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DEFINITION AND MEASUREMENT OF TRADE DISTORTION FOR THE FISHING INDUSTRY

At the 66th Session of the Committee for Fisheries, Member countries were invited to submit to the Secretariat papers which they considered relevant for consideration and analysis by the Expert Group. The attached revised and updated paper (previously distributed on 27th February 1991, AGR/FI/EG(91)3), which has been submitted by the EC Commission in response to this invitation, is distributed for DISCUSSION at the second meeting of the ad hoc Expert Group.

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DEFINITION AND MEASUREMENT OF TRADE DISTORTION FOR THE FISHING INDUSTRY

SUMMARY

1. This paper addresses the question of how to measure the trade distorting effect of either government intervention or lack of government intervention in the case of the fishing industry.

2. A situation without trade distortion is defined as the situation characterised by an efficient allocation. This therefore constitutes the bench-mark against which the amount of trade distortion can be measured.

3. The measurement of trade distortion is particularly difficult in the case of the fishing industry for the following three reasons. First, the occurrence of market failure in the fishing industry implies that an efficient allocation cannot be obtained without government intervention. The bench-mark against which to measure trade distortion does therefore, in the case of the fishing industry, unlike in other industries, require government intervention in the form of a management scheme. Second, restrictions on the free flow of services in the form of restrictions on the access of foreign vessels to national fishing grounds and to ports and port facilities constitute an important distortion to trade which need to be taken into account. Third, it is particularly difficult to establish a model of the fishing industry due to the complexity of the production function.

4. The concept of the Trade Equivalent Output Subsidy (TEOS) is defined as a (model based) measure of trade distortion and applied to the fishing industry. The TEOS expresses the output subsidy which, in the hypothetical situation where all other government intervention, other than that needed to assure an efficient allocation, is removed, will maintain the country's net export of the commodity in question at its actual level. The TEOS is used to illustrate that in the case of an open access fishery, increased subsidies decrease trade distortion whereas in other industries increased subsidies lead to increased trade distortion. Furthermore, the TEOS is used to illustrate the trade distorting effects of restrictions on the access of foreign vessels to national fishing grounds and to ports and port facilities.

5. The relevance of the PSE (Producer Subsidy Equivalent) as a measure of trade distortion in general and in the case of the fishing industry in particular, is also discussed.

6. It is concluded that the calculation of a model based measure of trade distortion is not feasible from an operational point of view. However, the results of an illustrative model may provide some interesting insights. Neither does the calculation of PSEs for fisheries, in view of the limited validity of the PSE as a measure of trade distortion and in view of the costs of such a calculation, seem worthwhile. It may, however, be of some interest to calculate other empirical indicators.

1. INTRODUCTION

7. This paper addresses the question of how to measure the trade distorting effect of government intervention or lack of government intervention in the case of the fishing industry.

8. The issues dealt with in this respect include a clarification of the concept of trade distortion in general, an assessment of the possibilities of measuring the trade distorting effect of government intervention in the case of the fishing industry and of the relevance of calculating empirical PSE type indicators[1)].

9. The paper is organised as follows. In section 2 the concept of trade distortion is discussed in general, and a theoretical measure of trade distortion is defined.

10. Section 3 discusses three characteristic features of the fishing industry which make it particularly difficult to measure trade distortion. The fact that government intervention is necessary to establish an efficient allocation, that the restrictions on the free movement of services (fishing effort) used in the industry constitute an important distortion of trade, and that the production function is particularly complicated to estimate.

11. In section 4, the application to the fishing industry of the theoretical measure of trade distortion as defined in section 2 is discussed.

12. In section 5, the relevance of calculating model-based measures and statistical measures such as the PSE is discussed.

2. GENERAL OBSERVATIONS ON TRADE DISTORTION

2.1. The concept of distortion

13. As a preliminary step in discussing how to measure trade distortion, it is useful to answer three questions:

- When is trade not distorted? In other words, what is the bench-mark against which trade distortion can be measured?
- What is conceptually the meaning of trade distortion as something which can increase or decrease?
- Which types of government intervention are most important in terms of distorting the trade of a given industry?

These questions are dealt with in the following two sub-sections.

2.1.1. When is trade not distorted?

14. The basic assumption underlying the concept of trade distortion is that a market economy without government intervention will be characterised by an **efficient allocation** in the sense that the real income of one agent in the economy cannot be increased without decreasing the real income of another agent. In a market economy without government intervention, all agents will face the same prices. In the case of foreign trade, the commodity[2] prices will equal world market prices (corrected for transport costs) and there will be a free flow of goods and services and of labour and capital across international borders. The prices paid by consumers and received by producers will represent the marginal social costs[3].

15. Therefore, we may, therefore, define a **situation without trade distortion** as a situation characterised by an economically efficient allocation[4].

16. A market economy is only capable of establishing an efficient allocation if there is no market failure. The phenomenon of market failure occurs, e.g. in the case of externalities, where the agents (consumers or producers) affect each other directly, independent of the price system. Government intervention thus becomes necessary in this case in order to establish an efficient allocation. In the case of pollution, for example, an efficient allocation requires that the government charges taxes corresponding to the difference between the private costs and the social costs, as this difference reflects the monetary value to society of the inconvenience caused by the pollution. Government intervention to correct market failure should therefore not be considered trade distorting.

17. Governments intervene in the economy not only in order to correct for market failure, but also in order to modify the income distribution resulting from the working of market forces and to achieve other social objectives.

18. It is therefore important to emphasise that an efficient allocation is not the same as a socially optimal allocation. There is, therefore, in what has been said above, no suggestion that a situation without trade distortion is necessarily a socially optimal allocation. Such an allocation will only be an efficient allocation if cost-free income redistribution is possible. Cost-free income redistribution is, however, not possible in the real world. Redistribution of income is costly both in terms of administrative costs involved and in terms of creating distortions to the allocation. Hence, there is a trade-off between the objective of economic efficiency and other objectives.

19. However, this need not concern us unduly here. The important points to make within the context of this paper are:

a) a bench-mark situation without trade distortion, against which the amount of trade distortion can be measured, can be defined as a situation characterised by an efficient allocation;

b) a market economy without market failure is characterised by the fact that it establishes an efficient allocation, provided that there is no government intervention, in particular if there is no restriction on the free flow of commodities, labour and capital;

c) government intervention correcting for market failures does not create trade distortion, but on the contrary, eliminates a source of trade distortion.

