THE INTEGRATION OF APPROACHES FOR MEASURING ASSISTANCE

(Paper submitted by the New Zealand authorities)

Introduction

Consider the variety of approaches suggested for measuring assistance: price wedges, producer subsidy equivalents (PSEs), effective rates of assistance (ERAs), and the use of economic models.

If we are to avoid confusion, we need to link these various approaches in both a theoretical sense and in terms of a practical work programme.

Fortunately, it appears that the measures described above, far from being inconsistent alternatives, form a logical progression, both theoretically and practically. Each measure builds on the former, adding more and more information in a step wise fashion.

The purpose of this note is to demonstrate the linkages between the measures in terms of their fundamental relationship to the concept of economic activity. A practical example of the successive refinement of measures is illustrated in the Appendix.

Economic activities

An economic activity comprises the labour and capital, known as the value-added, that is required to transform tradable inputs into a tradable output. The economic activity of harvesting takes intermediate inputs such as fuel, provisions, and repair services and transforms them into unprocessed fish. The returns to the crew and the vessel owners constitute the value-added.

When examining the effects of assistance on the allocation of resources, it is very important to clarify our understanding of the underlying economic activities which are affected by assistance. Resource allocation effects arise primarily because of the expansion of some economic activities at the expense of others.

A particular economic activity will expand if the relative returns to the value-added components increase relative to competing uses of that labour and capital. Increased returns allow that activity to bid away resources from other activities and to expand production. Whereas consumers base their decisions on relative prices of outputs, producers do so on the basis of the relative returns to value-added.

Scope of economic activities

For studies of assistance, the scope of an economic activity is determined by the points at which inputs or outputs can be traded. Where intermediate outputs are not tradable, or at least not at reasonable cost, their production should be considered as part of a wider economic activity.

For example, the freezing of fish on board, while a type of processing, could be considered part of the harvesting activity if the cost of landing, or transhipping unfrozen fish was prohibitive. Unfrozen fish in this case would effectively be non-tradable. On the other hand, fisheries close inshore might be able to land unfrozen fish in reasonable condition for further processing on land. In this case the freezing of fish should be excluded from the harvesting activity, and be incorporated as a part of the processing sector.

In general, economic assistance in fishing will relate to one of two economic activities, harvesting or processing. The precise division between the two activities would depend on the point that an intermediate product became tradable. In some cases harvesting will comprise some considerable degree of "processing" activities.

Combining assistance measures over both harvesting and processing activities would lead to misleading results. If there was a tradable intermediate product, the measured assistance might, in fact, apply to a very narrow range of the economic activities covered.

Notational conventions

Before demonstrating the analytical linkages between various measurement approaches, it is helpful to establish some notational conventions.

Subscripts

i = 1..n	Refers to an economic activity of type 1.
j = 1..o	Refers to country j. By extension, a further dimension could represent the location of the activity in country j. In a full specification, this extra index is likely to be useful to represent operations in different EEZs.
k = 1..p	Refers to a particular type of economic assistance, e.g. a tariff barrier, or a subsidy. By convention, k = 1 refers to assistance provided by border measures on the output of activity 1, in country j. It follows that only the binding border measure, e.g. tariff or import control, is identified.

Exogenous variables

OUTPUT(i,j)	The quantity of output produced by activity i in country j.
PREF(i,j)	The reference (world) price for the output of activity i, as applying to country j. Because of transport costs, the reference price for each country will be different.
PDOM(i,j)	The domestic price in country j of the output of activity 1.

VA(i,j)	The value-added (unassisted) associated with activity i in country j, if tradable inputs, and outputs were assessed at world reference prices.
ELVA(i,j)	The elasticity of value-added for activity i in country j. This is the per cent increase in output resulting from a unit per cent increase in returns to value-added.
MASSIST(i,j,k)	The marginal assistance accruing to activity i, in country j, from assistance type k.
TOTASSIST(i,j,k)	The total assistance accruing to activity i, in country j, from assistance type k.

Calculation of price wedges

The price wedge for a particular product is simply the percentage that the domestic price is above the reference price applicable to that country. In the special case of a binding tariff, the price wedge can be calculated directly as the nominal tariff rate.

(1) PWEDGE(i,j) = ((PDOM(i,j) / PREF(i,j) - 1)

Calculation of producer subsidy equivalents

The producer subsidy equivalent attributable to border protection measures on the final product is derived from the previous calculation of the price wedge. No new information is required unless, the price wedge has been determined by reference to a nominal tariff. In that case, we must also know the reference price applicable. By convention, border protection assistance is type k eq 1.

(2) PSE(i,j,k eq 1) = PWEDGE(i,j) * PREF(i,j)

PSEs may be calculated for other forms of assistance also. Particular case must be taken to ensure that only marginal assistance is measured in principle. For example, assistance does not occur where a simple income transfer takes place, with no effect on the relative value-added between different economic activities. However, for purposes of estimation it will often be appropriate to approximate marginal assistance by reference to the average assistance provided.

