Economic Theory and Public Administration

The Case of Fishery Management

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ABSTRACT

In this article fishery management is used as an excellent case to illustrate the way the confusion between positive economics (the domain that deals with descriptive and predictive aspects) and normative economic (the domain that deals with prescription aspects) may lead to the promotion of policies and regulations that may not benefit the public. The main argument of the article is that the predictive and descriptive contents of economics must not be presumed to necessarily constitute prescriptions. Caution is invoked in importing economic theory to the design of public institutions. It is further argued that not each prediction or description constitutes a social optimality. A critical review is provided of the assumptions and conditions that make profit maximisation in fisheries seem to be an important social goal. The article is divided into five sections: section one discusses the overall theoretical background; section two presents an account of the reason why, from the standpoint of a welfare approach, open access to a commercially valuable fishery tends to lead to economically sub-optimal catch; section three discusses the issue of distribution; section four describes briefly the capability to function approach to social evaluation and the relevance of this approach to fishery management; and section five concludes by reiterating the point made earlier that the predictive and descriptive contents of economics must not be presumed to necessarily constitute prescriptions.

"The ideas of economists and political philosophers, both when they are right and when they are wrong, are more powerful than is commonly understood. Indeed the world is ruled by little else. Practical men, who believe themselves to be quite exempt from any intellectual influence, are usually the slaves of some defunct economist" John Maynard Keynes, 1936.

INTRODUCTION

John Maynard Keynes' statement that practical men who rule the world are enslaved to the intellectual heritage of orthodox economic theory and political philosophy is perhaps a bit exaggerated, but the element of truth to this statement is hard to ignore. The influence of economic theories is visible in a number of public institutions and regulations. Global institutions such as the *World Trade Organization* and national institutions such as the central banks and a range of government policies and regulations draw some measure of inspiration from conventional economic theory. The influence of orthodox economic theory on the design and organisation of public institutions is bound to become even more ubiquitous because of the on-going campaign to promote market-mimicking-governance of public affairs in the belief that even where the market cannot function at all it is still desirable to construct institutions to produce outcomes that would have been produced by the market[1].

Certainly economic theory that has weathered rigorous tests can be useful in the design and running of public institutions. However, the application of economic theory in the design of public policies and institutions is susceptible to three pitfalls. *Firstly*, there is a tendency of confusing the descriptive and predictive contents of economic theory with its prescriptive role. For example, economic models that assume individualistic utility, maximisation have succeeded in predicting economic behaviour. This success, however, does not mean that economic science prescribes individualistic utility maximisation to individuals. Yet there is a tendency of assuming that just because a theory has been successful empirically or analytically, it describes how the economy *ought* to be structured and run.

Secondly a related pitfall of importing economic theory in the design of public institutions and policies is that there is a tendency of assuming that institutions *ought* to comply with economic theory, rather than the other way round. This can be seen in the emphasis that economic science accords the issue of efficiency, which is mistakenly thought to be rather objective and hence scientific, while eschewing issues of equity because such issues are considered subjective and thus unscientific. The structural adjustment policies of the 1980s are examples of the pursuit of efficiency without regard to equity. This is a glaring case of economic science directly imposing values on society rather than adjusting itself to the values of the society it is supposed to serve.

The *third* and last pitfall of employing economic theory in the design of public institutions and policies is that almost every theory is in contention, which leaves some room for economists to pick sides based on ideological preferences. It is, therefore, not easy to differentiate economic policy prescription based on an honest and open minded scientific inquiry from those that are driven purely by the ideology cloaked as a science. An example of ideology taking the upper hand in economics can be seen in the macro-economic interpretations of, and the prescriptions against, recession. In what seems to be a glaring ideological rather than scientific position, Edward Prescott, who is consistently opposed to an activist government, developed a model that, in its caricature, shows unemployment as a deliberate decision by workers to take the time off! This incredible line was mocked by the Nobel laureate economist Krugman (2009), who quipped: "was the Great Depression really the Great Vacation"? Prescott, who is also a Nobel laureate, once remarked that "economists create their own worlds. We are like little gods with our artificial economics wanting to see

what happens" (Knowledge@Wharton, 2004). It should be obvious that such a fantasy world can take any shape, depending on the ideology of the creator.