2.1.2. What constitutes trade distortion and which types of government intervention distort trade?

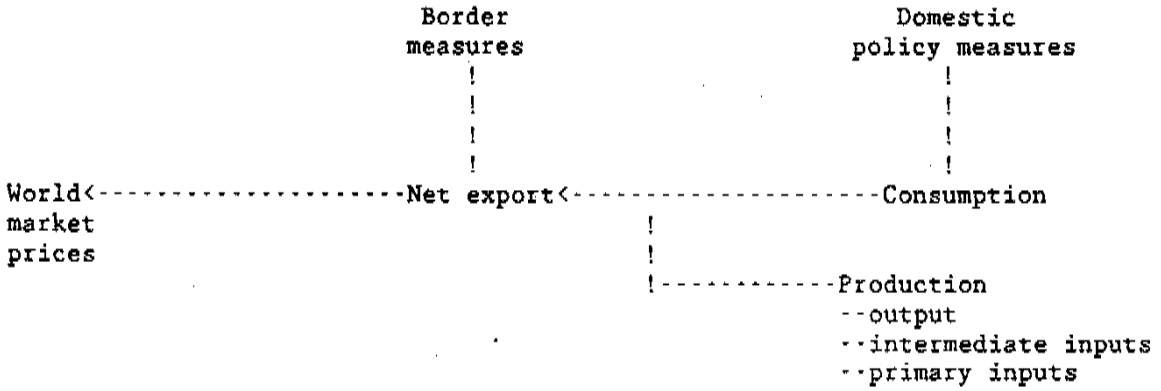
20. Government intervention affects other countries through the effect it has on world market prices and this impact on world market prices stems from the effect on net exports of government intervention.

21. The trade distortion for a given commodity may therefore be defined as the difference between the actual net export of the commodity in question, and the net export that would exist in the bench-mark situation characterised by an efficient allocation. Hence, if the actual net exports exceed the exports in the bench-mark situation, the trade distortion will be positive, and if the actual net exports increase, due to a change in government policies, this will constitute an increase in trade distortion[5].

22. Any government intervention, apart from the previously mentioned cost-free income redistributions, which moves the economy from one efficient allocation to another, does in principle create trade distortion. However, some types of government intervention are clearly more important than others in terms of their impact on the production and consumption of a given product and hence as a source of trade distortion.

23. Net export is, by definition, the difference between a country's domestic production and its domestic consumption.

Figure 2.1: The basic relations



24. Therefore, the government policy instruments (see Figure 2.1)) which are most important in terms of their impact on the trade of a given commodity are: (1) domestic policy measures which are directly related to production or consumption of the commodity in question and (2) border measures which are directly related to trade.

25. Domestic policy measures that are likely to have a significant impact on trade in a given commodity are those which create:

a) a price wedge between the producer price and the border price[6] of the commodity in question, e.g. output subsidies;

b) a price wedge between, on the one hand, the prices paid for commodities and primary factors when used as inputs in the production of the commodity in question and, on the other hand, the normal prices paid for the same inputs, e.g. industry specific input subsidies;

c) a quantitative restriction on the production or use of inputs in the production of the commodity in question;

d) a price wedge between the consumer price and the border price for the commodity in question, e.g. commodity specific consumer taxes.

Border measures that are likely to have a significant impact on trade in a given commodity are those which create:

e) a price wedge between the world market price and the domestic price for the commodity in question, such as tariffs, export subsidies and import quotas.

26. In most cases, border measures related to goods and services other than those considered above are not likely to be important in terms of distorting the trade in the commodity in question. However, there may be exceptions; border measures related to other goods and services that are either closely related to the one in question (in consumption or in production) or that used as an input in its production may have an important impact on the trade in the commodity considered.

27. Many governments, for obvious political reasons, restrict the free movement of capital and labour. Whereas this may be an important source of inefficiency, it does not in general have a significant effect in terms of distorting the trade in any specific commodity.

28. In general, domestic policy measures such as broadly based commodity taxes, general taxes on labour and capital and general income taxes are also of limited importance in terms of distorting trade in a given commodity[7].

2.2 Why measure trade distortion?

29. International trade is an important source of wealth for many countries. The economic welfare of a country can be significantly improved by exporting at prices which are higher than those that can be obtained in domestic markets and

by importing at prices which are lower than what it would cost to produce the same commodities domestically. The higher the world market price for commodities for which it is a net exporter and the lower the world market price for commodities for which it is a net importer, the better off a country is.

30. The world market prices which a country faces in its trade with the rest of the world are affected by the level of government intervention in other countries. If other countries increase their net export (i.e. increase exports or decrease imports) the world market price of that commodity will fall. Therefore, countries which export the commodity in question will be interested in other countries not increasing their net export of that commodity.

31. Governments will in general, as mentioned above, intervene in ways which distort the resource allocation and hence trade, even if this intervention implies costs in terms of reducing economic efficiency in their domestic economies; governments may be assured to take these costs into account when making policy decisions. However, in the absence of international collaboration, the governments have no incentive to consider the costs which their trade distorting policies impose on other countries, even though they may realise that mutual reduction in trade distortion may be in all countries' interest. The problem is namely that the government in a given country has no guarantee that a collaborative move by the government itself will be followed by collaborative moves by governments in other countries. One can therefore assume that there is scope for mutual beneficial reduction in trade distortion if sufficient trust can be created among countries so that reduction in trade distortion in one country will be followed by reductions in trade distorting government intervention in other countries.

32. In order to create such trust, it is important to develop measures which allow trade distortion to be monitored in a reliable way and to develop negotiation tools which allow countries to make commitments concerning reduction in trade distortion policies in an operational way.

33. One may ask why one could not just observe the values of the most important policy instruments which affect the net export of a given commodity. Providing such information may in fact constitute an important step in the right direction, but in terms of being able to measure trade distortion over time and space, this approach has its obvious limitations even if a conceptual framework has been created to ensure that the information supplied by various countries was comparable. As indicated above, the number of different policy instruments that are likely to have a significant impact on the net export of a given commodity is rather large; particularly as instruments which are only of potential importance need to be included in defining a measure, so as to make sure that governments are not tempted to use policy instruments which are not subject to surveillance. It may therefore be rather difficult to assess differences in distortion between countries and the evolution of distortion over time using this multidimensional measure of trade distortion. If one instrument has increased and another has decreased it will be difficult to judge if the distortion of net exports has increased or decreased by just observing the evolution of the values of the different instruments. There is, therefore, a need to define a one-dimensional measure of trade distortion.

2.3. How to define a measure of trade distortion for a given commodity

34. In science a measurement method, i.e. a procedure to attach numbers to properties of real world objects or processes, has to be judged on basically three criteria:

-- validity;
-- objectivity;
-- economic feasibility.

35. These criteria may be applied *mutatis mutandis* to assess measures defined for administrative purposes as in the case at hand[8].

36. A measure is **valid** if it is closely related to the property of the class of real world objects or processes which one wants to measure i.e. *in casu* the level of trade distortion of various countries at different points in time.

37. A measure is **objective** if different people who follow the same measurement procedure will attach the same number to a given property of the same real world object or process.

38. A measure is **economically feasible** if the necessary measurements can be made, given the resource constraint under which the measurement activity has to take place.

39. From the point of view of validity, a measure of trade distortion should satisfy the following four criteria:

a) it should, at least, take into account the policy measures mentioned above under points a) to e) in section 2.1.2.;

b) it should equal zero, if the actual net exports are identical to the net exports which would exist in a situation characterised by an efficient allocation;

c) it should increase, if net export due to government intervention;

d) it should be unaffected by the size of the country for which the measure is calculated.

