

**Transformation of the Coastal Commons Through
Cooperative Fishing Arrangements**

by

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Abstract

For centuries the world's oceans have been regarded as the common heritage of humankind. When the demands of the human community upon the oceans were relatively few, this philosophical canon was probably not unreasonable. But the burgeoning of human populations and the accelerated growth of technology have conspired, in the latter decades of the twentieth century, to make the concept of a *common property interest in the oceans* functionally obsolete.

In response to economic and political pressures to transform the ocean commons, many coastal nations have unilaterally extended economic jurisdiction over waters adjacent to their coast lines, traditionally regarded as "open ocean". Exploitation of living marine resources, particularly control and management of commercial fisheries, has been the principal focus (although petroleum production, minerals mining, etc., have also been important considerations).

While *extended jurisdiction* has characterized most of the world's marine fisheries since the mid- to late-1970's, it is evident that nations continue to seek their comparative advantage position in marine fisheries. In so doing, they sample from an increasingly complex variety of production and trade arrangements.

In studying these "trade" patterns, and the resulting resource allocation, analysts should distinguish between the terms of agreements between partners operating in isolation and those that result when there are many potential partners. Competitive conditions on both sides of the market for access to resources may reduce the magnitude of potential asymmetric information, a problem some have identified as fundamental to the stability of cooperative fishing agreements. They may also serve to unite "buyers" and "sellers" who share a common expectation about exploitation/conservation of the resource, i.e., those that share similar rates of time preference. Indeed, as the number of potential partners rises, instability and conflict within cooperative fishing arrangements may decline, smoothing the transition of the "commons" to a "quasi-privatized" resource management state. The emergence of a *market for access* may enhance the possibility of rational utilization of the newly redistributed wealth of world's oceans.

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This paper examines factors influencing the evolution of patterns of exploitation of the world's oceans. It focuses on issues surrounding the utilization of living marine resources, and how *trade* has effected... and been affected by... institutional changes in the way the international community regards *ownership* of, and *access* to, these resources.

Traditionally, the world's oceans have been regarded as a great "*commons*", collectively an asset of the community of mankind. Exploitation of the resource wealth of the oceans fell to those with the technological means and commercial desire to do so, on a first come - first served basis. Freedom of fishing on the high seas, for example, has long been recognized in international laws and treaties. As late as 1958, freedom of fishing was set forth as a basic ocean freedom in the United Nations Geneva *Conference on the High Seas* (TIAS 5969 & TIAS 5578, 1958).

Until very recently, acceptance of the world's oceans as a *common property*² resource was, in large part, a reflection of the limits of technology, e.g., the technology to monitor, or the technology to enforce, beyond a limited coastal fringe. Indeed, even into the mid-twentieth century, most coastal nations claimed sovereign control over no more than three nautical miles seaward of their coastlines. In a few cases, and for a small number of uses, e.g., fisheries, that limit was declared to twelve miles.³ With few exceptions, these jurisdictional limits were adequate, as demands on the resource base were small relative to the standing stocks.

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² The term *Common Property* is used here in the context of a single community of humankind. In this sense, at least, common property and open access may be regarded as interchangeable terms.

³ Article 24 of the Convention on the Territorial Sea, provided that a coastal State could proclaim a "contiguous zone", i.e., a part of the high seas contiguous to a nation's territorial sea, but that zone may not extend beyond twelve miles from the baseline from which the territorial sea is measured (Committee on Commerce, U.S. Senate, *Treaties and Other International Agreements on Fisheries, Oceanographic Resources, and Wildlife to Which the United States is Party*, Government Printing Office, December 31, 1974).

Within this institutional environment, large, sophisticated, industrialized fisheries emerged, in many cases targeting "high volume - relatively low unit value" species. Several of the most prominent examples included fisheries for Alaska pollock (*Theragra chalcogramma*) in the North Pacific and Bering Sea, cod (*Gadus morhua*) fisheries of the North Atlantic, pilchard (*Sardinops sagax*) fisheries off the west coast of South America, and hake (*Merluccius* spp.) fisheries in the southern Atlantic.