(3) PSE(i,j,k ne 1) = MASSIST(i,j,k)

MASSIST(i,j,k) may be approximated in many cases by:

(4) TOTASSIST(i,j,k) / OUTPUT(i,j)

Once a PSE has been calculated for individual types of assistance, an aggregate PSE may be calculated to summarise the total effect of all assistance measures. This is generally what is meant by the calculation of a PSE for a particular economic activity.

(5) PSE(i,j) = sum(over all k, PSE(i,j,k)

Calculation of effective rates of assistance

The ERA is usually defined in terms of assisted value-added as a percentage margin above unassisted value-added.

$$(6)\ \ ERA(i,j) = (ASSISTVA(i,j) / VA(i,j) - 1)$$

However this equation can be rearranged in terms of the PSE definition, by noting that assisted value-added is simply the aggregate PSE added to unassisted value-added.

$$(7)\ \ ASSISTVA = VA(i,j) + PSE(i,j)$$

Substituting this into the primary definition of ERA, and then rearranging gives:

$$(7)\ \ ERA(i,j) = PSE(i,j) / VA(i,j)$$

This rearrangement demonstrates that the calculation of an ERA for an activity simply involves dividing the PSE by the unassisted value-added association with that activity. Because we know the PSE, we can calculate unassisted value-added from our knowledge of assisted value-added, if necessary.

Model-based approaches

The most straightforward models look only at partial equilibrium changes in output as a result of assistance. The percentage change in output is derived by multiplying the ERA for the economic activity by the associated elasticity of value-added.

$$(8)\ \ \%CHANGEOUTPUT(i,j) = ELVA(i,j) * ERA(i,j)$$

The percentage change in output can be converted to actual quantity changes by multiplying by current output.

$$(9)\ \ CHANGEOUTPUT(i,j) = \%CHANGEOUTPUT(i,j) * OUTPUT(i,j)$$

More sophisticated models would follow through second-round price effects induced by the initial change in output. The price effects on returns to value-added would feed back through ELVA(i,j) to produce further output changes, eventually resulting in an equilibrium position.

For example, in the New Zealand case study on the hoki fishery, initial changes in assistance led to changes in the price of quota. The price of quota restricted or expanded the supply of harvesting services to ensure that total output remained within the TAC.

As was noted by the ad hoc Expert Group in its discussion, further feed-back price effects could be incorporated in such models. For example, changes in supply to final markets could induce changes in the price of the output for particular economic activities. These price changes would then feed-back into the return to value-added.

In non-quota fisheries, changes in assistance would lead either to the fishing down of stocks, or to more rigorous input controls, such as shortened seasons, to contain catches within the desired TAC. Conceptually models could incorporate the effect of these changes on the returns to value-added to harvesting services.

Conclusions

This report raises a number of points that may be relevant in designing a programme of work on economic assistance.

- Price wedge, PSE, ERA, and model-based approaches are not alternatives, but step-wise extensions of the same data. The ability to calculate a PSE is a necessary intermediate stage before calculating an ERA or constructing a model of the effects of assistance.

- It is not sensible to aggregate the harvesting and processing sectors where a tradable intermediate product exists, e.g. frozen fillet blocks. This suggests a separate analysis of the processing from the harvesting sectors in principle. Processing activities should be incorporated into the harvesting sector up to the point at which a tradable product is created.

- For harvesting services the analysis needs to be multidimensional, covering both the country of origin and the location of harvesting. A certain fleet may be lightly assisted in foreign EEZs but heavily assisted in its own. World reference prices need to be calculated for each country because of different transport costs and product quality in each market.

- The result of the initial analysis will be a series of PSEs for each country, each sector, and, in the case of harvesting services, for each EEZ.

The way to proceed in measuring assistance in fisheries is relatively clear; the chief problems lie in finding the necessary data. As discussed in other papers, the essential difficulties arise from the prevalence of quantitative barriers with respect to fishing services, and the difficulties of measuring the price wedges implied. In the case of processing, the price wedges, where they exist, are usually due to tariffs and so can be determined trivially. This makes the analysis of assistance to processing activities much more tractable.

APPENDIX

The calculations below illustrate how price wedges, the PSE, and ERA measures can be related in concrete terms. Examples are intended to be indicative only.

Processing of breaded fish products

Situation

Breaded fish products attract a tariff of 15 per cent when imported into the United States. Raw fish, in the form of frozen fillet blocks, can be used to produce breaded product and attracts no import duty. Based on confidential New Zealand data, the value added to transform raw fish to breaded product is relatively small, perhaps 10 per cent of the final price in an unassisted processing environment. It is assumed that processors in the United States receive no other forms of assistance.

Data and assumptions

PREF = PREF
PWEDGE = 15 per cent
VA/PREF = 10 per cent

Although PREF will be generally known, it is included as a variable only to illustrate how, in this simple example, it cancels out in the calculation of the ERA.

Calculations

PSE = PREF*0.15

ERA = PSE / VA
= PSE / (PREF*0.1)
= (PREF*0.15) / (PREF*0.1)
= 0.15 / 0.1
= 150 per cent

This would imply that the economic activity of breading fish in the United States enjoys a relatively high level of effective assistance, resulting from the rather low level of value-added involved.