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The Concept of Subsidies

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Introduction

In a 1992 *tour de force*, the FAO Fisheries Department summarized the state of the world's commercial fisheries with the comment that:

> Economic waste has reached major proportions; there has been a general increase in resource depletion, as fishing effort has moved down the food chain; the marine environment has become increasingly degraded; conflicts have become more widespread; and the plight of the small-scale fishermen has intensified (FAO Fisheries Department, p. 52).

As if to underscore the point, in July of that year the Canadian Minister of Fisheries and Oceans declared a two-year moratorium on the northern cod stock of Newfoundland, one of the world's great fisheries and traditional supplier of 10% of the world's Atlantic cod. It is now seven years later and the fishery was opened in a limited way during the summer of 1999. Stock failures have since led to a host of fishing closures and partial closures, most notably of U.S. groundfish in areas of the Georges Bank. Perusal of the FAO's chartbook on trends and catches since 1970 shows that many of the world's major commercial catches, particularly of demersal species, have shown a secular decline during the past quarter century (Stamatopolous 1993). The point has been emphasized in a more recent FAO document noting:

> Many of the resources classified as overexploited in 1992 have been showing decreasing yields for the last twenty years. Together, these resources are now producing 6 million tonnes less than they did in 1985 and about the same as they produced in the mid-1960s when fishing effort was undoubtedly much less than it is now (Grainger and Garcia 1996, p. 11).

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An earlier version of this paper, including an extensive taxonomy of subsidy types, was prepared for the United States Federal Task Force on [Fisheries] Investment, a body established in accordance with the Sustainable Fisheries Act of 1996. We wish to thank our colleagues on the Task Force for helpful comments which led, we hope, to a more focused definition.

Professors Joel Dirlam, Rögnvaldur Hannesson, and Noel Roy commented on earlier versions. Without unduly implicating them, we thank them for their help.

The authors point out that even this loss, out of a current world marine catch of 84 million metric tons, is seriously understated.

After years of fishery management, these are disappointing conclusions. Two intellectual responses have been engendered by these facts. The first is a renewed and accelerating interest in the privatization of commercial marine fisheries through the introduction of individual transferable quotas (ITQs)(Committee to Review Individual Fishing Quotas 1999). The second is a concern for subsidies, the subject of this paper. In its 1992 report, the FAO argued that the necessary first step in stopping the depletion of fisheries would be the removal of subsidies "which exacerbate the waste and increase the impediments to change" (FAO Fisheries Department 1992, p. 54). Never a neglected subject, fisheries subsidies have recently stimulated an enormous literature, with concern expressed and analysis performed by governmental agencies (Congressional Research Service 1995; Commonwealth of Australia 1996); intergovernmental agencies (World Bank: Milazzo 1998; OECD: Steenblik 1998 and Steenblik and Munro 1998); nongovernmental agencies (World Wildlife Fund: Burns 1997); and individual scholars (Stone 1997).

As a basic operational concept, subsidies are generally viewed as occurring "when the government through its actions enables producers of goods and services to avoid full payment for the factors of production and/or to behave differently in the marketplace than they would otherwise" (Schanz 1986, CRS-1). The opening substantive comments in the 1995 OECD report on environmental subsidies illustrate the frequent close association of subsidies with international trade:

> The first agenda item dealt with the problem of defining environmental subsidies and distinguishing among them on the basis of their trade-distorting potential (Pearson 1995, p. 5).

This paper considers the concept of subsidies in the context of fisheries policies. Since a major theme in discussions of fisheries management is the role of government in the decline of commercial fisheries, we ultimately return to the second part of Schanz' definition. What is needed is an approach that goes beyond questions of international trade, because trade pressure is only a small part of the problem of fisheries management.[1] The objective of this paper is to define subsidies so the term adequately encompasses the effects of government in stimulating businesses "to behave differently in the marketplace than they would otherwise."

In everyday parlance, a subsidy is the granting of money to an individual or firm by the government.[2] Presumably, the grant serves what is seen as a useful pub-

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[1] Much of the impetus for development of measures to more fully quantify subsidies is founded on the need to compare the level of agricultural subsidies across nations for the purpose of trade negotiations. Measures often employed for this purpose are: (*i*) the Producer and Consumer Subsidy Equivalents (PSE, CSE), and (*ii*) the Aggregate Measure of Support (AMS). The PSE and its counterpart the CSE are broadly defined aggregate measures of support which, in the case of PSE, includes direct payments to producers financed by budgetary outlays, budgetary outlays for certain other programs assumed to provide benefits to producers (*e.g.*, research, inspection, and environmental policies), and the value of revenue transfers from consumers to producers as a result of policies that distort market prices. The CSE provides a measure of direct and indirect government expenditures provided to consumers of a given commodity. The AMS, designed during the Uruguay Round of GATT negotiations as part of an effort to obtain commitments from member countries to reduce domestic support for agriculture, differs from the broader PSE by excluding estimated benefits (costs) of certain non-commodity specific policies (*e.g.*, research, inspection, and environmental policies) and by using special WTO-defined measures of deficiency payments and market price supports (see Nelson 1997). To date, the concepts have not been applied successfully to fisheries.