In the post-World War II era, these great ocean fisheries were dominated by *global distant water* operations from Japan, the Soviet Union, Norway, and South Korea, among others. For the most part, many nations with very extensive adjacent continental shelves were not a major participant in these industrialized high seas fisheries, despite the fact that some of the richest fishing grounds in the world are to be found on these shelves. The United States is a prime example. With perhaps the exception of large scale "high seas" fisheries for tunas, the United States was not an active participant in the major distant water fisheries of the world.

At the same time, the United States consistently ranked at or near the top of the list of seafood importing nations, much of that being groundfish products. But U.S. commercial fisheries have tended to target high value species like salmon, halibut, clams, shrimp, lobster, and a number of crab species.

Even when the U.S. industry did target "groundfish", they tended to do so on a much smaller scale, supplying local fresh-markets, again primarily with the relatively premium species and product forms, e.g., haddock, lingcod, halibut; fresh or IQF fillets. As for large-scale participation by U.S. fishermen in groundfish harvests, of the sort engaged in by the *distant water* foreign fleets, the only significant example was the industrial fishery for Atlantic menhaden.⁴

But over roughly the last one and one-half to two decades, the international institutional environment which had supported the development and maintenance of the global distant water fleets changed in a fundamental way; and with it, seafood trading patterns, as the world had come to understand them. Whether undertaken "unilaterally"⁵, as was the case for some of the earliest proponents, or in connection with the United Nations Law of the Sea initiatives, *extended jurisdiction* over adjacent continental shelf resources, became the rule rather than the exception in the 1970's. That is, within the span of a decade or less, most of the world's living marine

⁴ Large-scale U.S. commercial fisheries for menhaden, off the south Atlantic and Gulf coasts of the United States, were a very important exception to this general rule, producing landings on the order of 2 billion pounds, annually. However, approximately 98 percent of these harvests are converted into industrial oils, meals, and solubles. Small quantities are used for bait and canned pet food, but menhaden is not utilized as a food fish for human consumption.

⁵ By late-1976, over forty nations had already extended their fishery jurisdiction beyond 12 miles, according to U.S. Congressional testimony given in connection with the debate over the Magnuson Fisheries Conservation and Management Act of 1976. For example, despite official U.S. objections, nearly every Latin American country off whose shores tuna is caught had staked a claim to a full 200-mile fishing zone by the mid-1970's.

resources, which heretofore had been regarded as held in "*common*", came under the exclusive jurisdictional control of adjacent coastal nations.

By the mid- to late-1970's, *extended economic jurisdiction* had the effect of, at least potentially, excluding industrialized distant water fleets from many of their traditional sources of raw material. As suggested, this profoundly changed the economic and political balance, forcing distant water fleets to *compete at the bargaining table*, rather than on the fishing grounds, for a share of the harvestable resource. Extended jurisdiction effectively transferred immense wealth from the "*commons*", to the coastal nations.

It is true that some of the traditional distant water fishing nations secured exclusive control over their own coastal waters for the first time. However, these "gains" were offset many times over by the loss of access to the extended fishery zones of other newly endowed nations. In effect, following extension of jurisdiction, unless distant water fleets could demonstrate to the coastal nation that there was some *mutual* benefit to be gained from their joint participation in exploiting the fish resource, the distant water fleet was effectively excluded from its traditional operating areas, and its supply of raw material.

Because most distant water fishing nations were also dominant seafood export traders, these institutional changes had a destabilizing affect on significant segments of world's seafood trading network. Indeed, many seafood trading relationships were radically altered as a direct result of extended jurisdiction (Sproul and Queirolo, 1994).

The sweeping institutional changes which made fishery resource access problematic for the traditional distant water operators, placed in jeopardy literally billions of dollars of capital assets. As suggested, distant water harvesting capacity became surplus, processing and reprocessing capacity was underutilized, and marketing and distribution systems established and sustained under open access were threatened. This "*reversal-of-fortune*" was, in the scheme of things, relatively sudden (see, for example, the figure on Groundfish Catch in U.S. EEZ Off Alaska).