40. A measure may either be a statistical measure or a model-based measure. Statistical measures only depend on accounting data (information on prices and quantities concerning production, consumption and use of inputs) whereas model-based measures also depend on a parameterized model. Statistical measures have the advantage that they are in general objective (high degree of objectivity) but they are not necessarily closely related to what one wants to measure (low degree of validity). Model-based measures allow for expression of theoretical concepts of trade distortion and they are therefore superior to statistical measures in terms of validity, but they are in general less objective because they depend on parameter estimates which are always debatable.

41. The difference between actual net exports and the net exports in the bench-mark situation of no trade distortion may seem to be the most obvious candidate for a measure of trade distortion. A model is needed to calculate this measure and the model should be able to calculate the net exports in the hypothetical situation without any trade distorting government intervention. It may, however, be difficult to find a model which, in a reliable way, can provide an estimate of this hypothetical net export as the situation without any government intervention may be very different from the actual situation. Furthermore, a model based measure cannot as such be used to compare the level of trade distortion between commodities and between countries.

42. Another possibility which will be applied here is to define a trade equivalent output subsidy (TEOS) as that producer output subsidy which, if all other types of government intervention were removed, would keep the net export unchanged.

43. In principle, a complete general equilibrium model is required in order to calculate this measure correctly. A satisfactory approximate measure may, however, be calculated using an appropriate partial equilibrium model. Such a model must represent the policy instruments which are likely to have a significant impact on the trade of the commodity in question, i.e. the policy measures mentioned above under a) to e) in section 2.1.2. It must, at least, represent production (in terms of output, intermediate input and primary factors), consumption and net export for the commodity in question[9].

44. The hypothetical situation which must be estimated in order to calculate the TEOS will, in general, not differ a lot from the actual situation, hence limiting the requirements for the model, compared to a measure based on the difference between the net export in the actual and the non-distorted situation.

45. The TEOS is by definition equal to zero if net exports are equal to the net exports without trade distorting government intervention (in terms of the policy instruments covered by the model). It will increase with increasing distortion of the net exports of the commodity considered and it will assume the same value for a big and small country if the policy instruments and the structures of the economies are identical.

3. ISSUES WHICH COMPLICATE THE CALCULATION OF A MEASURE OF TRADE DISTORTION FOR THE FISHING INDUSTRY

46. The purpose of this section is to discuss issues which complicate the measurement of trade distortion in the fishing industry compared to other sectors.

3.1. The need for government intervention

47. In other sectors, the situation of no government intervention may be taken as the bench-mark against which trade distortion can be measured. However, this is not the case in the fishing sector, as this sector is

characterised by the previously mentioned phenomenon of market failure, which implies that the efficient allocation will not arise in a situation of no government intervention.

48. The efficient allocation within the fishery sector occurs when the effort supplied by the fishing industry equals the level of effort needed to obtain the maximum economic yield, E_{MEY}[10]. This is illustrated in Figure 3.1. At this level of effort it is not possible to increase the real income of one group in society without decreasing the real income of other groups even more. The marginal social cost of supplying an extra unit of effort taking into account both the cost of the extra effort as such and the decrease in future catch possibilities equals the marginal social benefit in terms of the value of the extra catch.

49. However, in a market economy, the individual fisherman has no incentive to take into account the costs in terms of reduction in future catch possibilities for the fleet as a whole. He only considers his private cost. The fishing effort of the whole fleet will therefore, in the absence of government intervention expand beyond E_{MEY}. The total level of effort will, in fact, increase until the private marginal cost equals the value of the marginal catch i.e. the price. In Figure 3.1 this condition is satisfied at a level of effort corresponding to E_O.

50. An efficient allocation requires the government to intervene in order to assure that the individual fisherman takes into account the extra costs, in terms of the decreased future catch possibilities, for the fishing fleet as a whole.

51. Means by which this can be achieved include a tax on effort and a system of individual transferable catch quotas (ITQ).

3.2. Trade distortion due to restrictions on access of foreign vessels

52. Restrictions on the free movement of services (in the form of economic barriers such as tariffs or in the form of quantitative restrictions) have in general a limited impact on the production of a given commodity for which it is used as an input, and hence for the trade in this commodity.

53. The reason for this is that the natural barriers to trade in those services which are used as input in production in most cases prohibit trade anyway. The potential for trade in services used as inputs in agricultural production, e.g. the rental of agricultural machinery, is very limited indeed.

54. On the other hand, fishing effort constitutes a highly mobile service which obviously is a very important input in the production of fishery products. Therefore, restrictions of the free movement of fishing effort across international borders, and restrictions on the access of foreign vessels to ports and port facilities, constitute a significant distortion of trade in their own right (the trade in fishing effort), and they also have a significant impact on the trade in fishing products.

55. Excluding foreign vessels from access to fishing grounds under coastal states' jurisdiction is actually tantamount to restraining the production of these vessels. This may significantly distort the allocation of resources if the foreign vessels are more efficient than domestic vessels, and therefore able to catch at lower costs.

56. Taking into account the access of foreign fishermen may significantly change the MEY which represents the efficient allocation. A fishing effort corresponding to the MEY could still be obtained by taxes paid by both domestic and foreign fishermen or by introducing internationally tradeable catch quotas. This would ensure that the fishing effort would be generated at minimum cost.

57. It should be emphasised that the point here is not whether it would be desirable from a political or administrative point of view to give foreign fishermen access to fishing grounds under coastal states' jurisdiction, but that restrictions on the access of foreign vessels are likely to constitute a significant distortion. The issues related to the access of foreign vessels to fishing grounds under coastal states' jurisdiction and to ports and port facilities cannot, from a purely economic point of view, be ignored in any discussion of trade distortion in relation to the fishing industry.

3.3. The difficulties of establishing a reliable model for the fishing industry

58. The creation of a model of any industry goes beyond the problem of collecting reliable data as the estimation of a production function will always be associated with certain errors. This makes the use of such models for the calculation of trade-distortion measures problematic, especially if these measures are to be used in a politically sensitive context.

59. In the case of the fishing industry, this concern carries even more weight as it may be argued that the creation of a model for the fishing industry is more difficult than in most cases. The calculation of sustainable catch depends on the relationship between the current catch and future catch possibilities, which is very difficult to establish, partly due to the intertemporal relationship involved, partly due to the multi-species character of most fisheries, which involves complicated interactions between different species.

4. DEFINITION OF A TRADE DISTORTION INDEX FOR THE FISHERY SECTOR

60. The purpose of this section is to provide an interpretation of the trade equivalent output subsidy (TEOS) as applied to the fishery sector.

4.1. The bench-mark

61. The proper bench-mark against which to measure distortion is, as explained in section 2, an efficient allocation. In sectors where market failure does not occur, an efficient allocation arises without government intervention. Within the fishing industry, however, as shown in section 3,

market forces fail to establish an efficient allocation. In the open access fishery, the private marginal costs are lower than the social marginal costs. Therefore, government intervention is necessary to establish an efficient allocation.

