ECONOMIC SUPPORT OF THE FISHING INDUSTRY: EFFECTS ON EFFICIENCY AND TRADE

(Paper prepared by Professor R. Hannesson)

Introduction and summary

This paper, written for the OECD, considers the effects of economic assistance to the fishing industry on trade flows and economic efficiency at large. There are three main questions dealt with in the paper:

- What is economic assistance?
- What are the consequences of economic assistance?
- What are the problems arising from economic assistance that particularly need to be investigated?

Economic assistance to industries is provided both directly and indirectly. Direct assistance consists of disbursements that increase producer prices or lower costs. Such assistance is fairly visible and its existence, if not the reason for it, is hardly controversial. Indirect assistance is provided by restricting competition in markets, domestically or internationally. The existence of such assistance is more controversial. In part, such controversies stem from disagreements on what is to be taken as the reference situation of unfettered competition. Does this only involve free trade in goods, or is free movement of capital and labour also included? In the context of fisheries, the main controversy centres on access to fish resources. Does unfettered competition only involve trade in fish and fish products, or does it also include access on equal terms to fish resources for vessels of any nationality?

The consequences of economic assistance depend on which of the above is taken as a benchmark situation and whether the harvest of fish is being controlled or left to uncoordinated activities of atomic industries. Providing economic assistance to an un-regulated fishery may quite easily lessen the supply of and the flow of trade in fish, contrary to what is usually obtained in other industries. If, on the other hand, the fish harvest is regulated, economic assistance is not likely to affect the supply of fish and the flow of trade in fish to any appreciable extent. Economic assistance then represents either pure waste on behalf of those who provide it, or the attainment of goals which, in the case where the policy is well thought out, represent a value at least as great as the cost of economic assistance.

The need for analysis of economic assistance and its impact on trade, depends in part on what is taken as a benchmark situation. If the benchmark situation involves only free trade in fish and fish products and the quantity harvested from fish stocks is managed, the impact of support to fish harvesting on fish trade is likely to be negligible. The quantity of fish supplied will not be appreciably affected, and the interesting questions related to economic support concern primarily domestic issues in the countries providing the support, such as whether or not the support provides benefits commensurate with the costs

of the policy. These are important issues, but not particularly important for international trade. The important trade issues arising in this context concern differential support to various types of processing (including fresh fish). It is quite likely that the effects of such support are substantial.

In case access on equal terms to fish resources is taken as a benchmark, the support given to fish harvesting becomes important from the point of view of international trade. Such support has obvious effects on the relative competitiveness of fleets of different national origin. Since investment in fishing fleets represents long term commitment, the long-term consequences of measures such as assistance to boat building need to be emphasised. Even if such measures appear wasteful in the short run, they could be strategically important, making it possible to out-compete competitors at the expense of short term losses but gaining some control over the market at a later date.

Defining and measuring assistance

The fishing industry is normally only a small part of the economy of a country. Hence, a partial analysis of the effect of support to the fishing industry is justified. Such partial analysis is based on the assumption that the prices of other goods are unaffected by measures that affect the price and the quantity produced and consumed of fish and fish products. We shall, therefore, take the partial approach in our discussion of the effects of support to the fishing industry. Partial analysis is much simpler than general equilibrium analysis, which would take into account the effects of economic support to the fishing industry on the prices and quantities of other goods.

We shall start with a simple, classic example of economic support and its consequences for the flow of trade, as this clarifies the basic issues, and subsequently discuss these issues in greater detail and how they relate to the fishing industry. Figure 1 shows the effects of economic support to an industry in a country which, initially at least, imports a part of its supplies from abroad. The curves labelled S and D show the supply and demand schedules in the country. Initially, supplies are forthcoming from abroad at a constant cost of p1 per unit. In market equilibrium in the absence of any support to the domestic industry, the quantity q_4 will be consumed, and the market price will be p_1. The quantity q_1 will be supplied by the domestic industry, while q_4-q_1 will be imported.