Significantly, at the point in time when extended jurisdiction and the transition of the ocean "*commons*" to quasi-privatized management became the norm, most of the coastal nations laying ownership claim did not have either the fishing capacity or the industrial experience in their domestic fishing sectors to fully exploit their new-found resource wealth. They also, in many cases, lacked technical knowledge, ranging from stock assessment and population dynamics information about their own resource base, to product development and market access considerations. Thus, *cooperative fishing agreements* (cfa) offered new opportunities for both potential partners to identify and exploit their respective comparative advantage within the new institutional context (Munro, 1985).⁶

⁶ As noted, by the mid-1970's, nearly every Latin American country off whose shores tuna are caught had declared a 200-mile exclusive fisheries zone. In the debate leading up to the passage of the U.S. Magnuson Fishery Conservation and Management Act of 1976, one compelling argument in favor of the U.S. adopting a 200-mile fishing zone was that, "...*passage of the (extended fisheries jurisdiction) bill may serve to relieve tensions between*

With the advent of cfa's, resource managers and policy-makers have raised questions about the nature and dynamics of these relationships. For example, what factors influence the probable form, duration, and success of such arrangements? Indeed, cooperative fishing agreements have become the focus of some debate within the fishery economics profession. Specifically, *could the variety of forms of cfa's, observed in the years immediately following widespread extended jurisdiction, persist? Would individual cfa's be short-lived and transitional, or could they be sustained over an indefinite period of time?*

In examining the development and evolution of these cooperative fishing arrangements, research has been directed primarily at the economics of bilateral agreements, or on the short run behavior of the respective cooperating partners (see, for example, Clarke and Munro; Kaczynski; Kerr and Sharp; Johnston and Wilson; Anderson and Sutinen). Little attention has been paid to the reaction (and role) of other, potentially competing, coastal and distant water nations.

But this approach stops short of examining the intermediate and long run implication of joint-venture cooperative arrangements for, 1) the coastal nation, 2) its distant water partner(s), 3) the extended community of *suppliers* and *demanders* of access, and 4) the fishery resource itself. As each party acquires experience and information from the cooperative venture⁷, short run adjustments are made, both by the parties themselves and by the broader community of coastal nations and distant water fleets. These latter groups represent potential competitors, whether supplying *access* or *expertise*, and may influence the form and stability of future cooperative arrangements.

What emerges, we have argued (Queirolo and Johnston, 1990), is a market for access, created precisely because of the widespread movement away from *common property* rules of exploitation of the resource, towards *private property* rights.

In the present paper we propose that the presence of competing buyers and sellers of access eliminates Pareto relevant externalities and, in so doing, removes the need to design complex contractual, monitoring, and policing arrangements, the mainstay of many earlier examinations of cfa's, e.g., Clarke and Munro 1990. We do not suggest that the market for access is "perfectly competitive", but rather, by considering what the access market would look like if it were, analysts can better understand actual arrangements by focusing on the nature of and the reasons for deviation from the competitive model.

these countries and the United States, thereby opening the way to reasonable access agreements for our fishermen..." (Memorandum to the Senate Foreign Relations Committee concerning S.961, The Magnuson Marine Fisheries Conservation and Management Act, November 21, 1975).

⁷ Information may not accrue to the two parties symmetrically, however. Because information may be employed to the advantage of one party and at the expense of the other, in such a situation the asymmetry of information is an issue deserving of further consideration within the cfa context. Its detailed treatment in the context of multiple buyers and sellers is, however, beyond the scope of the current paper.

