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# AGRICULTURE AND GOVERNMENTS IN AN INTERDEPENDENT WORLD

PROCEEDINGS  
OF THE  
TWENTIETH  
INTERNATIONAL CONFERENCE  
OF AGRICULTURAL ECONOMISTS

*Held at Buenos Aires, Argentina*  
24–31 August 1988

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INTERNATIONAL ASSOCIATION OF  
AGRICULTURAL ECONOMISTS  
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1989

Dartmouth

*Measuring Levels of Protection in Agriculture:  
A Survey of Approaches and Results*

PURPOSE OF MEASURING PROTECTION IN AGRICULTURE

One fundamental element of policy analysis is to gauge the extent to which governments actually influence market conditions. This is the essence of measuring levels of protection. The level of protection is not in itself a measure of policy impacts. The same level of protection can have different effects, depending on such parameters as supply and demand response. However, the implicit assumption is usually made that there is a fairly robust relationship between protection levels and the magnitude of both sectoral income transfers and sectoral distortions in resource allocation.

The economist evaluating policies, and pointing to the economic cost of transferring sectoral income through the price system, and the politician seeking to expand export markets both look to the degree of protection as a yardstick of progress. Economists have frequently calculated the extent of agricultural protection inherent in domestic policies. Recently there has been a growing interest in using estimates of protection levels in the context of international policy discussions. A number of countries have proposed use of an 'aggregate measure' of government policies in the agricultural talks of the ongoing Uruguay Round of GATT negotiations.

Use of such an aggregate protection measure in international trade negotiations would be a significant departure from past practice. Traditionally trade talks have related to border policies such as tariffs, quantitative restrictions and export subsidies. In agriculture past negotiations have not led very far. One of the reasons is the difficulty of dealing adequately with the wide variety of agricultural policy instruments working at the border and domestically (Hathaway, 1987). Hence there is a point in trying an approach based on a comprehensive indicator such as the level of protection in agriculture.

The introduction of an aggregate measure of support into international trade negotiations would constitute a challenge for the agricultural economics profession. It would indicate the potential usefulness of economic analysis, but also require additional efforts. One of the tasks is to share with negotiators the experiences made with different approaches to measuring the level of protection in agriculture.

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## TYPOLGY OF PROTECTION MEASURES

Economists have developed, and applied in empirical work, a number of different indicators for measuring the level of protection, with differing meanings, uses and degrees of complexity. The most simple measure is the nominal rate of protection (NRP) which measures the difference between world and domestic prices.<sup>1</sup> In a situation where only border policies are applied, the NRP correctly measures the policy effects at the output level. In particular, in a tariffs-only world the NRP is equivalent to the tariff applying to the product concerned.<sup>2</sup> The NRP is relatively easy to estimate if reliable statistics on domestic and border prices are available.<sup>3</sup>

The most appropriate use of the NRP is in relation to policy effects on consumption. As long as non-price policies are not in existence, different NRPs for different products indicate the direction in which consumption may be distorted. Distortions of production incentives would, though, be correctly indicated by the NRP only if all policies would affect output prices.

More recently, a measure similar to the NRP has been introduced into the agricultural economics literature, the Price Adjustment Gap (PAG) as christened by Miller (1986) and the corresponding Nominal Rate of Assistance (NRA) as defined by Haszler and Parsons (1987). This indicator includes direct per-unit subsidies such as deficiency payments but not decoupled income transfers. This clarification is useful; payments tied to product output but which are not reflected in the market price must clearly be included in the protection measure.

More often than not, policies do not only affect output prices, but input prices as well. In such a situation, a more complex measure, the Effective Rate of Protection (ERP), is a better indication of the direction in which policies distort incentives to produce different products, since it measures the joint effect of input and output policies on value added.<sup>4</sup> Clearly the superiority of the ERP over the NRP is the more pronounced the more important input policies are and the smaller the share of value added in producer return is. ERP analysis is particularly appropriate in the study of policy impacts on processing activities, in particular where the raw products are agricultural commodities subject to high protection (Tangermann, 1986). Within agriculture, the superiority of ERPs over the NRPs is probably most significant in sectors such as grain-fed livestock.

Estimating ERPs is significantly more demanding than calculating NRPs. In addition to NRPs for the output and all inputs, technical information on input-output coefficients is needed, which is notoriously difficult to obtain on a representative basis. Hence, different studies could easily come up with widely different ERP estimates for the same activity. Since the non-protected value added is usually chosen as the base, the ERP becomes rather volatile, jumping around from huge positive to huge negative numbers when the denominator is close to zero – as it very often is.<sup>5</sup>

However, even the ERP may not provide a complete picture of all policy induced output distortions. There may be policies which affect prices of labour, capital and land employed in a given sector (say, an investment subsidy for agriculture). Such policies do not affect value added and they are therefore not included in traditional ERP measurement. Hence, going beyond the value-added concept of the ERP, one can push the analysis to the level of profits. This is done

in the analysis of Domestic Resource Costs (DRC), widely used in the context of development policy for comparing private and social profitability of farming systems (Pearson and Monke, 1987). Of course, DRC calculations are even more demanding since they require a significantly larger amount of empirical information (for example, information on factor market policies and on factor-output coefficients). On the other hand, there is no doubt that factor market interventions are a typical feature of agricultural policies in many countries, such that the measurement of agricultural protection is not complete without inclusion of these policies.<sup>6</sup>

One further step would be to include the effects of macroeconomic policies. A particularly relevant candidate for inclusion is exchange rate distortion. In calculations of NRPs, ERPs and DRCs for developing countries, the effects of overvalued exchange rates, as often found in these countries, have sometimes been included. While inclusion of exchange rate distortions does not add information concerning distortions among traded goods, it does throw light on distortions between traded and non-traded goods. A recent example of this attempt to capture both the direct price policy impacts and also the indirect effects, through exchange rate distortions and general commercial policy, is the set of studies on 18 developing countries sponsored by the World Bank (Krueger, Schiff, Valdes, 1988).