The aim of this discussion is to argue for more prudence in the use of economic theory in the design of public institutions and policies. In particular, it is argued that economic prescription must take into account social values and goals, and that economic theory should not automatically be presumed to constitute prescription. Even where economic theory predicts what the social goal is, a society should not be ill judged for deviating from this prediction; rather, the theory should be subject to review and revision if society consistently deviates from it. Economics must first and foremost be used as a science for assisting societies achieve their own defined economic goals; economics may be used to clarify and articulate these goals, but it is not the business of economic science to decide for the society what its economic goals ought to be.

FISHERY MANAGEMENT

Economics of fishery management offers an excellent case study through which the thesis of this article can be argued. In particular, this discussion uses the case of the orthodox economic prescription for the optimum catch of fish to highlight the three pitfalls outlined above. This example shows how economic description of the socially optimum catch of fish is automatically taken as the prescription of what public regulation ought to do. Following two seminal papers by Gordon (1954) and Scott (1955), economists have tended to prescribe rent maximisation as the appropriate goal of fishery management. Indeed, in an economy in which all productive resources are fully employed and in which each fishery operates under perfect competition, rent maximisation in a fishery constitutes an efficient level of production. But there is hardly any economy that enjoys full employment of resources and of which its fisheries operate under perfect competition. In any case, efficiency, just like equity, is a value laden concept and thus its ranking within the order of competing priorities must depend on the values held by society.

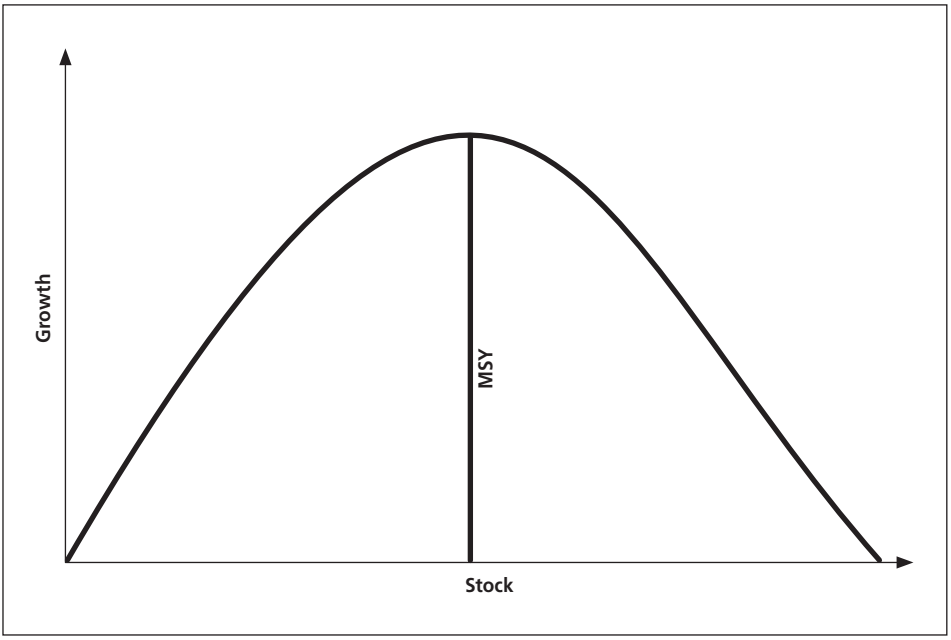
The example of economic optimum catch of fish also exposes the other pitfall discussed above. This example exhibits a case in which policy makers systematically deviate from economic prescription, and economists tend to refuse to take the cue and revise their prescription. As noted by Hannesson (1993) and Emmerson (1980), policy makers have not shown keen interest in pursuing rent maximization in the determination of the catch of fish. The U.S federal government for example ignored the rent maximising goal and introduced the notion of optimum sustainable yield (OSY) as the goal of fishery management in the U.S (Anderson, 1977; Bromley and Bishop, 1977). In fact Bromley and Bishop (1977) point out that no mention of the rent maximisation is even made in connection to the OSY. Copes (1972) has noted that some government administrators are "sceptical of economic theory and are intuitively drawn to the biological criterion of the maximum sustainable (physical) yield" (1972:161). Furthermore, Johnston and Smith (1977) have noted that their experience "suggests that fishery participants would rank efficiency fairly low on an extensive list of socially relevant variables" (1977:893). Yet there is a tendency on the part of economists of wanting policy makers to change fishery regulation in favour of rent-maximising catch. There is a drive of wanting an institutional framework that governs fisheries to comply with the elegant economic model that determines the optimum catch of fish.