The country can support its domestic industry in several ways. Economic support is any such measure that raises the profit per unit produced. This can be done either by raising the price of the product sold by domestic suppliers or lowering the costs of production. The increased profitability of the industry leads to increased production in two principal ways:

- increased profitability of additional production by existing firms in the industry provides incentives to expand production, while

- increased profitability of the industry by and large provides incentives for new firms to enter the industry.

To what extent the domestic production increases for any given increase in the profit per unit produced depends on how fast the profit per unit is eroded by increasing production. Furthermore, an industry may run against specific supply constraints that severely limit the expansion of production in response to an increase in its profitability. This is particularly important in the context of the fishing industry, as will be discussed below.

One way of providing economic support is by imposing a tariff on imports. Suppose this raises the market price in Figure 1 to p_2. The total quantity bought will decrease to q_3, while the domestic industry will be willing to supply the quantity q2 at this higher price. The import will shrink to q_3-q_2. Note that there are two separate reasons why the import shrinks. First, consumers will buy less of the commodity at a higher price. Second, domestic producers will supply more at a higher price. Both eat away at imports. The shrinking import will affect the level of production in the countries that export the commodity.

Another way of supporting the domestic industry is by raising the price received by domestic suppliers or lowering their costs without letting this affect the price that consumers pay. The burden of this type of support would fall on consumers in he form of higher taxes, but the effect on the demand for this specific commodity would be negligible, provided the expenditure on the commodity is only a minor part of the consumers' budget. The quantity bought would still be q4, but domestic producers would now supply a greater proportion of the total demand. If the support to domestic producers amounts to p_2-p_1 per unit the producers would supply q_2, as in the first example, but the effect on trade would be less, since the total amount consumed would stay the same.

Still another way to support the domestic industry is by restricting the import quantitatively. If, for example, it is only allowed to import the quantity q_3-q_2, equilibrium will be obtained in the market at the price p_2 where demand is equal to the total supply, the permitted import (q_3-q_2) plus the domestic production (q_2). The effect of this quantitative restriction is precisely the same as that of a tariff of p_2-p_1 per unit, except that the government would not receive any revenue from imports in this case unless it made importers pay for licences to import.

From this simple scheme, we see that the protection of the domestic industry has the following effects on trade, production and consumption:

- it increases domestic production;
- it reduces domestic consumption, unless consumer price is left unaffected;
- it reduces international trade and production in exporting countries.

The magnitude of these effects depends on the slope of the demand and supply schedules, often expressed as elasticities of supply and demand, and the difference between the price in the absence of support and the price including the support, referred to as the price wedge. With regard to the response by domestic producers, it is the increase in profit per unit produced that matters. Such increase may, as already stated, occur either through an increase in price or a decrease in the cost of production. Since a change in these variables has exactly the same effect on the profit per unit, we will follow what appears to be a widespread practice in the literature dealing with these issues and focus on changes in the producer price. The price in the absence of support is referred to as the benchmark price. The exposition to follow makes extensive use of these concepts.

It happens that economic support is given to an exporting industry. This would, of course, necessitate a different diagrammatic exposition. The basic effects are the same as for an import-competing industry, however, but the support would now harm the production by other exporters through increased exports from the country that protects its industry. This is a well-known phenomenon in agriculture and happens in fisheries as well.

From the above it is clear that we need to know the following in order to assess the effects of protection on trade flows and production/consumption of commodities:

- the magnitude of the price wedge;
- the elasticity of the demand and supply schedules;
- the benchmark situation (i.e. trade flow and price in the absence of support).

Measuring

The measurement of the PSE

With regard to the estimation of the PSE, it is useful to distinguish between (i) direct budgetary outlays and (ii) such support as does not cause any outlays from the public purse but raises the price or lowers the cost of the industry being protected.

Direct budgetary outlays include the following:

- price and incomes support;
- research and development;
- costs of management such as:
  - stock assessment;
  - enforcement;
  - extension services, etc.