62. The bench-mark against which a trade distortion index can be calculated must therefore be a situation where the fishery is managed in such a way that fishing effort corresponds to the MEY and private marginal costs are equal to social marginal costs.

4.2. Definition of the Trade Equivalent Output Subsidy (TEOS) as applied to the fishing industry

63. The Trade Equivalent Output Subsidy (TEOS) is that output subsidy to the fishing industry in question which, assuming that the fishery is efficiently managed, would be needed in the absence of any other government intervention for the net export of fish products to be identical to the current net export.

64. The method by which the measure is to be calculated depends on whether the fishery is efficiently managed or not.

65. The concept and derivation of the trade equivalent output subsidy is illustrated graphically in Figures 4.1 and 4.2 in the case of an efficiently managed fishery and in the case of an open access fishery, respectively.

66. For the sake of illustration, it is assumed that only output subsidies and input subsidies are used. Finding the output subsidy (TEOS) which keeps net export constant therefore amounts to finding the output subsidy which keeps output constant. The derivation of the TEOS in situations where also border measures and consumer taxes/subsidies are used is straightforward, but difficult to illustrate graphically.

4.2.1. TEOS in an efficiently managed fishery

67. Figure 4.1 represents the situation in an efficiently managed fishery which is supported by output subsidies and input subsidies. The MEY, S', indicated in figure 4.1.b), is calculated on the basis of the supported revenue curve, B, and the supported cost curve, b, depicted in Figure 4.1.a). In order to calculate the TEOS, the input subsidy is removed and the output subsidy increased, as indicated by the revenue curve, C, until the catch is equal to the actual catch, S'. The unsupported revenue and cost functions are represented by the curves A and a, respectively. The actual output subsidy is I, whereas TEOS is represented by I + II.

68. S^* represents the MEY calculated on the basis of the unsupported revenue curve, A, and the unsupported cost curve, a. The output and input subsidies are seen to lead to an increase in sustainable catch and hence to an increase in net export as illustrated by the fact that the S^* is smaller than S'. The TEOS will therefore, in an efficiently managed fishery, increase with increased government support.

4.2.2. TEOS in an open access fishery

69. Figure 4.2 represents the situation in an open access fishery which is supported as in the previous case only by an output subsidy and an input subsidy. The sustainable catch in the actual situation is S'. The corresponding level of effort E_A is greater than the effort needed to catch S' as illustrated in Figure 4.2.b).

70. The TEOS is calculated in two steps as illustrated in Figure 4.2.a). First, the effort, E, needed in an efficiently managed fishery to catch, S', is calculated and then the output subsidy, TEOS which would make the S' correspond to the MEY is calculated.

71. The TEOS might be either positive or negative depending on whether the MEY, S^*, calculated on the basis of the unsupported revenue and cost functions (represented by the revenue curve, A, and the cost curve, a, respectively) would be smaller or greater than S', or, in other words, depending on whether the hypothetical MEY is smaller or greater than the actual MEY.

72. An increase in support to an open access fishery will (when the effort is greater than the effort corresponding to the maximum sustainable yield, E_{MSY}), lead to a decrease in production and hence to a decline in net export. Therefore, in the open access fisheries, the TEOS decreases when support increases, contrary to what is the case in an efficiently managed fishery and contrary to what one would normally expect.

73. However, in all cases the TEOS will increase with increased net exports.

4.3. TEOS for fishing effort taking into account restrictions on the access of foreign vessels

74. The previous sub-section illustrated how to measure the trade distorting effect of government intervention in the form of monetary instruments. However, non-monetary instruments are also important and this sub-section indicates how to take into account the trade distorting effect from restrictions on the access of foreign vessels to national fishing grounds. The restrictions on the access of foreign vessels to ports and port facilities may be considered in an analogous way.

75. The need to take into account such restrictions when assessing the trade distorting effect of government intervention was argued in section 3. The issue here is to show how a TEOS can be calculated in order to provide a measure of trade distortion of fishing effort. Within this context, the fishing effort is considered as an output of a service industry which produces fishing effort.

76. In Figure 4.3, the curve labelled c is the cost function for the domestic fleet, whereas c' is the cost function for the international fleet. It can be seen that the marginal costs[11)] are assumed to increase as effort increases for the domestic fleet, whereas the marginal costs for the international fleet, MC_F are constant. At an effort level of E_N, the marginal costs for the domestic fleet, MC_D are equal to the marginal costs for the international fleet, MC_F. When effort is less than E_N, the efficient

allocation implies that only the domestic fleet is fishing, as the marginal costs for the domestic fleet is lower than the marginal costs for the international fleet. At levels of effort greater than E_N, it will always be efficient to let the foreign fleet supply that amount of effort that exceeds E_N, as the foreign fleet has lower marginal costs than the domestic fleet for any effort level exceeding E_N.

77. The level of effort would, if the fishery in question was efficiently managed and subject to no other government intervention than the restriction on the access of foreign vessels, correspond to MEY calculated on the basis of the domestic cost function, c. This level of effort is in Figure 4.3 indicated by E_A and the total costs by TC_A.

78. If the fishery in question was efficiently managed and if foreign fishermen were allowed access to the fishing grounds, the level of effort supplied by the domestic fleet would be only E_N. The total effort level would, however, be higher than E_A as the international cost function c' reflects smaller marginal costs. Removing the restriction on access of foreign vessels would thus imply a decline in the effort supplied by the domestic fleet from E_A to E_N, albeit an increase in the total level of effort.

79. It follows from the above that in a situation where foreign fishermen are not allowed access to national fishing grounds and where there are no other types of government intervention the TEOS for fishing effort is equal to that subsidy to the fishing effort of the domestic fleet, which, in the case of free access for foreign vessels on the same terms as the domestic fleet, would induce the domestic fleet to supply a fishing effort equal to E_A. The TEOS is, therefore, in Figure 4.3 represented as the difference between TC_A and TC_S, the total costs assuming a subsidy which will allow the domestic fleet to expand its effort to E_A in the presence of foreign competition, i.e. without the restriction on the access of foreign vessels as in the actual situation.

5. IS IT WORTHWHILE TO CALCULATE MEASURES OF TRADE DISTORTION FOR THE FISHING INDUSTRY?

80. The questions which will now be addressed are: Is it worthwhile in an administrative context to calculate a model based measure of trade distortion for fishery products? Is it worthwhile to calculate a PSE type measure of trade distortion for fishery products? and if the answers to the two preceding questions are negative, should one engage in calculating some other measures?