The fishery case highlights the last pitfall mentioned above, which is the existence of competing paradigms within the economic science which leaves a room for ideologically driven, rather than scientifically supported, prescription. In particular the approach for evaluating human welfare that has been proposed by Sen (1984, 1985a, 1985b, 1993) which is gaining currency, offers alternative ways of prescribing optimum catch in the fisheries. This approach permits other goals of fishery management apart from the goal of efficiency. Based on this approach a country may wish to maximise the amount of fish consumed by its population for its nutritional values, and thus decide quite deliberately to eschew efficiency in favour of maximising the sustainable catch of fish. Existence of such competing paradigms should remind economists to pay more attention to what a society needs rather than focusing on what the theories they subscribe seem to prescribe.

Open access fishery and the sub-optimal outcome

In order to use the fishery case to illustrate the points made above one needs to delve a little bit into the elegant world of the economic model of optimum catch of fish and lay bare its assumptions and its theoretical basis. The starting point is the relationship between growth of the stock of fish on one hand and the size of the stock on the other. A small stock of fish engenders small growth. As the stock of fish becomes large more reproduction takes place resulting in a large growth. However, there is a limit beyond which an increase in the size of stock would not lead to an increase in the amount by which the stock grows. This is because as the stock of fish grows the feed becomes scarcer, the habitat becomes too crowded and so on; in short the carrying capacity becomes binding. Once this limit is reached, any increase in the stock of fish leads to a decline in the amount by which the stock grows. Figure 1 illustrates this

Figure 1 The Relationship between Stock of Fish and Growth of the Stock



biological phenomenon. The inverted u-shaped curve shows the amount by which the stock of fish grows at various stock levels. This is a particular case of logistic growth rate of a fish stock as explained by Schaefer (1954) and Schaefer (1957).

In principle, if the amount of fish that is caught at any given period of time equals the amount by which the stock of fish grows in that period of time, it would be possible to continue to catch this amount *ad infinitum*. Thus the sustainable catch of fish is the catch that involves the amount by which the stock of fish grows. If the catch of fish at any given period of time exceeds the growth of fish stock, the stock of fish would eventually decline, and this would lead to a decline in the sustainable catch. If the catch of fish continuously exceeds the growth of fish, the fishery may collapse, in the sense that the stock of fish may be reduced to a level that robs it of its viability as a biological entity. Examples of fisheries that have collapsed abounds.

Production of fish is therefore quite peculiar. When the stock of fish is small, it pays to defer fishing so as to allow the stock of fish to grow. Left alone, such a small stock of fish would lead to an increase in the growth of the stock. At some point the growing stock of fish generate the maximum possible growth rate of fish. If the stock is left to grow beyond the level that generates maximum growth rate, the growth rate would progressively decline. At some point the stock of fish becomes too large as to generate zero growth. This biological fact is used in formulating an economic model of fishery.

Economics predicts that a commercially valuable and open access fishery would be over-fished and may even collapse. The terms are defined forthwith. Open access resource is a resource that can be accessed by anybody without restriction. Open skies is an obvious example; nobody is restricted from gazing at the stars. Most fisheries have some nominal restrictions such as licensing, but in effect these regulations do not deny access to any citizen. Such fisheries can be treated as open access resource. The term over-fishing in economics refers to the level of catch that fails to maximise resource rent. When a fishery is over-fished to the extent that the amount of resource rent is zero, it is said that rent has been dissipated.

