

# Fisheries Management and Uncertainty

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*Abstract* This paper explores likely changes in the types and extent of uncertainty resulting from increased regulation of fisheries. Specifically, fisheries management may be a principal source of uncertainty, and institutional uncertainty may be substituted for the uncertainty of nature.

## Introduction

Ocean fisheries must surely rank high among industries that in the recent past have had to adjust to fundamental changes in institutional framework. The changes in the law of the sea have either made fleets obsolescent by banning them from their traditional fishing grounds or added to the costs of fleets that could gain access to traditional waters now under the jurisdiction of foreign countries. These changes are indeed an outstanding example of the latent uncertainty inherent in all institutional arrangements, no matter how time-honored they may be. But such revolutionary events are—fortunately, we might say—rare. While less dramatic but more persistent types of uncertainty are more relevant for day-to-day fisheries management, I still find the introduction of the 200-mile limit an appropriate point of departure because of its highly significant impact. In the United States an entirely new institutional structure has been erected in

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its wake, and elsewhere more authority has been bestowed upon established institutions. In short, fisheries are being regulated as never before.

### **The Conventional Wisdom**

What are the implications, with respect to uncertainty, of a tighter regulation of fisheries? Conventional wisdom tells us that the welfare-economic impact of a strengthened management would be beneficial. There are two main arguments leading to this conclusion. First, there is the indicative planning argument—that is, the uncertainty that firms and individuals face is to some extent the result of a lack of information about other agents' plans, including those of the government, usually the most influential agent of all. This uncertainty will be reduced if the government announces the direction in which it will be steering the economy. Second, there is the argument that a government planning agency need not be unduly deterred by uncertainty—more precisely, the kind of uncertainty which is usually called risk. For the economy as a whole, as well as in the long run, variances in returns will cancel each other out, and the government can thus concentrate on the expected return from a particular industry.

The basic fault with this conventional wisdom is that it assumes a well-informed and benevolent government which maximizes some unselfish welfare function. Once we take a more realistic approach and view government and its branches as entities furthering their own selfish interest, these conclusions about uncertainty and fisheries management are no longer necessarily correct. In particular, I wish to question these conclusions by presenting the following considerations:

1. Fisheries management may itself be a source of uncertainty. Therefore, by increasing the authority of fisheries management, institutional uncertainty may be substituted for the uncertainty of nature.
2. The elimination of risk or the mitigation of its consequences may in certain cases increase allocative inefficiency in the fisheries.

### **Regulation by a Single Authority**

Let us first ignore the international dimension and look at possible sources of uncertainty within a single fisheries-management authority. If we are trying to build a theory on the hypothesis of maximizing behavior, we first need to consider the following question: What is the management authority trying to maximize? Here it is probably useful to think of this authority not as a monolith but as composed of two groups with different interests, "politicians" and "bureaucrats." The politicians formulate policy and are directly or indirectly responsible to the electorate. The bureaucrats are professionals whose tenure is not in principle subject to political vagaries.

As we know, politicians in a democracy have to seek legitimacy by convincing a sufficient number of voters of the usefulness of their services—at least in relative terms. As we know equally well, this is not accomplished by persuasive argumentation about the social welfare function. Catering to the interests of well-defined groups appears to be a more direct route to power and influence. Such an approach has an unfortunate side effect. What so often are identified as group interests are privileges or rents arising from allocative inefficiencies—for example, monopoly profits and rents that result from limited entry to professions. What appears to an individual as a minuscule part in an improvement for the general public is willingly sacrificed for a bigger share in some privilege at the expense of the general public. The problem is, of course, that when a sufficient number of interest groups have been bought off in this way, all may end up in a worse position than otherwise would have been the case.

What, then, is the implication for uncertainty of increased government regulation? There are contending influences: in some ways uncertainty will be reduced, while in other ways it will be increased. Uncertainty will tend to increase, or be introduced into an otherwise predictable environment, because it is sufficient to buy the support of a limited but varying number of interest groups to obtain the electoral support needed to wield the powers of government. There are several reasons why the support of different interest groups might be solicited at different

times. First, it will be necessary to renew old alliances time and again with new favors or to replace the old alliances with new ones. Second, the relative "cost" of different interest groups may change over time. Third, different contending political parties will have preferences for, or different cost considerations in, enlisting the support of different interest groups. Fourth, as it becomes increasingly clear how governments cater to group interests, more and more effort will be spent on lobbying for such interests or on forming new groups around any such common interest as may be identified. Indeed, one may perhaps go as far as to say that entrepreneurial talent is increasingly being rewarded by gaining favors from the government rather than making a salable product. As this sort of activity becomes more widespread, the general framework within which firms operate will become more fluid, and there will be increased uncertainty as to who will be favored by government at any particular time.

One particular type of uncertainty, however, will doubtless be decreased by the increased regulation of fisheries. This is the uncertainty associated with technological change and obsolescence. Because innovators are few, there is more electoral support to be enlisted from those who are threatened with obsolescence. Governmental support of sunset industries in Western Europe is a good example. In Norway governmental policy gives explicit support to labor-intensive fisheries and recommends the phasing out of one of the few profitable fisheries (the factory trawlers). Another example is the prohibition of purse seine gear in the Lofoten (Norway) fishery a few years after it was introduced in the 1950s. This is extremely efficient fishing gear, but a biologically defensible use of this gear would greatly reduce the need for boats and manpower. Arguments not dissimilar to the ones advanced against purse seine gear were also used against the introduction of motorized vessels about a hundred years ago, but to little avail. (This was well before the age of economic planning.)

