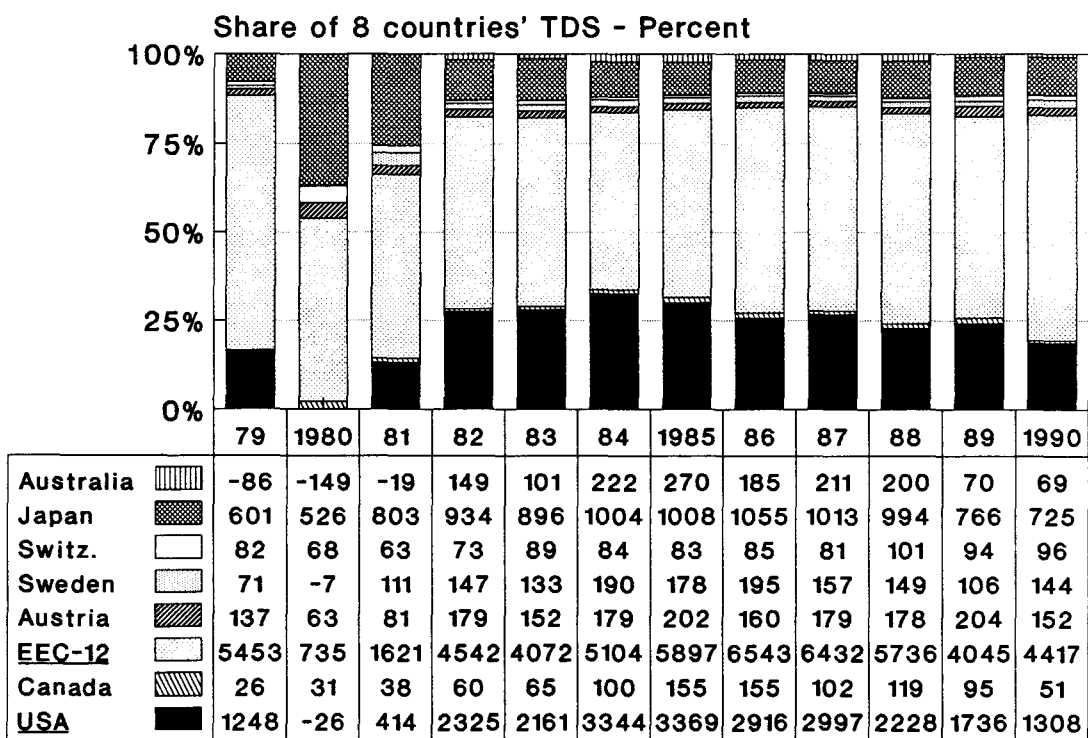


TDS data in table is in 1000 Metric Tons



Source: Calculated from OECD reports.

## REFINED SUGAR



TDS data in table is in 1000 Metric Tons

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