Figure 2 serves to illustrate a simple static case of fishery exploitation and serves to explain why an open access fishery would lead to rent dissipation. This figure also explains the assumptions upon which the social optimality of rent maximisation is predicated. The inverted U-shaped curve in the upper panel of Figure 2 is the fishery yield curve. The yield curve is based on two key assumptions. First, it is assumed that the catch of fish is sustainable, that is, the amount of fish that is harvested at any given period of time is equal to the amount of growth of the fish stock. Thus, one can simply replace the term growth with catch in Figure 1 above. The yield curve is expressed in terms of the value of the catch, rather than the weight of the catch. This is done by multiplying the price of fish by the amount of catch. It is however assumed that the price of fish remains constant irrespective of the level of catch. The price of fish would be constant only if the fishery is too small to influence the market price thus, one must assume that there are a large number of other fisheries and they operate under perfect competition such that not a single fishery can influence the price of fish in the market. In fact this is the assumption that Gordon (1954) made in his seminal work that showed that rent maximisation in the fishery produces a socially optimal level of catch. Further, a trivial and innocuous assumption is made to the effect that the price of fish is the unit. This simply re-calibrates the yield curve such that the quantity of catch is the same as the value of catch.

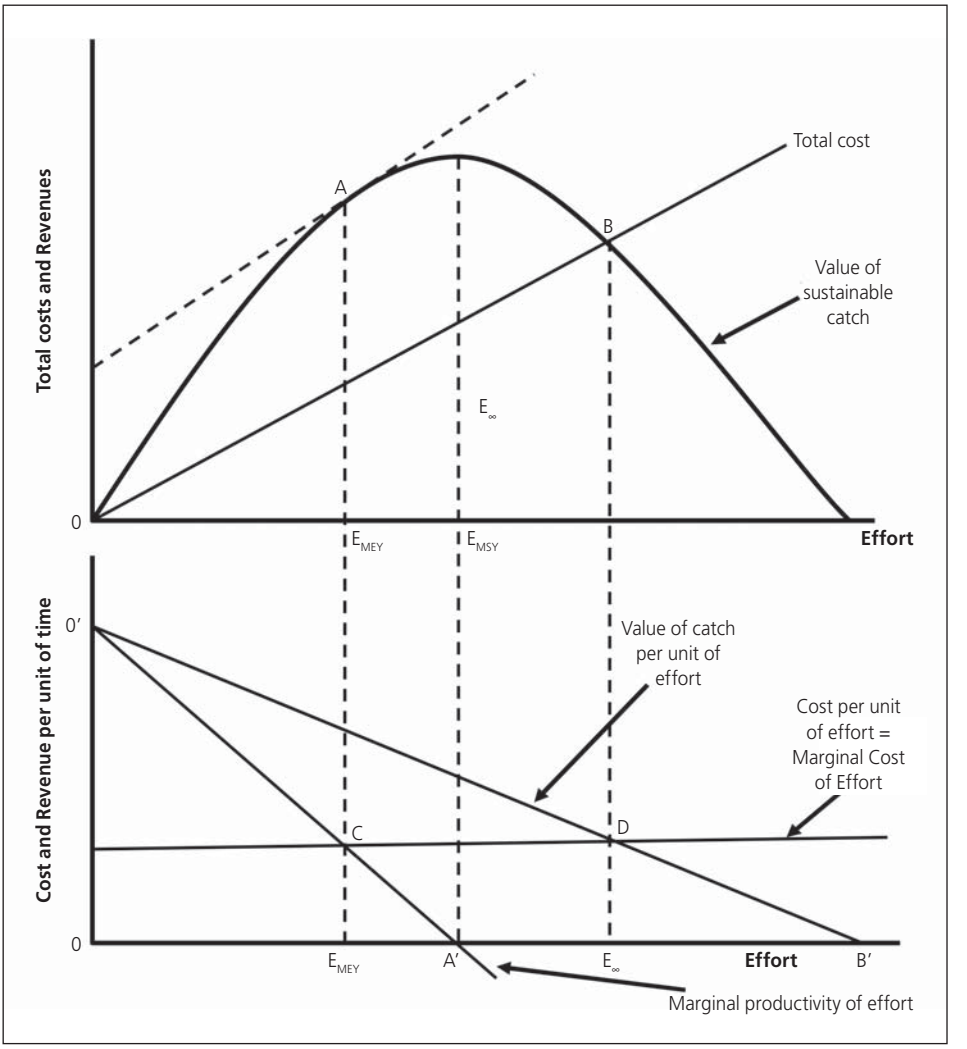
Given the assumption above, the upper panel of Figure 2 gives a yield curve as a revenue function. This curve is identical to the growth curve in Figure 1 except that the horizontal axis now represents fishing effort (an index of an omnibus of inputs such as labour time that is deployed into the fishery) rather than fishing stock. The stock of fish is at its maximum when fishing effort is at zero. The stock completely collapses when fishing effort is at the point where the horizontal line that represents effort intersects the yield curve. It is assumed that fisheries *tend* towards equilibrium, in the sense that catch tends to be equal to growth (see for example Schaefer (1954, 1957), Vincent *et al.,* (1997), Hannesson (1978, 1993) or Mkenda (2001) for more details on the equilibrium assumption). Thus the yield curve is a sustainable yield curve. There are two points to note here. *Firstly,* occasionally, catch can exceed growth, which pushes sustainable catch to a declining sustainable catch. The tendency for catch to exceed growth would ultimately lead to the collapse of the fishery.