That price and incomes support constitute protection seems obvious enough. Price support raises the price and the profit per unit produced directly, while incomes support lowers the cost and makes it more attractive to be employed in the fishing industry relative to other industries. It is more doubtful if expenditure on research and development should be counted as support. To the extent there is an argument for government financed research and development it rests on the public good character of these activities; if they benefit mainly others than those who might undertake these activities, the incentive to do so is weak. If, however, the research and development benefits mainly the fishing industry, as appears likely with respect to activities specially designated to this purpose, then the industry should also pay for them. It is natural, therefore, to count such expenditures as assistance if they are being financed out of general tax revenue without being recovered from the industry that benefits.

The costs of management should also be counted as assistance if they are not recovered from the industry in the form of fees or taxes. Fish resources are of a kind that are not easily subject to private ownership, even if such use rights as fishing licences or fishing quotas may be so treated. Maximising the aggregate economic benefit of such resources requires some form of control. Stock assessment and enforcement of fishery regulations are two main components of such control that potentially is a major benefit to the industry. The costs of these activities would have to be borne by the industry itself if they

were not otherwise forthcoming and the industry would want to maximise the aggregate economic benefit of the fishery.

Certain forms of assistance may be of a nature that does not encourage increased production. An example is decommission grants, provided the firms that receive them curtail their activities in proportion to the grants received. Even if the purpose of decommission grants is to reduce fishing capacity and effort, they may fail to do so. This is particularly likely to happen when multi-vessel firms receive grants to decommission some of their vessels, as it is not to be avoided that such grants increase their profitability and put them in a better shape to improve their remaining activities. Recurrent decommission grants may furthermore create the expectation that such grants will be routinely forthcoming.

Indirect support includes the following:

- tariffs;
- imports quotas;
- tax concessions;
- interest rate concessions.

The difference between (i) and (ii) above, is that the indirect support does not cause any budgetary outlays and hence cannot be found from examining government budgets; indeed tariffs provide income and not outlays for the public purse. All these items do, however, either raise the price received by producers or lower their costs and hence increase their profit per unit produced. The methodology of evaluating this type of support is to compare the actual prices, tax or interest rates paid with the values that would prevail in the absence of these measures. This can be difficult and is likely to involve as much good judgement as direct estimation.

One problem of estimating price support arises in connection with restricted competition in the market place. What is needed is an evaluation of by how much this increases the market price. If, however, the focus is on trade distortion, this may not be important. Quantitative restrictions on imports affect the flow of trade directly, so it need not be inferred from the impact such restriction have on supply and demand. The reactions on the demand and supply side do, however, give rise to allocation effects that are interesting enough units own right. Quantitative restrictions to fish trade are quite widespread and are mainly of two types. One is tariff free, or low tariff, quotas on fish and fish products, the other is a ban on landings from foreign vessels. The latter is related to the issue of access to fish resources, which will be discussed below.

Adding up all the support for the entire industry and dividing by the production value, gives the PSE as a fraction of total value. Doing this for the aggregate fishing industry is likely, however, to be too crude. Fish products are of many varieties; some are at best imperfect substitutes and some not at all (fish meal and fresh fish, for example). Even if it will sometimes be difficult to associate certain kinds of support with a particular branch of the fishing industry, the ability to distinguish between support of groundfish products and products from herring and similar fish, or frozen versus cured groundfish products, is likely to be extremely useful for an analysis of trade flows. This product specific calculation of the PSE i all the more necessary as the interesting trade issues resulting from assistance to the fishing industry concern the differential impact on supply of and trade in fish products. This will be discussed in greater detail below.

Some refinements of the PSE

The effective rate of assistance (ERA) is a comprehensive measure of the degree of protection, taking into account negative (or positive, as the case may be) assistance provided by assistance to other industries from which the industry under consideration gets its supplies. If, for example, nets and fuel are subject to import tariffs, this will be a burden on the fishing industry, which will need some tariff protection merely to keep even compared to situation with a free trade of all commodities. The ERA is not directly comparable with the PSE, as it compares value added with and without protection. The importance of the ERA concept for the calculation of PSE is that the PSE should preferably make the same type of correction for assistance provided to other industries and which may impose a burden upon the industry under consideration. The drawback is, however, that such corrections make the calculation of PSE much more complicated, as it becomes necessary to assess the use of various inputs in the industry and how much protection is given to the industries providing these inputs.