[2] Firms can also cross-subsidize operations; a vertically integrated fish processing-harvesting firm might use processing sector profits to offset harvesting losses. Such subsidies are independent of government and are, therefore, not considered in this paper.

lic purpose. For instance, were a government to desire to increase the nation's fishing capacity, the government might pay a "boat bounty," or subsidy, of, say, 30% of the cost of fishing vessels. By reducing the cost to the boat owner, a purchase that might not otherwise have been profitable may become profitable and the purchase made. Dictionaries tend to restrict their definitions to subsidies of this type.[3]

Yet, the range of possible subsidies is much broader than this. In a popular public finance textbook, Groves (1945, pp. 331–34) considered a different kind of subsidy. Although automobile sales have never been directly subsidized in the U.S., roads have generally been built with government funds. In the absence of user charges, a subsidy is being provided to the owner of the vehicle, since the full cost of operating the vehicle is not being borne by its user. Individual states, as early as 1901, charged motor vehicle registration fees, and starting in 1919, individual states collected gasoline taxes. If these and similar fees and taxes do not cover the full cost of building and maintaining the roads, the infrastructure expenditure includes a subsidy component. The improved infrastructure, especially when combined with subsidized costs, leads to increased use of roads through increased capitalization (the purchase of cars and trucks). The analogy to fisheries, where excess capacity is a chronic problem, is obvious.

Subsidies: Implemented for a Purpose—Not Necessarily Evil

Any subsidy is introduced for a purpose. From different perspectives, the subsidy might be considered to be "good" or "bad." If the subsidy accomplishes a universally desired goal, then society would rate it as good. However, there are always distributional effects associated with any subsidy, whereby some sectors of the economy are favored over others. In a more recent public sector economics textbook for instance, Stiglitz (1986, pp. 184–97) discusses the environmental problem of pollution abatement. Firms, such as steel producers, operate factories that pollute. Governments, increasingly concerned about the impact of pollution, have adopted a number of methods to control pollution, including the subsidization of firms for the purchase and installation of pollution abatement equipment. While the policy achieves the socially desirable objective of reducing pollution, an argument could be made that, in addition to helping clean the air, taxpayers are subsidizing the private profits of the polluting industry, thereby resulting in a redistribution of income from the general public to the steel industry. Such distributional effects tend to be controversial.[4]

An example directly relating to fisheries is the subsidization of sewage treatment on commercial fishing boats. While superficially this would achieve a (presumed) societal goal of helping to protect the marine environment, it would also tend to distort costs to the individual fishing firm and, hence, its profit maximizing potential and related level of output. One might even ask whether an industry that cannot pay for its own sewage treatment is worth supporting.[5] The question of "good" versus "bad" subsidies can be a complicated one. Regardless of the current connotations of the word "subsidy," each government program falling within our rubric "subsidy" must be evaluated on its own merits. Some will be seen as worthwhile;

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[3] For instance, *Webster's Dictionary* (1963, p. 876) defines subsidy as, "a grant by a government to a private person or company to assist an enterprise deemed advantageous to the public."

[4] The complexity of these issues is illustrated by the possibility that subsidies which reduce costs to firms in the pollution generating industry may actually result in increased pollution levels due to expansion of existing firms and entry of new firms.

[5] Some may argue that most land-based enterprises are also not responsible for treating their own sewage. Municipal taxes, however, will generally cover the costs associated with the treatment of waste.

i.e., the provision of beneficial "public goods," others less so. Since subsidies are controversial, and the term itself has come to be pejorative, we must emphasize this last point. Subsidies are not necessarily "evil." Some subsidies can serve a useful social purpose, such as those which further the preeminent social goal of improving human safety. Others, however, may contribute only marginally or even detract from the stated or implied social goal.[6] Furthermore, some fishery related subsidies, which may have served a useful social purpose when implemented, may no longer do so because of a change in the structure of the fishing industry (*e.g.*, from undercapitalized to overcapitalized), a change in the collective social goals, or some amalgam thereof. If the goals of society can be ascertained, the individual "subsidy" can be evaluated in the context of whether it moves society closer to its achievement.