Inclusion of exchange rate distortions is necessary when the analysis aims at the totality of all policy effects on individual sectors. On the other hand, exchange rate distortions usually are not an element of protection in the sense defined above (that is, policies targeted at individual sectors). Hence, depending on the purpose of measurement, exchange rate distortions can either be included or excluded.

All measures mentioned so far are partial in two dimensions. First, they take no account of general equilibrium effects in the domestic economy. Second, they work on the small country assumptions. The analysis can be expanded in both dimensions, though of course only at the cost of increased complexity and additional research investments. In particular, to include these dimensions one has to go beyond a purely statistical analysis and include more or less complete models full of assumptions on reaction coefficients.

General equilibrium effects, working through links such as factor prices, income distribution, public budgets and exchange rates, are the more important the larger the sector concerned. In developing countries, agriculture usually has a large share in total employment and GDP, and general equilibrium effects may be significant. In most developed countries, on the other hand, agriculture is relatively small. There, it may be interesting to use general equilibrium models for analysing the effects of agricultural policies on other sectors of the economy (Stoeckel, 1985). However, the general-equilibrium-adjusted rate of protection<sup>7</sup> in agriculture is probably only marginally different from the rate of protection measured in the traditional partial approach.<sup>8</sup> Hence, the construction and use of general equilibrium models for the sole purpose of measuring levels of protection more accurately would probably not be justified in industrialized countries.

The situation is different when it comes to the small country assumption. In a number of highly protectionist countries, agriculture is large in relation to the world market. In such cases domestic protection can significantly affect world market prices, and therefore distort the basis of comparison for protection

measurement. In such cases, there may be a point in measuring the level of protection against the world prices that would have obtained in the absence of policies of the country concerned. Moreover, one can go even further and measure protection against those world prices which would prevail if all countries together would completely liberalize trade.<sup>9</sup> Clearly such measurement can be done only in the framework of trade models.

While all these types of protection measures have been used more or less frequently in agricultural economics analysis, one measure has recently received particular attention in the political sphere. The US, EC and Cairns Group proposals for the agricultural talks in the Uruguay Round each mention the possibility of negotiating on the Producer Subsidy Equivalent (PSE) of national policies, and the Canadian and Nordic proposals refer to the analytically similar Trade Distortion Equivalent (TDE). The PSE measure (and the corresponding Consumer Subsidy Equivalent, CSE) has earlier formed the basis for the OECD report on national policies and agricultural trade (OECD, 1987). The PSE is defined as the level of (per-unit) producer subsidy that would be necessary to replace the array of actual farm policies employed in a particular country in order to leave farm income unchanged. It can be thought of as the 'cash' value of policy transfers occasioned by price and non-price policies. The CSE is defined correspondingly.<sup>10</sup>

How does the PSE relate to the other protection measures? In the way the PSE was originally used, it probably comes closest to the ERP concept, in the sense that it includes input policies, but not factor market policies. The original PSE calculations did not include the effects of non-agricultural policies, both at a sectoral level (such as tariffs on fuel) and of macroeconomic nature (such as exchange rate distortions). Indeed, not even the effects of agricultural policies on inputs (feed prices in livestock production) were included. However, subsidies and taxes not reflected in prices were taken into account.

The PSE was based on the small country assumption and on existing world prices. It was expressed in money units per ton of output, as an aggregate sum of money, or as a percentage of actual domestic producer returns. In this way the problems resulting from the small base of value added in ERP measurement were avoided.

For the purpose of agricultural policy analysis a measure like the PSE has been found to be a flexible instrument, since it can be geared to the effects of the wide range of policies employed in agriculture. Data needs are manageable, and the assumptions required (or implicit) are limited and transparent. As a basis for international policy commitments, as in trade negotiations, the definitions can be adjusted to accord with what is politically agreeable (Tangermann, Josling, Pearson, 1987).

None of the protection measures presented above is immune to criticism. Some of them are not sufficiently comprehensive, others are too complex to be used in regular empirical work. Moreover, protection measures can contain very different amounts and types of information. In the end, the measure used in any particular context has to be tailored to the needs and the possibilities of the exercise concerned.

## EMPIRICAL APPROACHES AND RESULTS

The suggestion that the effect of the various types of agricultural support policy on trade should be collected in an aggregate measure dates back at least to the Haberler Report (GATT, 1958). The issue was taken up in a GATT Committee, but no agreed method emerged from this discussion (GATT, 1962). Policy comparisons tended to be made on the basis of domestic price levels, relative to world or reference prices. The one serious suggestion for bringing domestic policies under international agreement, the EC's *montant de soutien* proposal during the Kennedy Round, was based on the notion of binding the relationship between domestic prices and a reference price. Research on world markets also tended to emphasize the price-level differences among countries, ignoring the complexities of the policies themselves.