The uncritical estimation of PSE on the basis of budgetary outlays has been criticised for being too inclusive, also taking into account outlays that have no effect on output and the flow of trade. With the focus on use of factors of production and the impact on trade flows this is a legitimate concern. A corrected PSE, sometimes labelled TDE (trade distortion equivalent), is more appropriate for the purpose at hand. Such a measure takes into account only the support that encourages increased use of factors of production and hence increased production volume, according to the responsiveness of supply to increases in the use of labour and capital. It is necessary, however, to recognise that a variety of measures which at first sight do not seem related to changes in the use of resources are indeed likely to attract resources into the industry in the long run, through making it more attractive than other industries. The classification of expenditure into categories that do and do not encourage increased use of manpower and capital is bound to involve a portion of good judgement. A reasonable precaution is, in our view, to include all economic support unless it is satisfactorily proved not to augment the use of resources in the industry in the short and the long run.

A precaution arising from the peculiarities of the fishing industry is called for. The fishing industry is subject to quite substantial natural fluctuations in the abundance of fish and hence fishing quotas and fish catches. Furthermore, market conditions are also quite variable. The support given to the industry does not necessarily vary in harmony with these fluctuations; indeed, it may be expected to be quite independent thereof or perhaps counter-cyclical. For this reason, it is necessary to assess the support to the fishing industry over a certain period of time which includes both good and bad conditions.

The benchmark solution

The supply response to economic support to the fishing industry depends critically on whether the industry is un-regulated and has free access to the fish resources, or whether the catch is being managed either by a limit on the total catch or by restraining the activity of the fleet, or both. We consider each of these in turn.

Free access

Suppose, first, that the fishery is not being managed at all, so that there is free access to the fish resources and everyone may catch as much as he pleases. Figure 2 shows what the long term supply of fish then looks like. The long term supply of fish from a given stock will increase with the producer price of fish, up to a certain point, as increased profitability attracts more and more firms to the industry or

induces each firm to increase its fishing effort. The yield potential of each fish stock is limited, however, and encouraging the entry of new firms or an increase in the effort of each firm beyond a certain point will so decimate the stock that the long term yield will diminish. This is the reason behind the peculiar backward-bending shape of the supply curve shown in parts (a) and (b) of Figure 2.

To what extent the total supply of fish will react similarly to increase in the producer price will depend on how many different stocks there are and how large differences there are in the exploitation costs of the stocks. If the cost per unit of fish landed is sufficiently different from one stock to another, it could easily happen that the total supply would increase as a result of increasing producer price even if the opposite were true for one or a few stocks which are cheap to exploit. Panel (c) in Figure 2 shows the aggregate supply curve from two stocks (panels a and b), which is so constructed that the supply from stock (a) decreases as a result of increased producer price while the aggregate supply is still rising. Sooner or later, however, the total long term supply would decrease as the producer price increases.

This leads us to the conclusion that the supply response to economic support to the fishing industry is by no means clear. The long term supply could either increase or decrease, depending on where exactly on the long term supply curve the benchmark position is. Figure 3 illustrates this. For simplicity, we ignore trade and show the price wedge produced by economic support to the fishing industry as a difference between the producer price with (p_2) and without (p_1) support. In the left part of Figure 3, the economic support to the fishing industry leads to an increase in long term supply, while in the right half the opposite happens. Considering trade, it is clear that economic support to the fishing industry in an importing country might in fact increase trade. This is, perhaps, counter-intuitive at first but is in fact easy to understand. If the fishery in the importing country is overexploited, the economic support will only encourage further over-exploitation and so decrease the long term supply of fish. Economic support would in such a case be extremely counter-productive. Not only would it fail to improve the economic situation of the fishing industry in the long term; on top of that it would increase the need to import fish.

This is probably not a very realistic benchmark situation. Under the present Law of the Sea, most countries have an incentive to manage their fisheries even if they may fail to each an economic optimum they are indeed likely to avoid the pitfalls of a totally uncontrolled exploitation. Let us, therefore, look at the situation in a managed fishery.