Some subsidies involve the allocation of government funds directly to the immediate beneficiary. There are, however, other government programs which do not necessarily entail direct payments being made, that can also have a real or potential impact on the profit maximizing level of output of firms. Direct government payments to the fishing industry for capital expenditures are clearly subsidies. It would be inadequate, however, to limit our discussion of subsidies to ones of this nature. How far from these direct payments must we look to cover the ground? To determine this "distance," it would be useful first to establish a working definition of subsidies.

Subsidies, or Expenditures in the Public Trust

There are alternative ways of looking at activities that we denote as subsidies. Since marine fish are "owned" by the public, *i.e.*, are a public good, the state has a fiduciary responsibility, a public trust, to protect the resource. The costs of science and enforcement (and management as well) are necessary governmental expenditures in pursuing this public trust. As such, they are not necessarily subsidies.[7] We only mention this approach here without pursuing it further, because, carried to an extreme, there would be no subsidies, only expenses in support of the public trust. While the difference may constitute an important philosophical point, and certainly reflects strongly on one's attitude towards government activities, for purposes of this analysis, we have intentionally focused on a more restrictive, but functional, definition of subsidies, which is formally presented below. Whether or not the subsidies serve a "public trust" function is an important question but immaterial in the current context.

A Historical and Legal Note

Subsidies of the sort conceptualized in the standard dictionary definition have a long, and not very controversial, history in the U.S. During the late eighteenth century, when the Constitution was being framed, it was understood and accepted that individual states subsidized industries within their borders. However, taxes that offered preference to within-state industry were anathema. The Commerce clause of the Constitution was intended to abolish such tariffs, and the U.S. Supreme Court has always ruled as unconstitutional preferential taxes and tax rebates that favor in-

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[6] Those that contribute only marginally may still be considered beneficial if the costs involved are small. Those that detract from social goals would rarely be considered beneficial, even in the absence of any direct government expenditures.

[7] To help clarify this point, the government would clearly have an interest in supporting scientific endeavors that help carry out its public trust responsibilities.

state business to the detriment of out-of-state business. Nevertheless, the Supreme Court has continually upheld the constitutionality of grants of money (subsidies in the dictionary sense) which favor in-state business over out-of-state business (Coenen 1998, pp. 979–85).

It is difficult, if not impossible, to differentiate between the economic effects of the constitutional and unconstitutional forms of subsidies. Both are either revenue enhancing or cost diminishing—profit increasing—and the anticipated response of a firm is identical. For our functional analysis, determining the effects of government policy on fishing capacity, both types of subsidies must be considered, so the legal framework is of no help in our search for a working definition of "subsidy."

Criteria for Defining Subsidies

To define "subsidy" in a manner that would be useful for our purposes, it would be helpful to review alternative criteria that could form the basis of the definition. Three criteria: (*i*) modification of market failures, (*ii*) cost reduction, and (*iii*) revenue enhancement, are proposed, discussed, and found wanting.

One criterion that could potentially be used in defining a subsidy is based on the concept of market failures.[8] One could establish an ideal case, for instance, perfect competition, as a basis for determining the degree to which government programs help to distort or correct the operation of the market. Problems with this criterion are twofold. First, there is the problem of establishing the perfectly competitive norm in the pervasive presence of market failures. Second, even if the competitive norm could be established, one must then also be able to isolate the specific distorting (or correcting) effects of government programs. A program, such as a lower-than-commercial interest rate loan program, might be undertaken by government to correct market failure caused by, say, incomplete information in the private sector.[9] One might interpret such a loan program as a "good" subsidy, but it is difficult to see how it could be excluded from a general definition of "subsidy." Surely such a loan program, if targeted at a fishery, even if it served to correct a market imperfection, would be subject to a legitimate claim for a countervailing duty by a fish importing country. Who is to judge whether the higher commercial loan rate or the lower government rate more adequately reflects the rates that would exist in a "perfect" market? In his economic analysis of the different effects of government loans, loan guarantees, and grants on firms, Li (1999, p. 25) denies the possibility that the government can ever correct a market failure, since, in his opinion, "the government does not have information or technology advantage over private agents."