5.1. Is the calculation of model based measures practicable?

81. Experience shows that setting up an international trade model is an enterprise which requires considerable resources and seldom provides unambiguous results. For example, the experience of the OECD of setting up an international trade model for agricultural products[12] demonstrates that such a model cannot be constructed without making a number of subjective and therefore potentially political controversial assumptions. The added complexity of having to model the intertemporal interrelations between a number of fish species suggests that the task of setting up an international trade

model for fishery products will be even more demanding. It is therefore difficult to envisage that the task of monitoring trade distortion for different fish products could be done on the basis of model based measures. However, the setting up of a simplified model may still serve an illustrative purpose. Such a model may prove particularly useful for the interpretation of various statistical measures of trade distortion and for assessing the relative importance of various types of government intervention in terms of their trade distorting effect.

5.2. It is worthwhile to calculate PSE measures of trade distortion for the fishing industry?

82. The PSE which has been calculated for agricultural products by the OECD has been extensively used during the GATT negotiations as an indicator of trade distortion.

83. The PSE, as it is currently defined by the OECD, is a statistical measure, i.e. a measure which is essentially based on accounting data and which indicates the transfer (due to government intervention which is considered part of "agricultural policy") to the agricultural sector from consumers and taxpayers.

84. The PSE for a given commodity takes into account the transfer to the agricultural sector which is due to the difference between the domestic producer price received by the sector and the world market price. It also takes into account the transfer to the agricultural sector, which is due to input subsidies that are specific to the agricultural sector(13). The PSE does, however, not take into account the effect of government intervention on consumer prices(14).

85. The question to be addressed here is whether it is worthwhile to calculate a statistical measure for fish products in analogy with the PSE for agricultural products.

86. In order to answer this question, a number of preliminary questions will be addressed, on the one hand related to the political interest for measuring trade distortion for fishery products, and on the other hand concerning how appropriate the PSE is for this purpose. The answers will be provided in light of the methodological discussion in section 2.3.

5.2.1. The political interest

87. The first question relates to the political interest in calculating PSEs for fish products. There is no surplus problem in the fishery industry contrary to what is the case in agriculture. The effect on world market prices of surplus production of raw fish due to government intervention does not seem to be a burning issue. For the international fishery policy debate issues related to access of foreign vessels to national fishing grounds and issues concerning tariff escalation for processed products seem more pertinent. However, the PSE has nothing to offer on either of these two scores.

5.2.2. The validity of the PSE as a measure of trade distortion in general

88. The PSE has, in general, a number, of important limitations from a theoretical point of view.

-- A measure of trade distortion should assume the same value no matter whether the reduction in net output has been achieved by quantitative restrictions or by price changes. However, the PSE is bigger when the reduction in output has been achieved by price reductions than when it has been achieved by quantitative restrictions, on outputs or on inputs.

-- The effect on output and hence on trade distortion for a given amount of transfer depends on whether the transfer is provided in the form of an output subsidy, an input subsidy or a subsidy to labour, capital or land. The PSE does not reflect this.

-- The PSE does not take into account effects on net trade due to changes in consumer prices.

89. The two first limitations are a consequence of the statistical nature of the PSE. One could, however, define a model based measure which would represent the same transfers as those captured by the PSE, which would not have these limitations. Still, even a model-based PSE would assume the same value whatever the consumer price and hence it would not be able to reflect the fact that changing the consumer price from the world market level distorts trade. The PSE is, therefore, in fact at best a measure of distortion of production rather than a measure of trade distortion.

5.2.3. The validity of the PSE as a measure of trade distortion for fishery products

90. The discussions in sections 3 and 4 suggest that there are two characteristic features of the fishery sector which make the PSE even less valid as an indicator of trade distortion for fish products than for other, e.g. agricultural products.

91. Firstly, section 3 indicated the consequences of the market failure of the fishery sector. In the case of open access fishery it was shown that an increase in the PSE (reflecting an increase in the transfer to the fishing sector from consumers and taxpayers) does in fact imply a decrease in net exports, i.e. a decrease in trade distortion.

92. Secondly, in Section 4 it was demonstrated that government intervention in the form of restricting the access of foreign vessels to waters under coastal states' jurisdiction and to ports and port facilities constitute an important instrument of support to the domestic fishing which the PSE, at least in the way it has been calculated for agricultural products, does not take into account.

5.2.4. The reliability of the PSE type measures

93. It may prove to be quite difficult to calculate reliable PSE figures for fish products. The fact that fish products are often only traded in highly processed form, and the fact that the same firms often catch and process the fish, render it difficult to establish reliable estimates of domestic prices and reference prices (i.e. adjusted world market prices) for raw fish, as it becomes difficult to differentiate between that part of government support which benefits the primary industry and that part which benefits the processing industry. Furthermore, the fact that fish constitutes a highly heterogeneous product group with respect to types of fish as well as with respect to quality, further complicates the estimation of domestic prices and of reference prices (i.e. world market prices).

94. Within the agricultural sector, fruit and vegetable products possess some of the same characteristics as fish products viz. being perishable and heterogeneous. It may be indicative of the problems involved in calculating PSEs for products with such characteristics that the OECD has not calculated PSEs for this sector as a whole but in fact only for apples[15)].

5.2.5 Comparison of cost and benefits

95. It may, in fact, be quite costly to calculate PSEs for fishery products due to the complications mentioned in the previous sub-section. This cost factor, together with the limited political interest and the low validity of the PSE measure in general, and in the case of fishery products in particular, suggests that it would probably not be worth the costs to calculate PSEs for the fishing industry.

5.3. Other indicators of the trade distortion impact of government intervention

96. The fact that it is not possible to calculate reliable model based measures of trade distortion for fishery products and that it does not seem worthwhile to calculate PSEs for fishery products, does not imply that it is not useful to collect and to process information on government intervention in relation to the fishing industry and to present this information in a consistent framework.

97. It would indeed be relevant to have information on:

- How government intervention distorts the allocation of fishing effort due to inefficient management methods and restrictions on the access of foreign vessels. In this context information about the cost of domestic vessels compared to the cost of foreign vessels is a relevant indicator.

- How the trade in raw fish equivalent is distorted due to border measures and domestic policy measures. In this context the wedges between domestic producer prices and world market prices could be calculated.

-- How the trade in processed fish products is distorted due to border measures and domestic policy measures. Here it would be of interest to establish the extent of tariff escalation.

98. In addition to the above, it may also be relevant to calculate social indicators such as the difference between the income of fishermen and that of other social groups and to assess the importance of the fishing industry in certain regions. This type of information may contribute to the understanding of why governments tend to support the fishing sector and why there may be differences in the level of support provided in different countries.

NOTES AND REFERENCES

1. PSE (Producer Subsidy Equivalent) measures have been calculated by the OECD Secretariat for agricultural products and are being used in the current GATT negotiations. For further information see C. Cahill and W. Legg (1990) "Estimation of Agricultural Assistance using Producer and Consumer Subsidy Equivalents: Theory and Practice". OECD Economic Studies, No. 13.

2. For the purpose of this article, the word "commodity" will be used as the same meaning as the expression "goods and services".