The first calculations of PSEs and CSEs was undertaken as a part of the FAO work on 'International Agricultural Adjustment' (IAA). The method was described in a paper for the 1973 FAO Conference, where it was applied to five commodities and five countries for the period 1968–70 (FAO, 1973). A follow-up paper for the 1975 Conference expanded the coverage to include six countries and six commodities, and extended the period to 1968–74 (FAO, 1975). At that Conference the FAO was given the task of monitoring adherence to the eleven 'Guidelines for International Agricultural Adjustment.' One of these guidelines stressed the need for developing countries to adopt domestic policies which provided 'appropriate incentives for farmers' and for developed countries to aim at a 'rational use of resources' in formulating their farm policies. The PSE calculations were used by FAO to address the issue of the incentive effect of policies.

The first sign of significant governmental interest in the comprehensive measurement of the impacts of domestic policies on international agricultural markets came in 1982, when the OECD ministers gave a mandate to the Organization to analyse the 'approaches and methods for a balanced and gradual reduction of protection for agriculture' and to examine the 'national policies and measures which have a significant impact on agricultural trade'. The OECD Secretariat adopted and modified the PSE/CSE measure and applied it to seven countries and twelve commodities, for the period 1979–81. After considerable internal discussion the results were released in published form (OECD, 1987).

The potential value of the study for trade negotiations was recognized by the OECD Council in May 1987, but it was the specific mention of the PSE measure in the US GATT proposal of July 1987 that focused attention on the OECD work and its usefulness. By this time the USDA had produced its own PSE study based broadly on the OECD method but including some non-OECD countries (USDA, 1987). The USDA results covered the 1982–84 time period. The OECD has since updated their own calculations to include the 1982–6 period. An updated version of the USDA study, with data through 1986, is also under preparation, with an expanded commodity and policy coverage for some countries.

The basic method used to construct the PSE is similar in all of these studies. Policies are classified into those that raise (or lower) the price level in the market and those that involve budget expenditures but do not directly influence price.<sup>11</sup> The transfers to producers are taken to be the sum of the price and non-price

TABLE 1 *Comparison of policy coverages, PSE studies*

FAO	OECD	USDA
<i>Policies Included</i>		
Market price support	Market price support	Market price support
Deficiency payments	Direct income support	Direct income support
Input subsidies	Indirect income support	Input policies
Storage subsidies	Extension + Research	Extension + Research
Transport subsidies	Structural policies	Marketing subsidies
	Sub-national measures	Controlled exchange rates
<i>Policies Excluded</i>		
Administrative costs	Administrative costs	Administrative costs
Income subsidies	Social Security benefits	Social Security benefits
Acreage control		
Extension + Research		
Structural policies		
Social Security benefits		

transfers – ‘subsidy equivalent’ of the included policies. The same transfers arising from different policies are treated equally. In the OECD and USDA studies the expenditure on ‘long term’ programmes – research, extension, environmental and structural payments – are also added in and allocated to individual commodities according to their share in output value.

Table 1 indicates the main differences in policy coverage among the three studies. The FAO study divided policies up into those that (artificially) increased the demand for ‘farm-owned resources’ as opposed to those that operated on the supply side. It was argued that the main problems of international agricultural trade stemmed from the demand-side policies, including market price support, input subsidies and storage and transportation assistance. Acreage control programmes, along with structural and factor market policies, research and extension and direct income payments (unrelated to output), were deemed to be supply-side policies, and of less direct interference with world markets. The OECD study chose a broader range of farm policies to include in the subsidy-equivalent calculations. Besides market price support and output related payment (such as deficiency payments), direct income transfers were included, along with specific taxation benefits, research and extension, structural measures, capital grants and interest subsidies. Though clearly having an effect on output, the increased heterogeneity of the policy instruments included put more strain on the assumption of equal-output impact per dollar of transfer.<sup>12</sup>

The USDA study adopted a similar classification of policies to that of the OECD, but added a new element. In the case of developing countries, where government policies dictated the exchange rate, it was felt that the degree of transfer to agriculture should be modified by the indirect transfers through exchange rate distortions. Consumer price indices were compared with those in the US to establish approximate ‘purchasing power parity’ exchange rates, which were then used in the PSE calculations. As a consequence, the USDA results for developing countries should be treated with care: they include effects not