There is yet another consideration to be taken into account. According to the

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[8] Panayotou (1993) defines market failures as institutional failures attributable partially to the nature of certain resources and partially the failure of the government to (*a*) establish the fundamental conditions for markets to function efficiently (such as property rights and the enforcement of contracts) and (*b*) use the instruments at its disposal (such as taxation, regulation, public investment, and macroeconomic policy) to bring costs and benefits that the institutional framework fails to internalize into the domain of markets.

[9] Dewar (1983, p. 67) notes that the *Fish and Wildlife Act of 1956* authorized loans for replacement, repair, and operation of fishing vessels when vessel owners could not obtain commercial loans. Congress, acting on the belief that fisheries were undercapitalized, authorized loans to vessel owners at unsubsidized market interest rates but with beneficial repayment terms. Dewar concludes that Congress believed that banks were overestimating the risks of loans to vessel owners. In passing, however, it might be noted that if the conclusion by Congress was erroneous (*i.e.*, the banks' interest rate and repayment schedule did accurately reflect the risks involved in fishing operations), then government intervention would increase, not correct, market distortions.

theory of the second best (Meade 1955, pp. 102–18), when there is a number of market imperfections, correcting only a subset does not ensure movement of the system closer to the ideal, and may even move it away. Thus, to continue with our example, a government ostensibly correcting loan conditions, leaving all other imperfections intact, may actually move the system further away from the conditions of a perfect market.[10]

A second criterion that could potentially be used in defining a subsidy is based on the concept of costs to the firm. Specifically, any government program that reduces the firm's costs, either implicitly or explicitly, serves to increase its profits. In the long-run, such a program would stimulate the use of additional inputs and, with some rare exceptions, output.

A third criterion would be revenues. As with the second criterion, any government program (*e.g.*, a price support program) that serves to increase revenues would stimulate profits and, again, with some notable exceptions, output.

Subsidies affecting either revenues or costs, or which modify market imperfections (and as a result affect revenues or costs), affect, at least potentially, the firm's profits. Therefore, in evaluating a subsidy, a suitable all-encompassing framework is provided if we determine the potential effect of the government program on the profits of the firm.

A Tentative Definition of "Subsidy"

Based on the previous discussion, a subsidy can tentatively be defined as any government program that potentially permits the firm to increase its profits beyond what they would have been in the absence of the government program. It should be noted that anything that increases the profits of a firm presumably increases government tax revenues and, therefore, decreases the net government financial outlay for the subsidy. To accurately compute the amount of the net subsidies, it is necessary to take these counterbalancing taxes into account. This factor is of little relevance at low marginal tax rates but becomes more so as the rate increases, and it is not given further consideration in this paper.

Profits are the result of economic activity by a firm. Assuming that the firm is functioning within an unchanging form of industrial organization and an event occurs that increases anticipated profits, the firm has an incentive to further enhance its profits by increasing its level of economic activity. Once a decision is made to expand output, if the firm is operating at or near full capacity, the decision to expand output must be made in conjunction with the long-term decision to expand capacity.[11] In the case of fisheries, capacity would be expanded by increasing the number or capacity of fishing vessels and fish processing plants.[12] Thus, we shall assume that a subsidy which, by our tentative definition, potentially leads to an increase in profits, leads also to an increase in capacity.

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[10] As noted by Panayotou (1993), government policies introduced for the purpose of correcting a market failure often tend to introduce additional distortions in the market for natural resources. As such, a market failure by itself, is not a sufficient condition for government intervention. Specifically, government intervention is warranted only if (*i*) the intervention outperforms the market or improves on its performance and (*ii*) benefits of intervention exceed costs, including indirect and unintended costs of distortions introduced via intervention in a given market.

[11] The firm's definition of capacity is flexible. A fisherman or fishing firm may consider full employment of a vessel as occurring when the vessel is used at only 50% of its physical capacity.

[12] Excess plant capacity can, in turn, lead to changes in harvesting capacity and pressure on fish stocks as owners attempt to utilize their capital and as workers seek employment.

Subsidies Increase Profits with Respect to What?

Since we are defining subsidies in terms of potential changes in profits, the question arises, "Changes with respect to what?" Perhaps the most obvious answer is changes from the situation that would exist under the theoretical considerations of perfect competition. The primary difficulty referred to earlier, is that this is a theoretical construct that cannot exist in many cases; thus, as a criterion, it is too amorphous to serve as an operational concept. Even when perfect competition could exist, information requirements necessary to determine the norm are liable to be too great to permit the criterion to be functional.

Rather than use conditions existing under a specific form of industrial organization, we prefer an alternative approach roughly analogous to partial equilibrium analysis. That is, to evaluate a subsidy, assume that we start with the present situation, the government subsidy program is then invoked, and under the rather stringent assumption that no other "external" factors change, the potential change in profits, at least conceptually, can be determined.