The *second* point is that sustainability in itself is not necessarily socially optimal. As the yield curve indicates, sustainable catch can give the maximum amount of fish when effort is at E_{MSY}, but it can also give very little catch at the extreme ends of the fishing effort. The society obviously would not just want to fish at a sustainable level; it would want to ensure that the welfare of the society is maximised. For sometimes, biologists have been recommending that fisheries be regulated to ensure that fishing effort is at the level where the maximum amount of fish is caught, a level of catch that is referred to as the *Maximum Sustainable Yield* (MSY). This must seem sensible because the object of fishing is to catch fish, and the more one can catch sustainably the better. But following Gordon (1954) and Scott (1955), economists have insisted that social optimality must take into account the cost and the benefits of fishing, and that in a static case, the net social benefit is maximised only where rent is maximised. Reference will again be made to this, but meanwhile it is showed why, left alone, a commercially valuable fishery would not operate at either the MSY or rent maximised catch.

A fisherman makes a decision to fish simply based on his own costs and benefits. However, a decision to fish affects other fishermen, because a catch by one fisherman lead to less catch by other fishermen. If it is assumed, rather innocuously, that fishermen are homogenous in terms of their productivity, a situation develops where what an individual fisherman perceives to be a marginal product of fishing is, from the point of view of the whole fishery, actually the average product of fishing effort (called the value of catch per unit of effort in the lower panel of Figure 2). Thus while individual fishermen act rationally by deploying fishing effort up to the point where marginal cost and the own value of marginal product are equated, the collective outcome of this is irrational in that the whole fishery operates at a point where marginal cost is equated to the value of the average product.

It is worth remembering that costs in economics refer to opportunity costs, that is, it is what is foregone in the best alternative engagement to be able to support the current production. Marginal cost in the fishery is, therefore, the output in the other best alternative sector that is foregone by engaging the last unit of fishing effort in the fishery. The value of average product is actually the average benefit. It is known that the average benefit (referred to as marginal productivity of effort in Figure 2) is greater than marginal benefit, as shown in the lower panel of Figure 2. When marginal cost is equated to average benefit, rather than the marginal benefit, it means that the last fishing effort taken from the best alternative sector produces less value in the fishery than it would have produced in the alternative sector. This constitutes a loss to the society in the sense that the economy is not maximising values of all outputs.

Figure 2 Sustainable Yield and Optimum Catch



Another way of looking at this is through the upper panel of Figure 2. In this panel, an open access level of fishing is at the point where total cost is equal to total revenue. This point is attained at B in the upper panel of Figure 2, where the value of sustainable catch is equal to the total cost. This point, which is referred to as an *Open Access Equilibrium*, is sub-optimal because it neither maximises the quantity of fish nor does it maximise rent or profit from the fishery. The maximum catch of fish is only attained if fishing effort is at $E_{MSY.}$ Thus, rent maximisation catch is only attained when effort is at $E_{MEY.}$ At this point, there is the maximum distance between the total cost line and the value of sustainable catch curve. Rent maximisation is the same as maximising profit from the fishery. At this point, where the dotted line that is parallel to the total cost curve is tangent to the value of sustainable catch, the amount of catch of fish is considered socially optimum, and this is attested by the intersection of the value of marginal productivity of fishing effort curve to the marginal cost in the lower panel. It is

important to note that this optimum catch of fish, also referred to as the Maximum Economic Yield (MEY), generates less fish than the Maximum Sustainable Yield.