A managed fishery

There are various ways of managing fisheries. One quite common method is to set an upper limit to the total amount to be caught (the total allowable catch, TAC). Other methods rely on controls of the fishing activity, which sets an implicit albeit imprecise limit to the amount caught. Both of these may be dealt with simply be setting an upper limit to the catch, which we call TAC. How this is attained is not important for our present purpose.

Figure 4 shows the supply relationship in a managed fishery. Two fish stocks are shown in panels (a) and (b). The price of fish must exceed a certain minimum in order to make it worthwhile to catch anything at all from a given stock. It is quite likely that only a small part of the total allowable catch will be utilised if the price is low, while more and more will be taken the higher the price is. There is likely to be a certain price level at which virtually all the TAC will be taken, so that further increases in price will not increase the catch at all.

The aggregate supply response from the two stocks in panels (a) and (b) is shown in panel (c). The supply elasticity is likely to be grater for the aggregate curve than for each particular stock, depending on how many stocks there are and how large a difference there is between them with respect to the cost per unit of fish caught. But even in the aggregate there is likely to be some price at which a further increase in price will have no effect on the supply.

The effect of economic support on the supply of fish is quite different in this case of managed stocks. Provided we are on the rising branch of the supply curve, economic assistance will indeed increase the supply, as happens in the free access case with lightly exploited stocks. if, however, we are on the vertical part of the supply curve, the economic assistance will have no effect at all on the supply. Economic assistance will, in that case, only waste the resources of the country that provides it, and domestic production will not be encouraged while the cost for the given production of fish will be increased. The low of trade will not be affected at all, unless the support comes in the form of a higher consumer price that curbs the demand for fish.

Figure 5 illustrates the effect of economic support to an industry with no supply response (a vertical supply curve). To take the total allowable catch some minimum fishing effort will be needed, giving rise to a certain minimum cost per unit supplied (c_1). If the industry is profitable there will be a difference between the equilibrium market price (*) and this minimum cost per unit. This difference amounts to rent due to the limited catch that can be taken from the stock. Most fisheries are, however, not very successfully managed with respect to maximising the rent; even if they are potentially profitable, they sometimes barely break even because of over-capacity. It is not uncommon, in such circumstances, to provide economic support to the industry. This support raises the profit per unit produced, attracts more capital and manpower to the fishing industry and ultimately raises the cost per unit produced to, say c_2 in Figure 5. The amount s (c_2-c_1) represents unnecessary costs of fishing; that is, value of other goods that could be produced if capital and manpower were not unnecessarily attracted to the fishing industry. It happens that economic support raises the cost per unit beyond the equilibrium market price, as shown in Figure 5, and so erodes the profitability of the industry, a fact that is sometimes used as an argument to increase the support even further.

Thus the effect of providing support to an industry with a fixed supply, such as the fishing industry when the price is high enough for the entire total allowable catch to be taken, is not to encourage domestic production in the industry receiving assistance but to discourage production in other sectors of the economy. To justify this type of policy, there must exist benefits from attracting manpower and capital to the fishing industry in excess of what is needed. By evaluating the costs of this policy; that is, the value of alternative production forgone, it is possible to find a value which these benefits must attain at the minimum to justify the policy.

Does public management of fisheries amount to assistance?

It has been alleged that public management of fisheries in fact amounts to economic assistance to the industry. This implies that the benchmark solution with which to compare an assisted industry is one of free access.

In our view this is a misconception. As has been demonstrated theoretically and confirmed over and over again by empirical observation, un-regulated access to fish resources leads to over-exploitation and dissipation of economic rent. In the absence of private property rights to fish stocks, public authorities must intervene in order to ensure that maximum economic benefit is derived from the use of fish resources. That this will probably best be accomplished by the establishment of some form of

harvesting rights, is a separate issue which need not detain us here. A situation of efficient economic management, even if this necessitates public regulation, is as natural a benchmark for the fishing industry as for any other industry, such as the petroleum industry for example, which is in some need of public management as well (access rights to and delineation of oil fields). The only assistance implied by public management is the covering of management costs by general public revenue without any recovery from the industry itself. Since the purpose of management is to increase the profitability of the industry, these costs should be covered by the industry itself. A regime of recovery of management costs would indeed be a test of whether or not management is worthwhile.