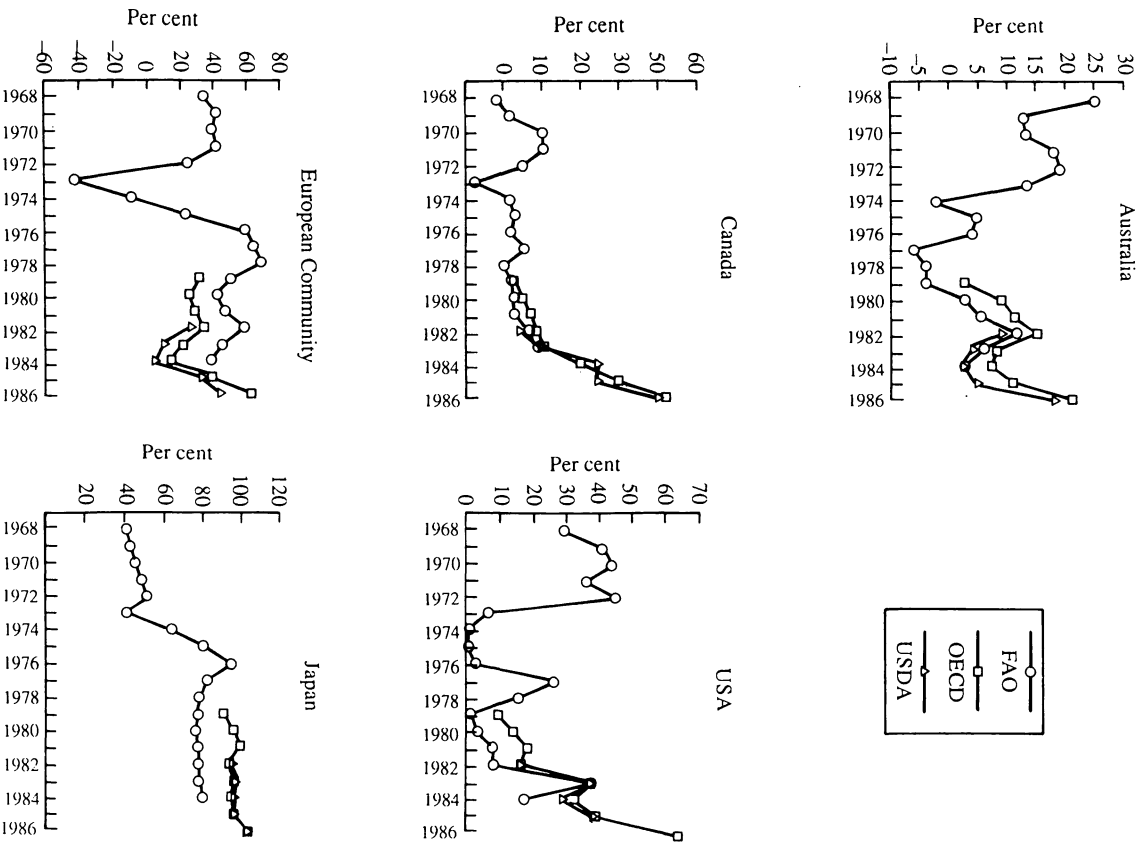


FIGURE 1 Comparison of PSE Estimates: Wheat

normally attributed to agricultural policy and not susceptible to modification in a negotiation on agricultural trade.<sup>13</sup>

The fact that transfers from various policies were aggregated in the PSE has led to it being labelled an 'income' measure. It is not necessarily the case that a dollar transferred to farmers under various types of programmes will have the same impact on farm output. Income support can be 'decoupled' from output levels; it can be tied to some form of acreage control; it can be linked with the use of specific input; and it can be given in the form of subsidized research and extension programmes, which may have a less immediate impact on output. The path from PSEs to output and trade effects needs to be trod with care.

This distinction between income and trade measures was drawn out in the 1973 FAO study, where the PSE and CSE were treated as 'domestic performance measures' (along with budget cost, effective protection, and the cost per unit of transfer). The suggested 'trade performance measures' included the tariff equivalent, the foreign exchange displacement, the trade volume effect and the impact on world price levels. Trade volume effects were used in the IAA progress reports in 1977 and 1979, but in later years only the PSEs were reported. The OECD took the PSEs and CSEs and fitted them into a multi-country trade model to get trade volume and world price impacts, glossing over the income/output distinction. The USDA study does not make any claim that the PSE calculations accurately reflect trade effects, although later work in USDA has built such measures into a multi-country trade model.

The similarity of the methods used in the three institutions should lead to comparable results. Differences that exist will tend to be of policy coverage and of judgement on the impact of particular policies. Figure 1 shows the estimates for PSEs for one commodity, wheat, for the countries and over the period for which comparison is possible. In general, results of the three different studies are rather similar. In particular, the directions and magnitudes of changes from year to year are consistent in most cases. The FAO estimates are below those of OECD and USDA for Japan, and above for the EC.

## CONCLUSIONS

The notion that the effect of farm support policies can be measured is not new to economists: its emergence in the arena of international negotiations is however fairly recent. Measurement of policy impacts always presents a challenge to distil the essence of a government action from the mass of detail in legislation and the complexities of national markets. An appropriate measure for one purpose may be less than useful for another. The policy focus may also differ; sectoral trade talks may need a measure which captures sectoral policy effects, whilst national policy discussions might include consideration of macroeconomic impacts.

This pragmatic view of measurement leads to the conclusion that economists should always be pushing for more complete ways of capturing policy effects – both the costs and the benefits. But they should not be surprised if their efforts are used selectively. The most general protection measures – the effects of all policies on factor incomes from a general equilibrium model – may be useful in

certain institutional settings. Partial measures –nominal protection rates and price gaps – may also serve a purpose. At present there seems to be a need for a flexible, reasonably comprehensive, easily-explained measure of the level of support given by output-increasing national support policies. The PSE (or TDE) seems to meet that need; it will be interesting to see whether the political process makes use of this new-found knowledge.

## NOTES

<sup>1</sup>To be exact, world and domestic prices have to be expressed at an equivalent level, that is, the producer or consumer level. Since producers and consumers may be affected by different policies and because of different marketing margins, the NRP will usually differ between producers and consumers.

<sup>2</sup>More precisely, the NRP is equivalent to that part of the tariff which is non-redundant. If there is 'water' in the tariff, the NRP is below the tariff.

<sup>3</sup>Complications in empirical work, though, usually arise from heterogeneous product qualities and difficulties of defining the appropriate border price equivalent of domestic price. Moreover, in special cases (in particular where the country is self-sufficient) there are even conceptual ambiguities (see Corden, 1971, pp. 21–7). The same complications apply to most of the other measures mentioned below.

<sup>4</sup>The classical textbook exposition of the concept of the ERP is Corden, 1971. For a summary of the history of this concept see Appendix I of Corden's book.

<sup>5</sup>Particular problems arise when the non-protected value added is negative.

<sup>6</sup>Another element which could be included at this level, though not quite systematically, is special sectoral treatment with regard to direct taxes (for example, income tax privileges for agriculture). However, tax concessions are usually excluded from both ERP and DRC calculations.