If there is no regulation limiting the catch of fish, the fishing effort would expand up to point E∞ which is characterized by the equality of the total fishing cost to the value of sustainable catch. This sub-optimal outcome is caused by the fact that individual fishermen make rational decisions to maximise individual profit which turns out to be collectively irrational in the sense that the fishery profit is not actually maximised. This point, also called an *Open Access Equilibrium* maximises neither total catch of fish nor resource rent from the fishery. If the price of fish goes up sufficiently fishing effort would expand until the whole fishery industry collapses.

There are therefore two reasons why public regulation is required in the management of fisheries. *Firstly,* it is because there is an imminent danger of the fishery to collapse if it is left unregulated. *Secondly* it is because *Open Access Equilibrium* does not seem to engender social optimality. It is not easy to locate the point that would constitute social optimality. Neoclassical economics describes rent maximization as constituting an optimal goal of fishery management. The rent maximising catch tend to be lower than the maximum amount of fish that can be harvested in a sustainable way. Put differently, economics seem to identify profit maximisation in the fishery as a superior goal rather than maximising the amount of fish that is harvested and made available for consumption. The basis of this position taken by orthodox economic science is dealt with in the next section.

The model discussed above is static. However, if one allows a dynamic model and introduces discounting, it turns out that the socially optimum catch of fish is even less than the E_{MEY} shown above. In other words, economics prescribes the catch of fish that is less than the maximum possible catch, a fact that is invariant to whether the analysis is static or dynamic.

Socially optimum catch: assumptions of orthodoxy Economics

Orthodox economics shows that regulating fisheries to ensure maximisation of resource rent is socially desirable. This is a descriptive aspect and must not be taken to automatically constitute prescription. What the model above describes is the goal that a society would prefer to pursue for its fishery if the underlying assumptions of the model hold. As will be explained, this description ignores the issue of equity and focuses only on the issue of efficiency. In fact, one of the seminal paper on this subject is titled *The Fishery: The Objectives of Sole Ownership* and shows that assigning the ownership of the whole fishery industry to one individual would ensure efficiency in the fishery (Scott 1955). As a prediction of what would happen under sole ownership this is fine, but it becomes rather problematic when one turns it into a prescription. Similarly, there is no basis for prescribing rent-maximisation to the fishery unless that is indeed the goal that the society aspires to achieve. Other societies may put more premium on some alternative goal such as the maximisation of the quantity of fish caught, or the promotion of equity.

Nevertheless, economists, and now even some biologists, have taken to prescribing rent maximisation as the goal of fishery management. The elegant model described above and illustrated by Figure 2 may seem to make a compelling case for considering rent maximisation in the fishery as an optimum goal of fishery management. However, it is important to review

the assumptions that form the basis of this model; some of these assumptions are rather heroic and if one relaxes them, the prediction of the model collapses.

The central assumption of the fishery model described above is that there are many fisheries in the economy such that each single fishery is a price taker. This assumption was explicit in Gordon (1954) but is hardly referred to explicitly nowadays. This assumption makes it possible to draw the elegant yield curve in Figure 2, without which the analysis would have floundered. More importantly, this assumption is central in designating costs and benefits as social values. It must be remembered that rent maximisation is actually the maximisation of collective profit in the fisheries. Maximisation of profit becomes a socially desirable goal only if the economy is operating in a perfectly competitive mode, in which case prices constitute social evaluation of benefits of products and costs constitute the costs to the economy of producing products. It is on the basis of this assumption that Scott (1955) actually showed that introducing sole ownership of fisheries would be socially desirable.

It is difficult to find a fishery that operates as a price taker in the market, meaning that the price of fish is not influenced by the amount of fish the fishery produces. Once this assumption is removed, it makes no sense to argue that a society would prefer rent maximisation as the goal of fishery management.

Another assumption that underlies the fishery model above is that of full employment – it is assumed that the economy fully employs all productive resources. If there is unemployment, and in particular if fishermen have hardly any alternative employment opportunity, the labour cost of fishing would be zero, and since the cost of labour constitutes the largest component of cost in artisan fisheries, then the cost of fishing would be close to zero. If the cost is close to zero, the total cost curve in Figure 2 would be horizontal and close to the horizontal axis that depicts fishing effort. In that case the economically optimum catch would be very close to the biological *Maximum Sustainable Yield*. This perhaps explains why policy makers tend to be attracted to the *Maximum Sustainable Yield* rather than to the rent maximising catch. In any case, since economics as a science must first describe and predict and only use these descriptions and predictions for prescription, whenever the description or prediction of economics departs from what is observed, the description and prediction must be subject to revision. As cited in the introduction of this paper, there is evidence that policy makers are wary of the economic description of rent maximisation as the socially desirable goal of fishery management. Economists should not force societies to comply with their models; the models should be revised to comply with the reality.