It is nevertheless understandable that the question of assistance has arisen in connection with management of fisheries. The reason for this is that the benefits of management are not evenly shared by the world community. The introduction or the strengthening of fisheries management has brought benefits to some but may have imposed costs on others. Management may therefore appear to some nations in much the same light as distortions of trade brought about by economic assistance.

To clarify this issue, let us first look at a situation where all fish caught in a given country are also consumed in that country. Suppose there has been free access to the fish resources at the country's disposal. Then the government in the country decides to manage its fish resources for maximum economic profit. This entails some cut-back in fishing effort. The country as a whole benefits from this because the total value of goods produced increases. Under the free access regime the marginal unit of resources employed in the fishery produced a lesser value than it could have produced elsewhere in the economy. When a managed fishery has attained its long term equilibrium a marginal resource unit produces the same value in the fishery as it does in other sectors of the economy (assuming no market failure elsewhere in the economy). The consumers cannot possibly be made any better off by moving labour or capital from he fishery to some other activity; the value of the fish consumption lost would exactly match the value of other consumption gained.

It is by no means certain, however, that the total value of fish produced will increase because of a (better) managed fishery. Figure 6 shows what may happen as a result of replacing free access with rent-maximising management. under free access, the fishery is in equilibrium where the demand equals supply of the backward-bending supply curve, the price is p_1 and the quantity supplied q_1. With profit-maximising management, the effort and supply are controlled so that the marginal cost of fishing (mc), including the user cost of the resource, is equal to the price. This gives the profit-maximising price p_2 and quantity q_2. A comparison of the left and right panels of the figure shows that the quantity can either rise or fall as a result of management. If it falls, this means that free access provided too much fish at a too high cost; the last unit of fish was acquired by using resources which would have yielded a greater production value elsewhere. Even if the country's consumers lose some fish by a managed fishery, this is more than compensated by an increase in the value of other goods provided by reallocating resources away from the fishery.

Herein lies the key to the riddle why some countries might in fact lose from a better management of fish stocks. Some countries are fish exporters, while other countries are fish importers. If the production of fish decreases as a result of better fishers management, the fish importers are indeed likely to be made worse off; they will get less fish at a higher price. This could be offset, however, by a transfer of labour and capital from the fishing industry due to loss of access to fish, as the resources transferred can be used for producing more of other goods.

It is, however, by no means necessary that fish importing countries stand to lose from improved fisheries management. Precisely the opposite happens if better management results in an increase in the production of fish; importers of fish will then be able to buy more fish at a lower price. It is, in fact

possible that the fish exporting countries will face so adverse changes in their terms of trade that they come out worse after improving the management of their fisheries. Figure 7 uses traditional welfare economic analysis to demonstrate how this can come about. the figure shows the transformation curve between commodity Y, which represents fish, and commodity X, which represents all other goods and services, together with two welfare contours showing which combinations of the two goods provide equal satisfaction to consumers. The transformation curve peaks at a certain value of X because if too much of the productive resources in the economy are devoted to the fishing industry the result will be overfishing, in the sense that less fish and less of other goods will be produced in the long term. If there is free access to the fish, the equilibrium in the fishing industry will be attained where the value of the average product of effort in the fishery (defined as a bundle of labour and capital), PyAPy, is equal to the cost per unit of effort, c; that is

$$P_yAP_y = c,$$

while equilibrium in the rest of the economy, in the absence of market failure elsewhere, will be

$$P_xMP_x = c$$

with P_xMP denoting the value of the marginal product of a bundle of labour and capital elsewhere in the economy. Hence

$$AP_y/MP_x = P_x/P_y.$$

due to the law of diminishing returns $AP_y>MP_y$, which implies

$$MP_y/MP_x<P_x/P_y.$$

The ratio MP_y/MP_x is equal to the slope of the tangent to the transformation curve, d_Y/d_X (with an opposite sign). The inverse of this $(-1/(d_Y/d_X)$ measures the opportunity cost of fish, that is, the amount of the alternative commodity X that must be forsaken to produce an additional unit of Y, fish. In fact, the un-managed fishery might be so grossly inefficient that fishing less intensively would provide more fish and more of other commodities in the long run. This is the situation depicted in Figure 7. Production takes place at point Q_1 were the ratio MP_y/MP_x is negative and obviously less than P_1, the ratio of the price of the two commodities (P_x/P_y). Fish is scarce and expensive, and exporting a little of it enables the country to buy lots of other goods, so the consumption takes place at the point C_1.