<sup>7</sup>Corden, 1971, pp. 106 ff., has used the terms 'net protective rate' and 'net effective rate' in this context.

<sup>8</sup>It would appear that under normal conditions the (true) general-equilibrium-adjusted rate of protection always tends to be less than the rate of protection measured in the traditional partial framework.

<sup>9</sup>A recent study has suggested the terms 'adjusted protection rate' for the case of single-country liberalization and 'real protection rate' for the case of global liberalization (Parikh *et al.*, 1986, p. 2/9).

<sup>10</sup>In the following we refer only to PSEs since CSEs play less of a role in the current policy debate.

<sup>11</sup>Budget expenditures were also used extensively in the FAO studies to calculate the price effect. Estimating the average per unit export subsidy on the basis of annual expenditure on such subsidies may be better than trying to calculate the appropriately weighted average of a variable export subsidy over the period of a year.

<sup>12</sup>The OECD study included expenditures given at the sub-national level (and the national level, in the case of the EC). These were excluded from the FAO measure largely on grounds of data availability.

<sup>13</sup>The attempt to qualify the impact of macroeconomic policies on agriculture is, of course, invaluable in the context of national decision taking. Recent work at the World Bank has increased our knowledge of these issues (Krueger, Valdes and Schiff, 1988).

## REFERENCES

- Corden, W.M., 1971, *The Theory of Protection*, Clarendon Press, Oxford.  
 FAO, 1973, *Agricultural Protection: Domestic Policy and International Trade*. C 73LIM9, Rome.  
 FAO, 1975, *Agricultural Protection and Stabilisation Policies: A Framework for Measurement in the Context of Agricultural Adjustment*. C 75LIM2, Rome.  
 GATT, 1958, *Trends in Agricultural Trade: Report by a Panel of Experts*, Geneva.

- GATT, 1962, Committee II, *GATT Programme for Expansion of International Trade: Trade in Agricultural Products*, Second and Third Reports of Committee II, Geneva.
- Haszler, Henry, and Parsons, David, 1987, 'The Price Adjustment Gap and World Agricultural Policy Reform'. *Quarterly Review of the Rural Economy*, Vol. 9, No. 2, June.
- Hathaway, D.E., 1987, *Agriculture and the GATT: Rewriting the Rules*, Institute for International Economics, Policy Analyses in International Economics No. 20. Washington, DC.
- Krueger, A.O., Schiff, M. and Valdes, A., 1988, *Measuring the Impact of Sector-Specific and Economy-wide Policies on Agricultural Incentives in LDCs*. Mimeo.
- Miller, G., 1986, *The Political Economy of International Agricultural Policy Reform*, Australian Government Publishing Service, Canberra.
- OECD, 1987, *National Policies and Agricultural Trade*, Paris.
- Pearson, S.R., and Monke, E.A., 1987, *The Policy Analysis Matrix: A Manual for Practitioners*, Pragma Corporation, Washington, DC.
- Stoeckel, A., 1985, *Intersectoral Effects of the CAP: Growth, Trade and Unemployment*, BAE Occasional Paper No. 95, Canberra.
- Tangermann, S., 1986, *Escalation of Barriers to International Trade of Agricultural Products—a Research Survey and Illustrative Case Study for Cocoa and Soya*, Paper prepared for FAO, Commodities and Trade Division. Göttingen.
- Tangermann, S., Josling, T.E. and Pearson S.R., 1987, 'Multilateral Negotiations on Farm Support Levels: The Role of PSEs'. *World Economy*, Vol. 10 pp. 265–81.
- USDA/ERS, 1987, *Government Intervention in Agriculture: Measurement, Evaluation, and Implications for Trade Negotiations*. Staff Report No. AGES861216, Washington, DC.

## PANEL DISCUSSION

## BARBARA CHATTIN

Josling and Tangermann provide a useful perspective on the Producer Subsidy Equivalent (PSE) and its rise to prominence in the international arena. They review clearly the conceptual differences between the PSE and other measures of protection. They show that the question, 'What is a PSE?' will receive a somewhat different response depending on what institution is answering the question, that is, the policies included in 'the' PSE are not exactly the same for the three institutions that have developed empirical estimates. The paper also shows that for certain commodities, for example, wheat, the PSEs of the three institutions are similar.

Differences in policy coverage (and to a lesser extent data sets) are a major reason why PSE estimates generated by the three institutions diverge. GATT proposals calling for the use of an aggregate measure of support differ chiefly in the policies to be included in the indicator. If an aggregate measure is adopted by the GATT, another set of PSE-type estimates perhaps covering yet a different set of policies could be generated. Hence, the paper's emphasis on the issue of policy coverage is very relevant.

Proposals to use aggregate measures of support in the GATT negotiations have spurred interest in PSEs and related measures. However, researchers in my agency, the Economic Research Service of USDA (ERS/USDA), view PSEs from another perspective – as a tool to facilitate our research agenda.

Economists in ERS/USDA are often asked by policy makers, other researchers and the public to identify the agricultural policy tools used in other countries and to analyse the extent to which governments influence agricultural markets. As agricultural market conditions deteriorated in the 1980s, we searched for better tools to help us answer the question, 'How level is the playing field?'

The OECD work on PSEs, which involved substantial ERS/USDA input on data and review, was very useful as far as it went; that is, as far as the countries and commodities covered and the time frame analysed (1979–81). The PSE approach assigned a 'common denominator' to the wide range of trade barriers and domestic policies used in different countries, thereby enabling cross country comparisons of very different policy sets. We therefore decided to expand the PSE framework to cover additional countries and commodities and more recent time periods.