Subsidies Increase Profit over What Time Frame?

Some fisheries subsidies might affect profits in the short-term and others in the long-term. But the long-run creates complications. Take, for example, the Fishery Vessels Assistance Act of Canada under which, from 1942 to 1986, the federal government paid the owner a bounty for every new fishing vessel built. As a result of this bounty, the cost of vessels decreased, anticipated profits rose, and more fishing vessels were built. Since changes in the number or capacity of vessels are changes in capital, the usual timeframe for the analysis is the long-term. However, that is not the end of the story. The standard economic theory of open-access fisheries states that as more vessels are added, the profits (or more properly the rents, but we will ignore the difference) ultimately will dissipate.[13] Thus, the bounty leads to increased anticipated profits and, therefore, to an increase in fishing capacity, but this increase in capacity ultimately leads to a reduction in profits. Our immediate concern is the "impact" effect of the bounty, which is to increase anticipated profits, and not the ultimate effect. Both the increase in anticipated profits (and for a while an actual increase in profits) and the subsequent reduced profits are caused by changes in the number of vessels; *i.e.*, changes in capital. Both are long-term changes. It will be helpful to distinguish between these two aspects of the long-term. In the absence of a conventional expression in economic theory, we will call the "impact" or intermediate effect the "medium-term" and the ultimate effect the long-term. In general, our focus will be on the medium-term.

Subsidies to Whom?

While much of the discussion to this point has concentrated on subsidies in relation to the harvesting sector of the fishery, subsidies to other sectors/institutions are also worth considering. As one specific example, subsidies can be given to the processing/marketing sector of the fishing industry. The issue then becomes whether subsidies to this sector can have an impact on capacity in the harvesting sector. The answer clearly is yes. Consider the situation whereby each of a given number of pro-

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[13] While this statement is generally true, it should not be interpreted to negate the fact that fleets are heterogeneous, and some vessels, the "highliners," will continue to earn profits.

cessors in a region generates an identical demand for the raw fish input to be used in the production process. A subsidy to the processing sector will allow for the entry of otherwise unprofitable establishments as well as the possible expansion of existing facilities (assuming the price of the processed product does not respond significantly to increased production). This expansion, in turn, results in an increase in the aggregate demand for the raw input and a "bidding up" of the price of the raw input. This "bidding up" process results in an increase in profits in the harvesting sector, thereby encouraging the expansion of harvesting effort and capacity. Subsidization of the processing sector, therefore, implies a subsidy to the harvesting sector.

Additional Factors

Additional factors remain to be considered:

(*i*) Would a government policy that initially increases fishermen's profits, but in the long-run simply leads to the dissipation of profits, be a subsidy?
(*ii*) Would a government action that potentially diminishes profits be a [negative] subsidy?
(*iii*) Would global changes, such as monetary policies of the Federal Reserve System that serve to alter interest rates, be subsidies?
(*iv*) Would buyback programs which lead to fewer fishermen be subsidies, and if so, subsidies to whom?
(*v*) Could the lack of a government policy constitute a subsidy?
(*vi*) Can policies restricting access to fisheries be considered subsidies?
(*vii*) Could a government action that has no immediate effect on the fishery be considered a subsidy to the fishery?
(*viii*) Can a subsidy to a nonfishing industry constitute a subsidy to the fishery?

Can a Subsidy Lead to a Dissipation of Profits?

If a government program leads to a rise in profits, there will generally be an increase in output and, in the long-term, an increase in capacity. According to this argument, a government policy that initially increases fishermen's profits, but sets in train a sequence of events that leads to a dissipation of those new profits, is considered a subsidy. This apparent conundrum is perfectly consistent with the view often expressed about the world's commercial fisheries, that "in the short-term, subsidies produce additional profits for the fisherman, attract more fishermen into the fishery, and raise total costs until [profits disappear]" (FAO Fisheries Department 1992, p. 22).

Negative Subsidies

Although the concept of a negative subsidy runs counter to our usual way of thinking, it may be useful to consider this concept in some detail. Consistent with our broad conceptual definition of subsidy, a negative subsidy is simply a government program that tends to reduce profits.[14]

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[14] The concept of a negative subsidy is not without precedent. Webb, Lopez, and Penn (1990, p. 6), suggest that an artificially low domestic farm-gate price for a given product, due, for instance, to a mandated price ceiling, would constitute a negative subsidy.