So much for politicians, but what about bureaucrats? Will their activities tend to increase or reduce uncertainty? Here again there are conflicting tendencies. One reasonable hypothesis is that bureaucrats wish to make life easy for themselves by

sticking to established regulations and routines. However, to the extent that they repeatedly have to justify their existence (or if they are empire builders), they would be expected to revise old routines and create new regulations as evidence of their indispensability. (There is perhaps some room for differences in personalities to affect the outcome.)

### **International Regulation**

As the law, or lawlessness, of the sea so amply illustrates, the basic entity in international relations is the nation-state. The actions of national management authorities are perhaps in principle explicable as maximizing behavior, but where the interests of different national agencies are involved, game theory would be more adequate. Interdependence of national interests is still important in world fisheries despite the extended fishing limits: as is well known, many fish stocks transgress national boundaries.

As a result of the 200-mile limit and the creation of exclusive fishing rights, internationally shared stocks are now increasingly being regulated by quotas. This is certainly the case in the north-east Atlantic. For the fishermen concerned, the uncertainty previously attached to the abundance or scarcity of fish stocks has now been replaced by uncertainty about the quota allotment for the next season. Despite the fact that quotas are supposed to be based on scientific advice, nature is not alone in creating uncertainty about them. One source of uncertainty is the linkage of issues in international relations: at certain times governments may be tempted to trade their interests in fisheries for some other benefit; at other times they may have too little clout to put behind their claims to a share in the total allowable catch. There is even uncertainty about whether the interested parties will manage to reach agreement on quotas before it is too late in the season. The negotiations within the European Economic Community on such matters are a notorious example. The EEC bureaucrats have invented the ingenious trick of stopping the clock to deal with deadlines, but this practice can be quite exasperating for those who are living in real time.

Additional uncertainty in internationally shared fisheries has

to do with the difficulties of monitoring the enforcement of internationally agreed regulations. These regulations are supplemented with agreements on mutual rights of inspection, but such rights are usually much less effective than when nationals alone are involved. Furthermore, sovereign states are seldom willing to grant others the rights of inspecting their own fishermen. Most often under international fisheries agreements each party is supposed to monitor its own fishermen. The problem is that a single party to an international agreement would benefit from breaking it as long as the breach was not detected. This is unfortunate: those who are supposed to police the agreement are precisely those who would benefit from breaking it. Such a situation creates various uncertainties for the fisheries. First, the long-term benefits from any fisheries agreement may not materialize as projected at its inception. Second, when one party to the agreement has become convinced that another's adherence is only lukewarm, the agreement will collapse and so will the broader framework within which the fishermen have made their decisions. For example, fishermen could suddenly be excluded from fishing grounds to which they had been given access by the agreement, or there might arise a situation of free access, in which benefits would accrue to those who are first to reach whatever fish are available.

### **Protection from Risk**

In stating that a mitigation of the consequences of risk in fisheries by government interference may actually increase inefficiency in the economy, I have in mind the risk due to natural fluctuations in the abundance of fish causing variations in yield per unit of effort. We are all familiar with the tendency toward a wasteful allocation of resources resulting from free access to common property. If a fishery is more risky than other industries while fishermen are risk-averse, this will to some extent offset the misallocation arising from free access. Thus, with a fisheries policy that protects fishermen from this risk by evening out the fluctuations in their income while doing nothing to limit fishing effort, the result will be an increased waste of re-

sources to the extent that risk discourages effort. Owing to the above-mentioned predilection of governments to cater to special interests, this is perhaps to be expected. Below I shall give an example, but first I shall demonstrate the argument a bit more technically.

Let us compare an industry in which the returns are risky (the fishery) to a riskless alternative. We assume a risk-neutral social planner, as variations in revenue in the fishery should be of little concern at the macroeconomic level. On the other hand, we assume risk-averse decision makers at the microeconomic level in the fishery. The social planner's problem may be stated as follows:

$$\text{maximize } E(\pi) = E[R(f)] - cf$$

where  $\pi$  is profit (rent),  $R$  is gross revenue per year,  $f$  is fishing effort, and  $E$  is the expectations operator. We assume that the expectation of  $R$  is given by a long-run sustainable yield function, but that environmental fluctuations can lead to variations in fish growth. We shall thus ignore transitions between long-term equilibria. Fishing costs per unit of effort  $c$  are assumed to be constant and known with certainty. The necessary condition for maximum is

$$E(R') = c$$

Compare this to the bionomic equilibrium. The equilibrium condition under free access when there is risk aversion on behalf of decision makers is that rents be just sufficient to cover the risk premium, which ensures indifference between the risky and the riskless alternative—that is,

$$E(R/f) - c = P$$

where  $P$  is the necessary risk premium per unit of effort. Comparing this with the condition for a social optimum, we see that this would be compatible with free access if

$$P = E(R/f) - E(R')$$

that is, if the risk premium corresponded to the difference between the expected revenue per unit of effort and the expected marginal revenue. This would, of course, be a coincidence, and the risk premium would in all probability be much lower than this difference. But more importantly, the existence of a positive risk premium will reduce the difference between optimal effort and equilibrium effort. Therefore, any reduction of individual risk brought about by a government policy which does not simultaneously limit fishing effort will be counterproductive and actually increase the gap between optimal and equilibrium effort.

Fisheries policy in Norway seems to offer an example of a rather extreme variation on this theme. Providing fishermen with an income comparable to that of industrial workers is a strong element in Norwegian fisheries policy. This policy has in practice usually meant supporting the fisheries with subsidies in lean years and not taxing excess profits in good years. If it can be assumed that effort expands when there are excess profits, the result is that effort increases over time but is never reduced because the losses which would lead to a contraction of effort are not allowed to occur. In a vicious circle, effort continually expands, and the "need" for subsidies increases along with it.

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