We also recognized that, because PSEs were static estimates based on the small country assumption and on existing world prices, additional tools would be needed to examine the effects of countries' policies on markets. PSEs (and their consumer counterpart, CSEs) also provided the policy data set for a model of international agricultural markets used to examine effects of changing government intervention. My colleagues are presenting results of the modeling work in other sessions of this meeting.

Calculating PSEs presented several challenges. It required expert knowledge of how *all* programmes operate in a country. Researchers familiar with price and income support programmes for grains, for example, had to learn how dairy, livestock, sugar and oilseed programmes operated in their country. Knowledge

of price and income programmes was not sufficient. I had to understand the operation of 15 non-commodity specific programmes, such as credit subsidies from the Farmers Home Administration, in order to derive US estimates.

Calculating PSEs often involved considerable debate over the most appropriate way to measure the effects of programmes within the static framework of the PSE. The basic estimation procedures were budget data or price gaps. One eye-opener was that researchers accustomed to estimating effects of programmes with econometric models often struggled to estimate support within the static PSE framework. For example, considerable thought was required to 'fit' generic certificates and stocking programmes for the US into the PSE framework.

As noted in the paper, the policies covered in the PSEs of the OECD and ERS/USDA differ chiefly in that ERS adds controlled exchange rates to the policy list for many developing countries. (The OECD does not cover developing countries.) We include controlled exchange rates in our PSE and CSE calculations because, as researchers, we want to know how support (or taxation) from exchange rate policies compares with protection levels from other agricultural policy tools. The PSE and CSE components relating to controlled exchange rates are calculated separately. All other PSE and CSE elements requiring exchange rate conversion as part of the calculations (that is, all measures evaluated with respect to external reference prices) are estimated using official nominal exchange rates.

Although Table 1 seems to indicate otherwise, the PSEs generated by ERS/USDA also include direct and indirect income support, market price policies, input subsidies, marketing and transportation subsidies, long-term infrastructure policies, subnational and taxation policies. However, for some countries the data on subnational expenditures and taxation policies are not currently available.

One major difference between the ERS/USDA exercise and those of the OECD and FAO concerns data availability. The FAO and OECD have direct access to governments who help supply data. Analysts in ERS/USDA must rely on published data sources. Identifying appropriate data sets often requires as much time and thought as developing the conceptual approach for quantifying the 'cash' equivalent of a country's policies, but data collection is a problem inherent in most empirical research.

I feel that we have learned three important lessons from our work with PSEs. First, despite the data problems, the PSE methodology can be implemented for a wide range of countries, commodities and policies. ERS/USDA has published PSE and CSE estimates over 1982–6 for many commodities in Argentina, Australia, Brazil, Canada, the European Economic Community, India, Indonesia, Japan, Mexico, New Zealand, Nigeria, Pakistan, South Africa, South Korea, Taiwan, Thailand and the United States. We plan to expand our country and commodity coverage and update our current set of estimates.

Second, by aggregating a wide range of government policies into a single indicator, PSEs improve our ability to make the extent of government subsidies more transparent to policy makers and the public. PSEs illustrate the relative importance of total government assistance in different countries and commodity markets. PSEs help show which forms of government assistance are most important in individual countries or in specific commodity markets. When

examined over time, PSEs indicate changing government involvement in agricultural sectors.

Finally, the process of estimating PSEs is the best way I know for researchers to improve their understanding of the policies operating within a country. I'll challenge anyone who thinks they know the policies of a country to generate PSEs for the major commodities in that country. At the end of the exercise that person will have learned a great deal.

### MAURICE SCHIFF

The paper by Josling and Tangermann (JT) presents a number of alternative measures of protection and argues that for purposes of GATT negotiations the PSE is better than the other measures discussed because it is more comprehensive and more flexible.

My comments are divided into three parts: first, what is it that these measures of protection are actually supposed to measure and, assuming perfect information, what would be the 'correct' way to do that? Second, given the difficulties in obtaining accurate and reliable information and estimates that will be agreed on in multilateral negotiations, how well do the various PSE and other measures approximate that 'correct' measure? Third, is the use of the PSE, as a basis for negotiation on reduction of protection to agriculture, the best strategy to ensure the success of those negotiations?

(1) What one would like to measure ideally is the impact of policy interventions on demand and supply, and thus on trade (and world prices). We focus here on the supply side but some of the comments also apply to consumption. Supply depends on the quantity of all the inputs used in production, including primary inputs (labour, land, capital), purchased inputs (traded or not), and public goods [infrastructure (roads, irrigation, and so on), research and extension, and so on]. Governments can affect the use of these inputs through quantitative controls or through prices. We focus here on price interventions. To quantify their impact on the supply of the intervened products, we need to know their effect on the supply prices of the products and on the demand prices of the inputs, the demand elasticities for the inputs in each of their uses, and the elasticities of the various outputs with respect to the quantity of each input (the production functions). By supply prices, I mean the prices actually received by producers for their products, and by demand prices, the prices paid for their inputs. These prices equal the market price plus the per unit effect of any subsidy or tax not reflected in the market price of the product (for example, deficiency payments) or of the inputs (such as a credit subsidy). Zero-degree homogeneity of output supply and input demand means that only relative prices matter. One possible deflator is  $P_{NA}$ , a price index of the nonagricultural sector, and which has a tradable and a non-tradable component, and is affected by trade and exchange rate policies. Such a deflator was used in the Krueger, Schiff and Valdes *World Bank* study referred to in Josling and Tangermann's paper.