Regulatory changes probably constitute the most common and visible type of negative subsidies. Take, for example, the recently enacted federal regulation that mandates the use of turtle (or other bycatch) excluder devices as a means of reducing unintended catch of turtles (or other marine species). Given our tentative definition, such mandated requirements, to the extent that they result in a loss of catch and profit in the directed fisheries, would be considered negative subsidies.

As a second example, consider federal regulation that increases the minimum fish size at harvest or sharply curtails total allowable catch (TAC). Such regulations, at least in the short-run, also result in reductions in catch and profits and, hence, constitute negative subsidies to the fishermen.

These examples, from a fisherman's perspective, are likely to be seen as "bad" subsidies. But from society's perspective, can the same conclusions be drawn? With respect to the first example, when the process of fishing kills turtles (or other nontargeted species), there exists a negative externality imposed by the fishing industry upon that segment of society interested in the preservation of turtles (or, more generally, fishing can impose negative externalities upon user and nonuser groups of the nontarget resource). From society's perspective, the negative subsidy imposed on the fishing industry via mandated bycatch excluder devices may be seen as a way to offset the negative externality caused by the fishery. To the extent that the regulation is successful in achieving the objective of reducing turtle or other bycatch mortality, the distributional effects associated with a subsidy, as noted earlier, are clearly evident. Specifically, while negative benefits (*i.e.*, costs and reduced profits) are imposed on the fishing sector, positive benefits accrue to other sectors of society. If the positive benefits accruing to society exceed the negative benefits imposed on the fishing sector (*i.e.*, negative subsidies), then the policy would assumably achieve a socially desired objective and would, from the standpoint of society, represent a "good" subsidy. Hence, while regulations may be considered as "bad" subsidies from the standpoint of the group upon whom they are imposed, from a larger, societal standpoint, they may be viewed as "good" subsidies.

The problem would be further complicated were the government to offer payments to fishermen to compensate for the cost of the turtle excluder devices. In that situation, there would be: (*i*) a negative externality imposed by the fishery upon that segment of society that values preservation of turtles; (*ii*) a negative subsidy imposed by the government on the fishery to compensate for the negative externality; and (*iii*) a positive subsidy to compensate for the negative subsidy. The net subsidy to the fishery (in terms of net anticipated profits) would be the sum of the positive and negative subsidies. The net social effect would be the net cost to government of the net subsidy less the social value of the negative externality. A similar analysis may be used to evaluate government actions favoring aquaculture which, in turn, affect habitat to the detriment of commercial fisheries.

Regulations that increase the minimum size at harvest or curtail TAC can be evaluated in the same context as regulations that mandate bycatch excluder devices. While the fishermen upon whom the regulations are originally imposed would consider them as "bad" subsidies, the regulations were imposed, presumably, because the long-run benefits associated with imposition of the regulations would exceed costs. The benefits of the regulations may, in the extreme, accrue only to future generations of fishermen (assuming all future benefits are not dissipated in an open-access system), while costs are imposed on the current generation. Hence, there exists in this case an intergenerational transfer of subsidies; *i.e.*, a "bad" subsidy to the current generation which results in a "good" subsidy to future generations.

Global Changes

Global changes, such as changes in monetary policies by the Federal Reserve System or general changes in tax rates, affect profits in fisheries as well as in all other industries. As such, government activities resulting in these changes constitute subsidies, according to our broad definition.[15]

Buyback Programs

Is the payment a government makes to a vessel owner to reduce capacity (as part of a buyback program) a subsidy? To clarify the argument, let us assume that the payment is to retire the vessel and gear, as well as any licences owned by the vessel owner. The vessel owner, therefore, is being paid to leave the industry. This direct payment constitutes a subsidy to the owner of the vessel being retired only if it is in excess of the vessel's fair market value. Assuming that the remainder of the fishing fleet is not expanded to compensate for the reduction in capacity that results from this payment, the payment serves to reduce fishing capacity. This is not a subsidy to the fishing fleet, if the fleet is defined as that which remains after the buyback occurs. It does, however, potentially affect profits, since the productivity of the remaining vessels increases. Had the government not intervened, profits, at least in the short-term, would have been lower. Thus, according to our definition, buyback programs are subsidies. This subsidy affects fishing capacity, but negatively. The current perspective that most commercial fisheries are overcapitalized implies that subsidies associated with buyback programs are desirable because they move society closer to its collective goals. Language regarding rebuilding of stocks in the recently enacted *Sustainable Fisheries Act* supports this view of buybacks.[16] Considering the concerns expressed in this legislation, the need for the evaluation of subsidies in the context of the social perspective of the times becomes clear. Given the perceived undercapitalization of the fisheries, such as Dewar suggests existed in the 1950s, and that which existed during the period of the Americanization program that followed the passage of the Magnuson Act in 1976, subsidies that served to increase fisheries capital were viewed favorably. Now that fisheries are perceived to be overcapitalized, these subsidies are out of favor, and subsidies that reverse the previous direction are viewed with approbation.