Now suppose the country introduces fisheries management for maximum economic efficiency. The equilibrium in the fishing industry will now imply $P_yMP_y = c$, which together with $P_xMP_x = c$ implies

$$MP_y/MP_x = P_x/P_y.$$

Equilibrium production in the economy will now be at a point like Q_2 in Figure 7 where a new price line P_2 touches the transformation curve, while consumption will be at a point like C_2. The new price line is steeper than the old one because the price of fish (P_y) has fallen in response to an increase in supply. The terms of trade move against the fish exporting country, transferring some of the benefits of better fisheries management to fish importing countries in the form of more fish at a lower price. The point to note in particular is that the terms of trade can change so much in the disfavour of the fish exporting country that it suffers a net loss from improved fisheries management; in Figure 7 this is implied by the new consumption point (C_2), which lies on a lower welfare contour than the previous one (C_1).

No single country, if faced with a choice like this, is likely to shoot itself in the foot by implementing policies of this kind. The point is, however, that uncoordinated fisheries management by many countries could unintentionally produce this effect.

In sum, the welfare transfers of improved fisheries management are unclear a priori and could be of a quite unexpected sort. These effects are an equally legitimate concern as the effects from trade distortions brought about by economic support to industries; in fact, on the surface they are not dissimilar. The effects of improved management should not, however, be confused with the effects of trade distortions. There is much to be said for investigating the welfare economic consequences of the new Law of the Sea, but it is a separate issue of interest in its own right.

Effect of support on trade flows

The effect of economic support on aggregate trade in fish and fish products depends on two effects:

- does the economic support induce a supply response?
- does the economic support raise consumer prices?

Only to the extent that the economic support induces a supply response will it raise the domestic level of production and reduce trade flows by displacing imports with domestic supplies. In most OECD countries it seems to be the case that the total allowable catch is fully taken and that there is pressure from the industry to increase the TAC beyond the carrying capacity of the stocks. Thus, it seems likely that economic support to the industry will have little or no effect on trade flows through increases in domestic production.

If the support is engineered by raising the consumer price of fish, there will be some reduction in the demand for fish. Given that the domestic production does not change, for reasons already given, this will have a direct and equal impact on the imports of fish.

It does not appear likely, therefore, that any important issues with regard to aggregate trade flows will arise from economic support to the fishing industry; the most important issue arising in this context concerns waste of productive resources, which is largely an internal issue for the countries following such policies. On the other hand, it is quite possible and indeed probable that economic support will affect the composition of trade in fish products (including fresh fish). Some protective measures do indeed attempt to affect the composition of trade. Such measures typically aim at promoting the export of products with a high value added content while discouraging the export of fresh fish. In a similar vein, protective measures by countries that import fish aim at discouraging import of products with a high value added content and encouraging import of fresh fish.

The important issues regarding the effect of economic support to the fishing industry on trade flows concern, in our view, the composition of trade and not aggregate trade. Important effects on aggregate trade flows arise however from restricted access to resources. We shall now briefly consider this question, and then return to slightly more technical aspects concerning the effect of economic assistance on the composition of trade.

Trade and access to resources

It is customary to distinguish between free trade and free flow of factors of production. Despite tariffs that still remain, voluntary restrictions and other barriers to trade old and new, the trade in industrial products is, to a large extent, free. Capital now flows relatively freely between sovereign states while labour does not, except within certain common market areas such as the European Community and the Nordic countries.