3. Assuming that the distribution of income is optimal.

4. Some economists will not include the condition of free flow of capital and labour in the definition of a situation without trade distortion. Nothing in this article will change if this broader definition is applied.

5. In general, there exist in a given economy, depending on the income distribution, an infinite number of efficient allocations. The specification of a bench-mark situation therefore, in principle, also requires the specification of a bench-mark income distribution.

6. For the purpose of this article, the border price is defined as the world market price adjusted for the influence of border measures, e.g. the world market price plus a tariff.

7. Whereas government intervention affecting the consumer price or the producer price for another commodity does not have a significant impact on the trade in the commodity concerned, it is, however, the case that a higher level of taxation of other commodities in general effectively constitutes a subsidy on the commodity in question.

8. In section 5, the PSE which is being used as a statistical measure of trade distortion is evaluated on the basis of these criteria.

9. In the case of number of jointly produced commodities the set of producer output subidies which would keep the net trade constant in the jointly produced commodities could alternatively be calculated.

10. For definition of this and other fishery economic concepts used in this section, see for example C.W. Clark, (1985), "Bioeconomic Modelling and Fisheries Management", John Wiley and Sons.

11. The marginal cost of a specific level of effort is reflected in the slope of the TC curve at that particular level of effort.

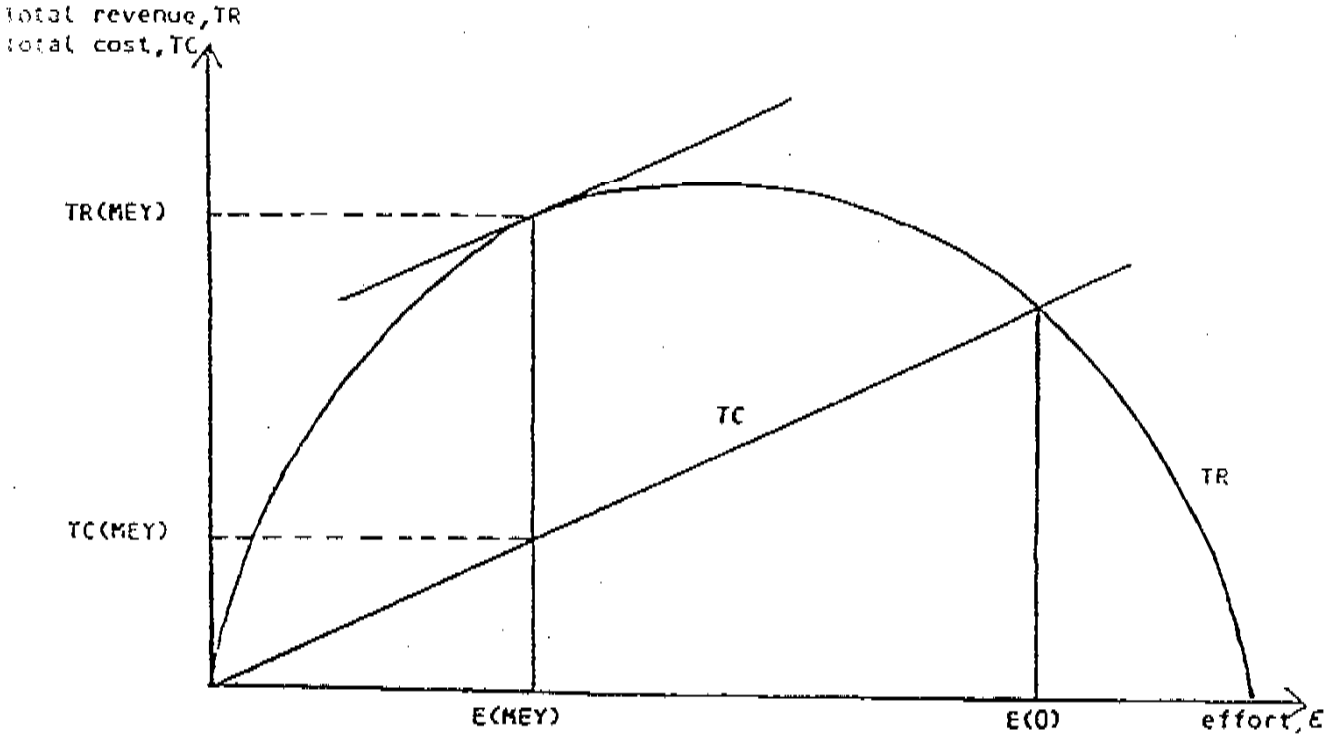
12. For details on the OECD MTM model see H.B. Huff and C. Moreddu (1990), "The Ministerial Mandate Model", OECD Economic Studies, No. 13.

13. Increased prices for inputs used in the agricultural sector due to the border protection provided to the sectors producing the inputs are in general not taken into account. This constitutes an important difference between the Effective Rate of Protection and the PSE.

14. The PSE has a less well known counterpart the CSE (Consumer Subsidy Equivalent) which measures the transfer to consumers due to government agricultural policy intervention, see C. Cahill and W. Legg, op. cit.

15. For beef, where there are also important quality differences, it has also proven difficult to establish a reference price.

FIGURE 3.1. THE EFFORT IN AN EFFICIENTLY MANAGED FISHERY AND AN OPEN ACCESS FISHERY



NOTE : This figure assumes that all vessels in the fleet are subject to the same cost functions.