(2) Agreement on values for the elasticities mentioned above seems extremely difficult at a national level, let alone in multilateral negotiations. Consequently,

we are back to some measures of the impact of policies on incentives which best reflect the degree of intervention on supply and trade. Agreement on the degree of distortion of the exchange rate would seem equally difficult and, as mentioned by Josling and Tangermann, these effects are not expected to be included in agricultural policy negotiations. One could then use as a deflator  $P_{NAT}$ , the tradable component of the nonagricultural price index (mainly manufactures), and measure the impact of policies on the supply price  $P_A$  of any (tradable) agricultural product (and input) relative to  $P_{NAT}$ , that is, on  $P_A/P_{NAT}$ . The intervention-free value of  $P_A/P_{NAT}$  does not depend on the exchange rate. We have also done that in the World Bank study. Results are similar to those using  $P_{NA}$ , but it avoids possible criticisms of assumptions underlying an equilibrium ER model. Of course, if, as has been the case in the past, reduction of interventions on  $P_{NAT}$  continues to be negotiated separately from agricultural policy, then focus will be on nominal prices only, as seems to have been done in the FAO, OECD and USDA studies. However it should be recognized that reduced protection for manufactures in OECD countries has indirectly raised protection to agriculture.

We identified above three sets of inputs: public goods, primary factors, and purchased inputs. The OECD and USDA studies include expenditures on public goods, such as research and extension, and structural policies, in their PSE measure. Why this is done is unclear to me. Say we have two economies, one which saves and invests 40 per cent of income, the second only 20 per cent because of a higher positive rate of time preference or because it has already reached a higher level of income per caput. The first economy invests more in public goods, including agricultural research, infrastructure, and so on. Should that economy be penalized for that by including some of those expenditures in a measure of policy intervention? This seems like adding together the impact of policies which distort resource allocation (say, import tariffs or quotas) and that of other policies which may very well allocate resources optimally.

What should be included is the part of the subsidy element in the expenditures on public goods which is over and above the positive externalities generated (for instance through lower prices) and which could conceivably be negative and transformed into a flow equivalent. This is also the case if one is concerned with the impact on income rather than output or trade. But how would one estimate the share of income taxes and other taxes paid by the agricultural sector which are allocated to these public goods? Thus, from the practical and conceptual view-points, it would seem preferable not to include expenditures on public goods in the PSE.

What about subsidies to primary factors? What matters is not the expenditures on those 'subsidies' but the difference between the prices paid and those which would have prevailed in the absence of interventions. Prices of labour and capital may be affected by interventions outside agriculture, such as interventions in the urban labour market, protection of the domestic industry producing agricultural machinery, macroeconomic policy (for example, fiscal deficits) leading to an increased demand for urban labour and thus to increased migration of labour out of agriculture, and others. Consequently, it could be argued in the negotiations that subsidies to those factors in agriculture compensate for distortions outside agriculture. The same is true for the credit to finance capital expenditures or the



purchase of seeds, fertilizers, and so on. Credit subsidies may compensate for controls on capital markets and financial intermediation which reduce competition and raise borrowing rates, for the effect of fiscal policies on real interest rates, and so on. Reaching an agreement on how to measure the *net* subsidy (over and above the compensation for the effect of policies outside agriculture) to primary factors and credit does not seem very realistic.

If this assessment is correct, then we are left with measuring the impact of policies on the prices of output (including deficiency payments, and so on) and purchased inputs, and of the three (FAO, OECD, USDA) empirical studies, the FAO used a definition which is closest to this measure. We are then getting closer to an ERP concept, except for the denominator. The PSE measures transfers due to the included policies relative to the value of output measured at domestic or world prices. One cannot apply elasticities of supply to PSE measures which include subsidies (or taxes) on output as well as on inputs but which are measured relative to price and expect to measure the impact on output. The FAO version of the PSE is a kind of hybrid between an ERP (in the numerator) and NPR (in the denominator). A country with a higher PSE may have a lower ERP if the share of purchased inputs is higher, and may, other things being equal, have a lower output effect.

(3) As mentioned above, past negotiations on agricultural policy have been held separately. Use of PSE measures may reinforce this process. In a forthcoming study, Zietz and Valdes (IFPRI Research Report, October 1988) argue that if agricultural policies are negotiated separately, they will be negotiated by the ministers of agriculture who often represent the parties interested in the continuation of those policies. They suggest an alternative strategy in order to integrate negotiations on agricultural policy with the other MTNs and thereby increase the chances of success of such negotiations in reducing protection to agriculture.

#### WILFRID LEGG

This brief survey of approaches to measuring levels of protection concludes that, from the available alternatives, the Producer Subsidy Equivalent (PSE) or the derivate Trade Distortion Equivalent (TDE) meets, in the authors' words, the need for 'a flexible, reasonably comprehensive, easily explained measure of the level of support'. This need arises because of the interest in using estimates of protection levels in the context of the current Uruguay Round of GATT negotiations.

The PSE measures the value of the level of assistance provided to domestic producers by a given set of policies at existing levels of production. It is an indicator of income transfers to farmers from consumers and taxpayers. This is clear from the paper. While, in the broad sense, the PSE is a measure of the protection of farm sector receipts, it is not a measure of protection in the narrower trade sense. A given level of assistance, measured by the PSE, arising from such policy measures as deficiency payments, variable import levies, quotas, stabilisation schemes and the provision of general services to agriculture can imply both different levels of border protection and resource allocation effects, depending on supply and demand responses.