The 200-mile exclusive economic zone imposed substantial restrictions on the movement of fishing fleets. Whatever the merits of the exclusive economic zone in terms of fisheries management, it amounts to economic support to the fishing fleets that are given exclusive rights to fish in the economic zone. While free access to fish resources has over and over again proved to be economically detrimental, it is perfectly possible to combine indiscriminate access to resources with fisheries management that attempts to maximise the economic rent of the resources. This can be done through free trade in fishing rights, either in the form of transferable fishing quotas or transferable fishing licences. Such trade would realise all the usual benefits of free flow of factors of production ensuring that the fish harvest be taken at the lowest possible cost. It is also likely to be opposed for the same reasons as free movements of labour are opposed.

The international mobility of fishing fleets resulting from a free trade in fishing licences or fishing quotas would be similar to free trade in shipping or aviation. Shipping companies operate throughout the world, using low cost crews. Airline companies do so to a lesser extent, but "freedom in the skies" would presumably result in airlines operating on a global scale with international crews. Indiscriminate access to fish resources is also likely to result in fishing companies operating on a global scale and with crews hired from the most cost efficient countries. The difference between air and sea transportation on the one hand and fishing on the other is, however, that fishing is based on the utilisation of limited, natural resources to which access must be limited in some way in order to utilise them efficiently. The nations controlling access to fish would, under a regime of indiscriminate access, do so through the selling of access rights in some form. who gets the income from selling access rights is a distributional issue, but the case can be made that property rights in some form are essential if the utilisation of the resources is to be efficient.

The restricted access to the exclusive economic zone affects fish trade in obvious and less obvious ways. The obvious effect is the loss of fish supplies from domestic vessels for nations whose fleets were barred from distant fishing grounds. The distant water fleet nations then had to either increase their imports or decrease their consumption of fish. The impact of the economic zone on the flow of trade has been documented elsewhere.

The less obvious effect on trade arises when the displacement of distant water fleets affects the use of the raw material, so affecting the trade in various fish products. As an example, European vessels fishing off North America used to bring back much of their catch as salted fish, while the fish taken by North American vessels typically ends up as supplies of fresh and frozen products. The European deficiency in salted fish has largely been made up by imports from Iceland and Norway.

Free trade in fishing licences or fishing quotas would fundamentally alter the importance of economic support to the harvesting part of the fishing industry. Such support would directly affect the ability of fishing firms to bid for fishing rights. In contrast with the present situation where economic support has a limited and possible negligible effect on the supply of raw fish due to the resource constraint, such support would, under a regime of free trade in fishing rights, become a major trade issue, through its effect on trade in fishing licences or quotas.

Effects of support on the trade in fish products

The effect of economic support on trade in fish products must be studied in a model which distinguishes between various sectors of the fishing industry, similar to the Ministerial Trade Mandate model used in the analysis of agricultural policy. In order that this be possible, support to each type of product to be considered must be identified.

An example of what is involved is as follows. Suppose the supplies of raw fish can be diverted into two final products. We use the following notation:

p_i = price of product i, i=,1,2;

q_i = quantity of product i, in terms of raw fish weight;

$c_i(q_i)$ = unit processing cost of product i;

r = raw fish price;

Q = given supply of raw fish (TAC).

Given that the raw fish is sold at a uniform price irrespective of how it is to be processed, the equilibrium condition in the industry is

$$p_i = r + c_i(q_i),\ i=1,2;$$

$$q_1 + q_2 = Q.$$

These last equations, which in fact are three, determine r, q_1 and q_2. Figure 8 shows how these variables are simultaneously determined.

Now suppose that economic support is given to industry 1. This takes the form of reducing the cost to the industry by the amount s per unit, but a similar effect would result if the producer price were raised instead. The cost curve $c_1(q_1)$ will be displaced downwards, as shown in Figure 9, and the new equilibrium will imply that more will be produced in industry 1 and less in industry 2.

Issues such as this could be quite important, particularly as different countries import different types of fish products. Both importing and exporting countries are tempted to distort trade flows in fish products. Importing countries try to encourage imports of fresh fish for processing, while exporting countries try to encourage exports of processed products and discourage exports of fresh fish. It is here, rather than with respect to the aggregate trade flow of fish, that the important questions concerning trade distortion lie

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Figures 1 & 2

Figures 3 & 4

Figures 5 & 6

Figures 7 & 8

Figure 9