The model above draws from neoclassical economics where utility is the metric of welfare. Reliance on utility as an exclusive metric of welfare has received a devastating criticism from the Nobel winning economist, Amartya Sen (1984, 1985a, 1985b, 1988, 1993). Sen proposed the use of *Capability to Functioning* approach in evaluating human welfare. Under the *Capability to Functioning* approach it is possible to focus on the nutritional needs of the population in the formulation of public regulation of fisheries, and hence one can actually recommend the *Maximum Sustainable Yield* as the goal of fishery management just to increase the quantity of fish caught and thus ensure maximum intake of fish by the population. This approach is gaining currency and has been very influential in introducing the *Human Development Approach* by the UNDP as an approach for evaluating human welfare. The neo-classical economics focuses only on regulating fisheries to ensure efficiency – that is, to ensure maximum output in the entire economy based on utility-based evaluation

of the output by the individuals in the economy. This approach has tended to recommend restricting the catch of fish in order to maximise profit, rather than regulating the fishery to maximise the sustainable amount of fish caught. No wonder, Emmerson (1980) considered the rent maximising goal as a step backward from the E_{MSY} goal as "it moves fisheries science further away from the nutritional needs of consumers" (Emmerson, 1980:17).

The fact that there now exists an alternative economic paradigm which is gaining currency and which permits more information to be used in the evaluation of human welfare that may include a focus on the maximisation of the quantity of fish, rather than the maximisation of resource rent, should make economists re-evaluate the focus on rent maximisation. While economists may continue to debate these paradigms, economic prescriptions would be more valuable by drawing normative contents directly from the society, rather than from the contested paradigms.

Economics and Policy Prescription

There is no doubt that economic science is a useful tool for prescribing policy and informing regulation and the design of public institutions. However, the main role of economics is to describe and predict. On the basis of these descriptions and predictions, prescriptions can be formulated. Prescription is within the realm of ethics. Thus, unlike description and prediction, one cannot appeal to empirical evidence or to the strength of analytics to sort out differences that may arise in prescribing policy. Ethics is rather complex to handle particularly in economics in which there is a thrust towards description and prediction. Unfortunately there is a tendency of confusing prescription on the one hand with description and prediction on the other. For example, while economic science describes rent maximisation as a goal that would be socially desirable because it promotes efficiency in the fishery, it does not follow that economic science actually prescribes rent maximisation. What is more, the fact that policy makers have tended to eschew rent maximisation as the goal of fishery management should have alerted economists to revise this description. After all, positive economics, which is the part of economics that deals with predictions and descriptions, must rely on facts to validate itself.

There is hardly any difference between prescribing efficiency from prescribing equity, apart from the fact that within economics there is a view that consensus is easier to muster with regard to prescribing efficiency than to prescribing equity. Both efficiency and equity are recommended through welfare economics. Welfare economics evolved specifically as a discipline within economics that outlines some explicit ethical criteria upon which desirability of one policy against another can be established (Boadway and Bruce, 1984). Since welfare economics is a normative science rather than a positive science, there is no recourse to facts that can assist in sorting out disagreement on ranking different policies or states. Recourse, however, is sought in a set of value judgements that seems to command reasonable consensus. As Boadway and Bruce (1984:2) noted, "... some value judgements might, in fact, command widespread support, and ranking based on them might therefore legitimately form the basis for actual policy prescriptions. The use of welfare economics for policy purpose is, we would argue, based on this premise. Much of welfare economic analysis underlying policy prescriptions is based on a certain set of value judgements which are widely accepted among economists, including ourselves". This is an interesting

observation because in making a policy prescription it is tempting to be bolstered by a false sense of being value-free, and thus *objective*.