FIGURE 4.1. THE TEOS IN THE CASE OF AN EFFICIENTLY MANAGED FISHERY

FIGURE 4.1.a

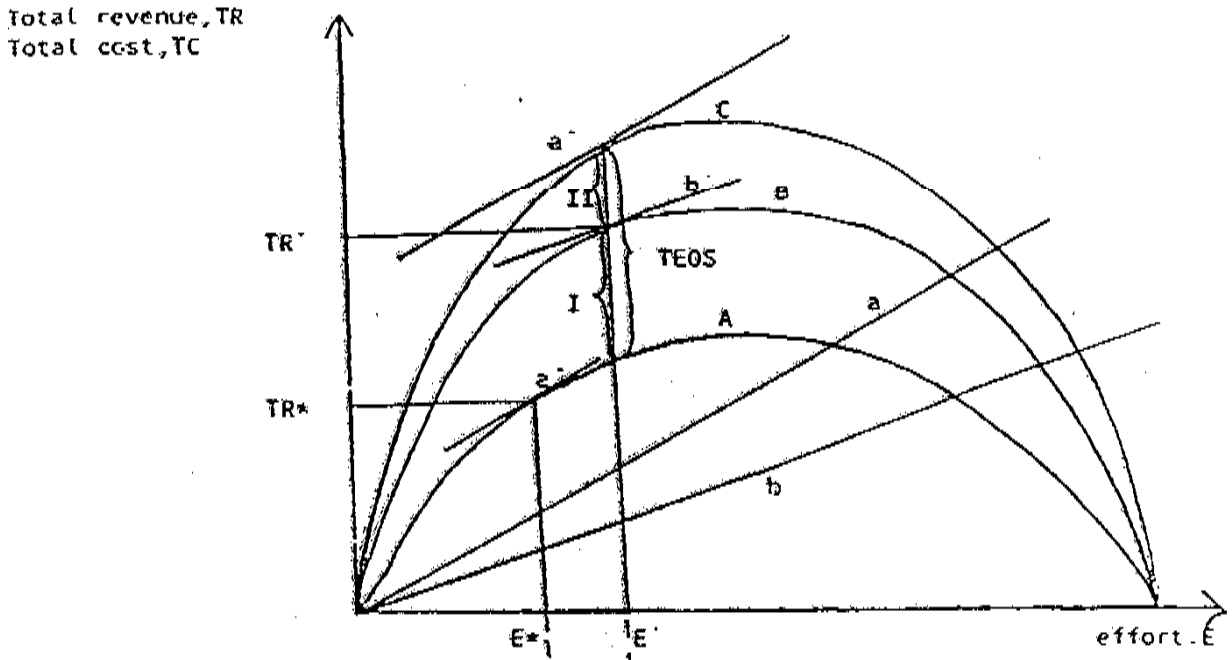
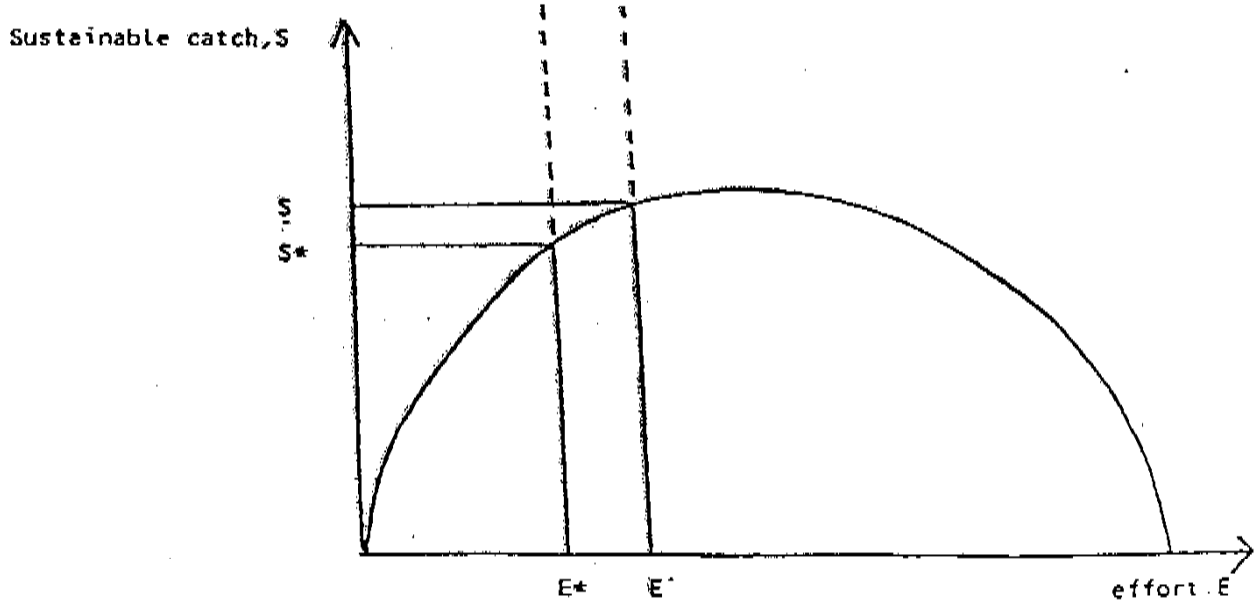


FIGURE 4.1.b



LEGEND

A : revenue curve with no output subsidy
B': revenue curve with the actual output subsidy
C : revenue curve with the actual cost subsidy replaced by an increase in the output subsidy
a : cost curve with no cost subsidy

FIGURE 4.2. THE TEOS IN THE CASE OF AN OPEN ACCESS FISHERY

FIGURE 4.2.a

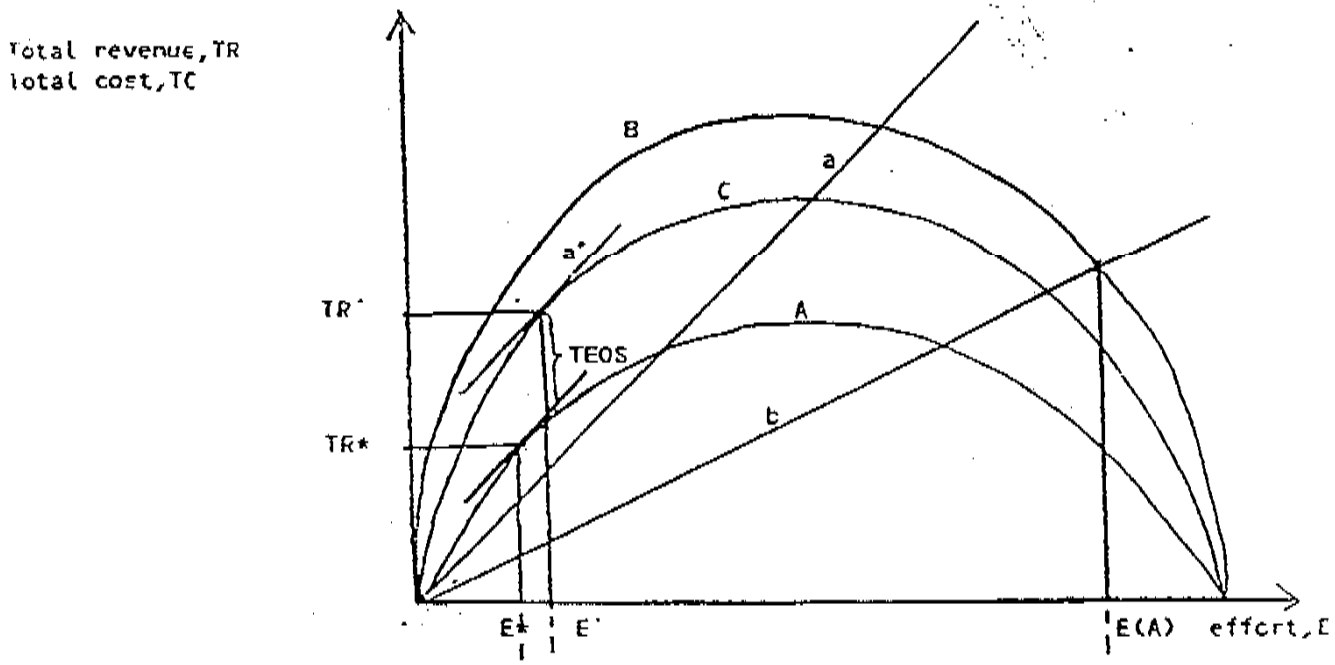
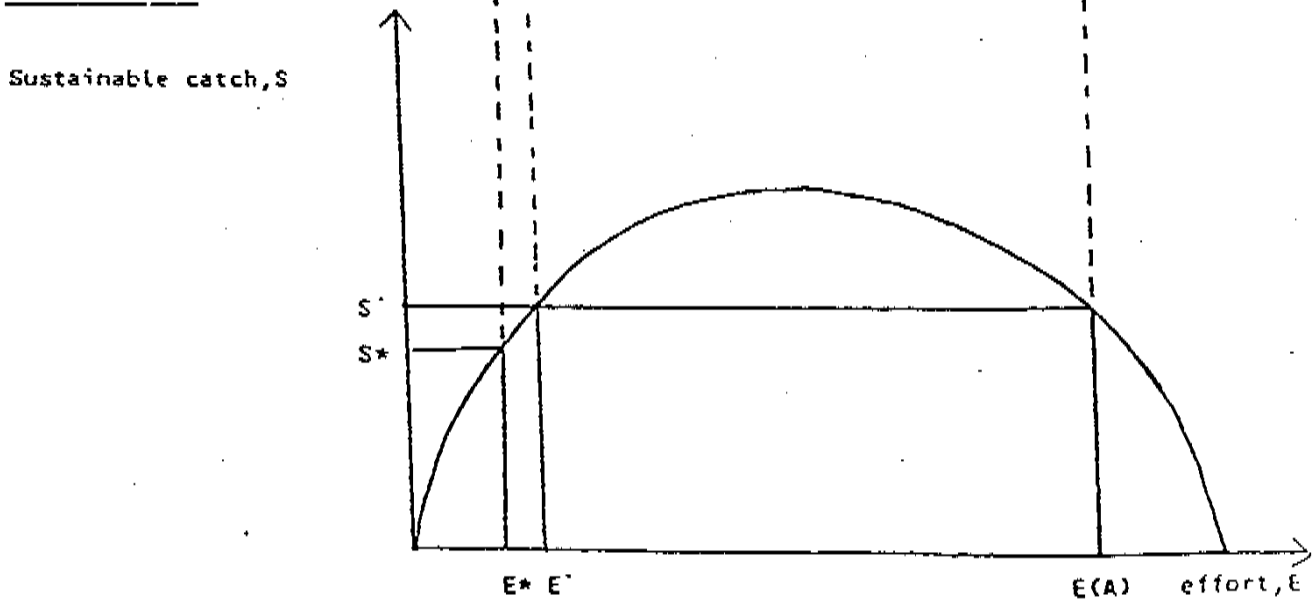