The use of PSEs in the GATT context has caught the policy makers' imagination. But the attraction of the concept should caution restraint as to what it can do. This is no criticism of the concept. But there is a danger that it will be required to give answers to questions for which its structure is inappropriate. One single indicator of the weather cannot tell us the temperature, the atmospheric pressure, the degree of humidity and the wind speed, although these variables are related. Likewise, the PSE cannot tell us in one measure the transfers to producers, the production incentive and the degree of trade distortion, although all these variables are also related.

The distinction between protection and assistance is not a semantic issue. Each of the measures of protection outlined by the authors has a well-defined objective as to what is being measured and each is appropriate for that purpose. It is a matter of choosing the right tool for the job. There is an extensive range of effects resulting from agricultural policies that we wish to measure for different purposes. It would be very convenient if we could devise a multi-purpose tool, a comprehensive measure which, in one intuitively appealing index, a whole set of effects could be captured. The GATT negotiations are concerned with the international effects of policies and actions of the negotiating parties. Is the PSE, which measures transfers to producers, an appropriate or sufficient tool? Is it robust enough in a negotiating context? These fundamental questions must be addressed. In this regard, I might add that in OECD we are exploring alternative indicators to PSEs.

PSEs are by no means limited to their possible role in international trade negotiations. As an indicator of the transfers to producers and the costs to consumers and taxpayers arising from agricultural policies, they are an essential yardstick in the annual work of monitoring the actions taken (or not taken) by OECD member countries in the reform of agricultural policies to which the OECD Ministerial Council agreed in 1987 and endorsed in 1988.<sup>1</sup> In particular, both the overall level of PSEs and the component parts add to our information on how total assistance is changing and whether there is a shift to income support measures that are less production-related. The availability and diffusion of this information is crucial to the process of periodic, public and independent policy review in supporting the momentum for policy reform which has to be ultimately determined and implemented at the domestic level. The point I am making is that trade reform in GATT and domestic agricultural policy reform are both parts of the same process. They are not separate.

OECD has been in the forefront in calculating PSEs – and the corresponding Consumer Subsidy Equivalents (CSEs) which should not, incidentally, be ignored – as well as providing a forum to regularly examine and improve the methods of calculation and the use of PSEs. Currently, PSEs are being calculated for 16 of the 24 OECD countries (with the EEC as one country group), covering commodities which account for around four-fifths of total agricultural production in each country.<sup>2</sup> Results extend back to 1979 and estimates for 1987 and 1988 are in the course of preparation. The EEC calculations, which cover 10 countries to 1986, will shortly include all 12 member states and data for 3 or 4 additional countries will soon become available. In OECD there is a general agreement that the PSE calculations for all commodities and countries are broadly consistent, given the static assumptions employed. Equity in treatment,

even if there are imperfections – is a powerful force in gaining acceptance.

Since the beginning of the decade, assistance as measured by the PSEs has more than doubled. Currently – and this is only a rough estimate – more than US\$200 billion each year is being transferred through agricultural policy measures to the agricultural sectors in the OECD countries studied. We are well aware that the agricultural sector consists of more than farmers and that there are other beneficiaries from agricultural policies. As economists, we also know that only part of the transfer constitutes a real loss of welfare. But these are subtleties that can be difficult to explain to the politicians and the public, and PSEs are to be judged as much by political as by economic criteria. The awareness of how much is being transferred to the agricultural sector, how it is distributed amongst groups of farmers and countries, and that an increasing part is wasted in offsetting subsidies of other countries may be a powerful force in generating policy reform.

Apart from the important question of the choice of world price as a reference to measure price support, there are three specific PSE areas of interest: the first is the influence of exchange rate changes on the price gap component of the PSE. The conclusion of the discussion in OECD is clear: the exchange rate is part of the economic environment within which agricultural policies operate. Changes in PSEs resulting from exchange rate movements are part of what PSEs capture. They emphasize the insulation of domestic policies from world market developments and thus the imperfect transmission of world prices to domestic markets. Any exclusion of exchange rate effects – even if one could establish exactly what that means, how it could be done and which base year to take – would lead to perverse results. However, it should be noted that in some non-OECD countries, where there is a two-tier exchange rate and agricultural trade is transacted at a different rate of exchange than is applicable for other goods, then this should be accounted for in PSE calculations.

Second, in the cases where there are supply control measures, it has been argued that some adjustment be made to the PSE measurements to take account of the reduction in output consequent upon such measures. However, it is clear that the level of price support multiplied by the actual quantity produced defines the price gap component of the transfer to producers. A distinction must be made between the PSE as a measure of producer transfer and as a measure of production incentive and trade distortion. However, other derived measures such as the TDE have attempted to capture the production (and trade) effects of policies.

Third, OECD is fully involved in examining the whole question of ‘decoupling’ – the implementation of policies that break the link between production decisions and farm income support – as part of the reform of agricultural policies. However, it is by no means an easy task to identify and measure decoupled policies.

In conclusion, we owe a great debt to Professor Josling for the pioneering work that was done over 15 years ago in developing the concept of PSEs and to Professor Tangermann and other researchers for pursuing work in this area. OECD has built on that work and has helped to bring it into the policy arena. We can only continue that work and hope that the concrete results are reflected in the reform of agricultural policies to ensure a healthy, viable agricultural sector in a prosperous economy. But this landscape is so unfamiliar that perhaps we cannot see around our favourite landmarks to the horizon beyond.

## NOTES

<sup>1</sup> *Communiqués*, OECD Council at Ministerial Level, 13 May 1987, and 19 May 1988.

<sup>2</sup> *Monitoring and Outlook of Agricultural Policies, Markets and Trade*, OECD, 1988.