Since the legitimacy of ethical criteria underlining the welfare economics is presumed to reside in its wide spread acceptance, it follows that the weaker and fewer the ethical criteria are, the better. The stronger the value judgement imposed the more likely it is that the consensus will become elusive. Two of the most widely applied ethical criteria are individualism and the Pareto principle. Individualism means that any ranking of different states ought to be based on individual preferences only. It is assumed that the only information necessary for mapping individual preferences is the utility the individual derives in a given state. Restricting the relevant information for ranking states to the space of individual utilities is called welfarism (Sen, 1977).

In a crude, but more intuitive way, the Pareto principle implies that any re-allocation of resources that results in more goods and services is preferable, provided that the gain from such re-allocation is more than enough for potentially compensating those who may lose in the process. It has been proved that under some mild assumptions, perfect competitive economy is Pareto optimal. Pareto optimum is attained only when no re-allocation would lead to higher welfare, including generating sufficient potential for compensating those who would lose through such reallocation. Efficiency is defined by Pareto's optimality. However, imperfect competition, incomplete market, asymmetric information and externality in general lead to inefficiency in that Pareto optimality can not be obtained. Thus Myles (1995:355) noted that "it is on this basis that economic policy is usually suggested as necessary in the presence of imperfect competition in order to reduce inefficiency". Thus, economic policy has tended to focus on the promotion of efficiency as a way of pushing the economy towards perfect competition. Indeed, even the prescription of rent maximisation in the fisheries is a prescription for efficiency.

Since the prescription for efficiency is based on the consensus on the part of economists, it is actually rather heroic on the part of economists to think that each society *should* automatically place efficiency at the top of its priorities. Certainly some other societies would rank equity or solidarity or something else above efficiency. It is important therefore that economists seek to uncover the order of priority of any society and use such information together with economic science to formulate the best approach for attaining the socially desired goals. In terms of fishery management, it is important that the goal of the society is identified first and economic science is brought to assist how to attain this goal.

CONCLUSION: A CALL FOR PRUDENCE

This article has used the case of fishery management to make some general points regarding the role of economic science in the design of regulations and other public institutions. The central point of this argument is that the descriptive and predictive roles of economics should not be automatically deemed to constitute prescription. In the case of fisheries economists have tended to consider efficiency, which is attained through rent maximization, as being the goal that societies would wish to pursue. This prediction has not been very successful as policy makers have tended to rank efficiency rather low in the order of priorities of fishery management. It is argued that such a predictive failure should necessitate a revision of the economic model. However, there is an unfortunate tendency of considering descriptive

and predictive roles of economics as automatically constituting prescription and therefore insisting that policy makers revise their order of priorities to conform to what economic science describe or predict. It was further argued that there is at least one new economic paradigm that is gaining currency and which encourages more information to be used in assessing human welfare. This new paradigm that is being championed by Amartya Sen, the Nobel winning economist, may permit within its framework non-utility goals such as the promotion of nutrition in the fishery management. Existence of competing on economic paradigms should have a sobering effect to economists and instilling more prudence in assisting policy makers design policies and public institutions.

The case of fishery management used, offers an example of market failure. Market forces alone fail to guarantee sustainability of commercially valuable fisheries and even where sustainability is achieved (at the open access equilibrium) it fails to generate socially optimum catch of fish. Existence of these market failures necessitates public interventions. Economists have tended to argue that promotion of efficiency is a more *objective* goal of correcting market failure than the promotion of equity, which is considered rather *subjective*. It is argued in this article that both efficiency and equity are ethical issues – they are both *subjective*. Rather than relying on the consensus of economists to decide what constitutes appropriate social goals, it is argued here that economists obtain such social goals from the priorities determined by the societies themselves. Some societies would put more premium on equity while others would prefer efficiency. It is not for the economists to decide on these matters *a priori*. For example, Scandinavians tend to put more weight on issues of equity and social solidarity than the Anglo-Saxons. Economists must respect rather than try to change such heterogeneity of values across countries.

Economics is useful in designing various regulations and public policies. Issues such as fishery management, health care, education, finance require economic science for descriptive and predictive insights. Economics however must not be used for imposing values. Societies must have mechanisms for establishing priorities based on their own values. Economics can only take such priorities and values into account.

ENDNOTE

1 An example of market mimicking governance is the market-based policy instruments for environmental management where for example market failure to curb pollution is solved by introducing marketable permits to pollute.

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