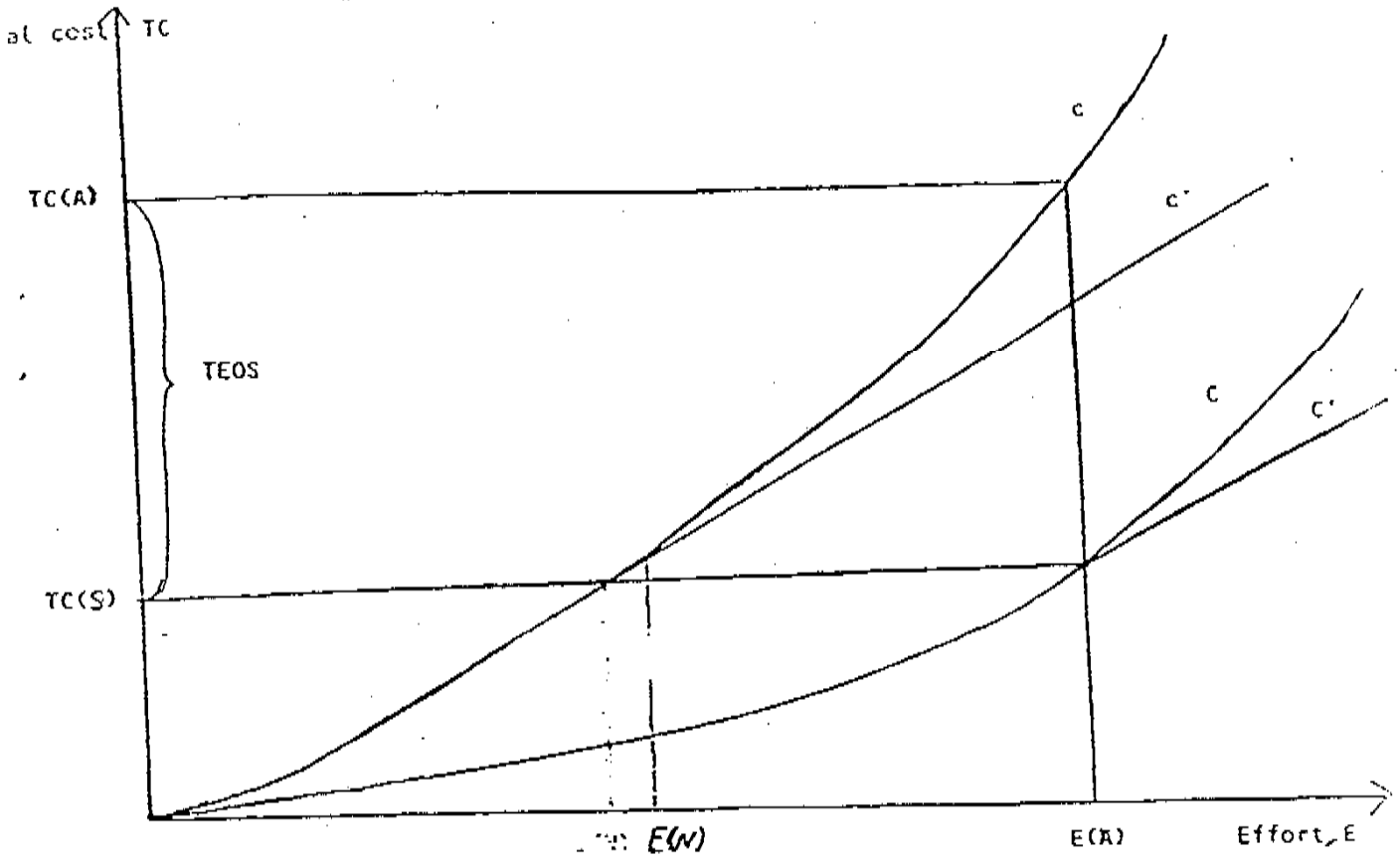
FIGURE 4.2.b



LEGEND

A : revenue curve with no output subsidy
B : revenue curve with the actual output subsidy
C : revenue curve with the actual cost subsidy replaced by an increase in the output subsidy
a : cost curve with no cost subsidy
b : cost curve with the actual cost subsidy

FIGURE 4.3. : TECS FOR FISHING EFFORT



LEGEND

c : unsubsidised cost function for the domestic fleet
c' : unsubsidised cost function for the international fleet (domestic and foreign vessels)
C : subsidised cost function for the domestic fleet
C' : cost function for the international fleet that takes into account the subsidy provided to the domestic fleet