Can Lack of a Government Program Constitute a Subsidy?

Referring to the steel mill example cited earlier, would the lack of a government program to prevent pollution constitute a subsidy? In general, government action is required for there to be a subsidy.[17] The exception is a situation where one govern-

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[15] Treatment of these global changes as subsidies is consistent with the estimation of producer subsidy equivalents established by the U.S. Department of Agriculture for negotiation purposes under GATT (see Webb, Lopez, and Penn 1990).

[16] It is worth noting, however, that in the absence of policy restricting what may be done with the income received by a fisherman participating in the buyback program, he/she may simply use the income to purchase the necessary equipment to enter an alternative fishery. Thus, buyback programs that are limited to a specific fishery may result in the expansion of capacity in those fisheries not included in the buyback program.

[17] All resources, to the extent that they are scarce, are valued by society. Some may, therefore, consider the steel mill, to the extent that it is using scarce resources but not being charged "fully" for their use, as receiving a subsidy. Analogous to this, fish stocks in the sea may be considered as assets owned by society. To the extent that users of the fish stocks are not being charged for the use of these assets, some may argue that a subsidy is implicitly being given by society at large to the direct users of the resource. This argument is predicated on the structure of property rights which is largely outside the scope of this paper.

ment takes no action while other governments in similar and competitive situations take action, for instance by charging the costs of certain government operations to private firms.

Policies Governing Access to Fisheries

Consider the extreme situation of a government which changes its fundamental fisheries policy from one of completely free access to one of ITQs, where the quotas are both permanent and set in terms of a percentage of the TAC. Assume that the ITQs are assigned on the basis of historical catch experience and without substantial charge.[18,19] The government has essentially converted a public good, the fish in the sea, to private capital. Increasing a firm's capital, free of charge, is surely a subsidy.[20] The firm is willing to participate in this operation in anticipation of increasing its profits. In addition to the long-run effects of limiting the access to the fishery of competitors, as in the case of buybacks discussed above, the recipient of an ITQ might immediately (or later) sell it, the receipts of which are a capital gain, a form of revenue. Such resource grants from the government can be made in less dramatic ways than the granting of permanent ITQs, such as through limiting access or establishing community quotas. In all cases, they comprise a form of subsidy to the commercial fishing sector.

Delayed Effects

Many government programs and actions, while not resulting in immediate changes in profits from commercial fishing activities, will, in the long-run, enhance revenues (or decrease costs) to individual firms and, hence, under our definition constitute subsidies. In the Gulf of Mexico, for example, more than 90% of the species harvested, including the most commercially valuable species (*e.g.*, shrimp, menhaden, oysters, and blue crabs) are dependent on the region's coastal wetlands for at least a portion of their life cycles (Weber, Townsend, and Bierce 1992). The region, however, and in particular Louisiana, has been losing wetlands at a high rate. In response, both the state (Louisiana) and Federal governments have invested, and plan to continue to invest, large sums of monies in projects aimed at reducing the rate of wetlands loss, if not reversing it. In the long-run, commercial fishermen will benefit from such projects via enhanced catches or a reduction in the unit cost of harvesting. Although the beneficial effects to fishermen are delayed, government actions of this nature, which are likely to achieve the socially desirable goal of at least partially restoring an ecosystem to its original condition, are subsidies to the fishermen.

As a second example, artificial reefs are, at times, made of surplus military equipment; *e.g.*, ships. As fish are attracted to these structures, or if their place-

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[18] An incidental, but potentially significant, aspect of the introduction of ITQs is that firms might increase their catch of species (and even increase their capacity to catch species) they anticipate will come under a new ITQ program. Such speculation is a rational attempt to establish a catch history that will entitle them to greater initial quotas.

[19] The argument changes, of course, if quotas are auctioned off by the government with the receipts deposited in the Treasury.

[20] In general, the subsidy associated with the establishment of an ITQ program, or similar program limiting access, accrues only to the initial recipients of the quotas.

ment results in increased biomass, costs to fishermen will decline, or their absolute level of catch will be enhanced. Hence, while delayed, use of surplus equipment of this nature in the marine environment also constitutes a subsidy according to our tentative definition.

The Effect on Fisheries of Subsidies to Other Industries

Assume, for concreteness, that subsidies are given to the agricultural sector that result in the use of inputs (such as fertilizer) and related output in excess of that which would be observed in the absence of such a subsidy. There are at least two ways in which the fishing sector could be influenced by a subsidy of this nature, far removed from the fishing sector. First, an "artificially" high level of agricultural product, to the extent that it competes with fishery products for the consumers' limited food budget, reduces demand (price) for fishery products, thereby negatively influencing capacity. Second, to the extent that agricultural runoff increases with input usage, degradation of the marine ecosystem may exceed that which would occur in the absence of subsidies to the agricultural sector. This, too, would negatively influence capacity in the fishing sector. Thus, the externalities resulting from the agricultural subsidy constitute a negative subsidy to the fishery.

Subsidies to the aquaculture sector can impact the commercial marine fishing industry in much the same way as those of the more general agriculture sector. First, aquaculture products compete with the commercially harvested product in the market. Second, the feed for some aquaculture-based species, such as salmon, is largely derived from commercially harvested species that tend to be at a relatively low level of the marine food chain. Use of these species can potentially have a negative impact on biomass and harvests of species at higher levels. Finally, other potential negative impacts, including possible genetic degradation of the wild stocks, are discussed by Naylor *et al*. (1998).

The World Trade Organization Definition

Before closing this discussion of factors that must be taken into account before arriving at a suitable definition of subsidies, it is necessary to consider an important competing definition, that of the World Trade Organization (WTO). The WTO deems a subsidy to exist if a government directly transfers funds to a company by means of grants, loans, or equity infusions; "potentially" transfers such funds by guaranteeing loans; foregoes revenues by allowing tax credits or waivers; provides goods or services (other than infrastructure); or offers income or price supports. However, exempting exported products from taxes (*e.g*., various forms of value-added taxes) that are applied to domestic consumption, are a form of tax waiver that is not considered a subsidy. In addition, there is a specificity requirement that a subsidy must not be general, but must apply only to "an enterprise or industry or group of enterprises or industries" (GATT 1994, pp. 264–66). This definition covers only positive subsidies specifically oriented to a single industry or group of industries, excludes infrastructure payments, and excludes programs that may have a more indirect effect on revenues, costs, or profits.

The WTO, following its predecessor organization, the GATT, is concerned with distortions in world trade that act adversely against national trading partners. Subsidies on products that are not traded internationally are not actionable

under the international conventions. In addition, actions against nations which are engaged in trade distorting subsidies are only taken if a trading partner believes it is being disadvantaged by the subsidy. The WTO definition is oriented expressly towards world trade considerations. Further, it must be recalled that the WTO definition is operational in the sense that it specifies prohibited actions against which nations can take remedial action. Our concern is far more general; it is with any government program that might affect the potential profitability of firms in the fishery.[21]

Definition of "Subsidy"

In consideration of these factors, our general definition of "subsidy" is the following:

> Government action (or inaction) that modifies (by increasing or decreasing) the potential profits earned by the firm in the short-, medium-, or long-term.

Subsidies, then, are measured in terms of expected changes in the profits of the industry that result from government action (or inaction), not in terms of the cost to the government. In fact, for an action to be a subsidy, there need be no direct cost to the government. The cost of a subsidy to government is an interesting and computable variable, but is not central to the concept of "subsidy."[22]

The objection might be raised that with this definition, virtually every government action would represent a subsidy to someone. Perhaps rightfully so. Far too often, government policy (action) is established which fails to fully consider ramifications to the natural resource-based sectors, such as fisheries. These policies (actions), with few exceptions, tend to favor some parties while disadvantaging others, and should be evaluated in this context. Such evaluation will provide us with a richer understanding of the role of government in influencing both income distribution among sectors of the fishing industry and fishing capacity.

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[21] That the WTO definition is too narrow for general application is implicit in the work of the OECD, where at its 69th and 70th sessions, the Committee for Fisheries instructed the authors of a draft report to extend their inventory of "assistance instruments" to include domestic support measures. See OECD (1992).

[22] The focus of this discussion has been the concept of subsidies with respect to the commercial fishing sector. Our definition can be expanded to include the recreational component of the fishing industry. Specifically, income is earned for the purpose of purchasing goods and services that provide satisfaction. This suggests that any government action (or inaction) that results in an increase (or decrease) in satisfaction can be construed as a subsidy. Government action (or inaction) that results in a potential change in satisfaction derived from fishing activity (either commercial or recreational) is considered a subsidy.

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