In the presence of *extended jurisdiction* (EJ) conditions and a market for access with a number of buyers and suppliers, one would expect the forces behind the neoclassical model of perfect competition to prevail, although perhaps not without imperfections and characteristic "market failures" in some aspects. If, 1) access rights were negotiable over time, perhaps, for example, auctioned off to the highest bidder; 2) transactions costs were minimal, owing to the forces of the marketplace; and 3) there were numerous buyers (distant water fleets and some fleets from adjacent coastal countries) and sellers (coastal nations), competitive efficiencies should emerge and sustain, even in the face of changing economic conditions. That is, we would expect to see the rents-dissipating "race-for-fish" on the fishing grounds, associated with open access conditions (or here characterized as "*commons*" management) replaced by competition at the negotiating table, or in the EJ access marketplace: a clear step towards economic rationalization of the fishery.

If our argument is correct, this means discussion can focus on the characteristics of that process and on the conditions that might limit its applicability. It is also important, within the cfa context, to distinguish between resource use and the distribution of income generated by that use. There is debate within the fishery management community, as well as the economics profession, over the need for, and extent of, enforcement and monitoring under EJ cooperative arrangements to ensure that the fishery resources of the coastal country are efficiently managed by the contracted distant water operator.

Consider the following hypothetical case. Assume, for the sake of argument, that the contracting distant water fleet was given sole access, for an indefinite period, to the coastal nation's fishery resource. In essence, this is equivalent to transference of *quasi-property interest* in the resource from the coastal nation to the distant water fleet. Assume further that the two partners discount the future at the same rate. The distant water fleet would, in this situation and under competition, have an economic incentive to harvest at the **same** rate as would the coastal nation, assuming the latter was simply "hiring" the physical capacity to fish.

This congruence of exploitation rates will emerge under a variety of contractual arrangements, e.g., a division of rents, lump sum payments (Cheung; Clarke and Munro). Therefore, in this situation, the only enforcement required would be by the distant water fleet, monitoring the performance of its own fishermen (i.e., self-policing). Of course, both parties would have an incentive to guard against potential third-party interlopers, to precluding a return to pre-EJ "*common*" exploitation patterns.

Among the most important characteristics of the arrangement which produces this result is the assumption of *indefinite access* to the resource. Because of the temporary conference of access (essentially transference of quasi-property interest in the resource), consideration of the implications of *contract duration* becomes relevant to an understanding of the nature and stability of the cooperative joint-venture arrangement under EJ.

Only when the contractual agreement is of sufficient duration to impart an effective "property interest" in the resource, will the distant water fleet find its optimal rate of exploitation to be

equal to that of the coastal nation. Absent such assurance of access, the property interest of the contracting fleet is so reduced that it will always seek to accelerate the harvest to the point of economic biological overfishing.

In practice, even with intensive monitoring and restrictive enforcement, the nearer the potential termination of the assured access, the greater the incentive to abandon cost minimizing and conservation maximizing practices, in favor of accelerated extraction of the target species. The combined costs of the necessary monitoring and enforcement programs, the inefficient use of productive inputs, and waste of fishery resources under these circumstances, results in the dissipation of the potential rents (both short and long term) which could have been realized from a stable, equilibrium solution.

In effect, provision of short term access, with the probability of imminent exclusion, results in behavior, on the part of the contracted fleet, which approximates that of open access. That is, because there is no long term "property interest" in stewarding the resource on the part of the distant water harvester, conservation of the biological resource base is economically irrational.

The stewardship of the marine resource base and the sustainability of the rents-stream from its exploitation, depends upon stable cfa's. Stable cfa's, in turn, depend upon three principal elements. The first of these elements is *competition for access*, reflecting the neoclassical competitive context, including consideration of the asymmetric information problem.

The second element is *contract duration*, which as just noted, effectively reflects the respective rates of time preference (discount rates) among potential cfa partners. The role that the respective rates of time preference of the two cfa partners play in the pattern of exploitation or stewardship of the resource stock is a complex one. Kaczynski, for example, made the intriguing observation that joint-ventures between well developed, economically stable distant water partner nations and newly endowed third-world nations could actually produce a degree of resource conservation and developmental stability which the third-world nation would not have likely attained on its own. We extrapolate from this to observe that, in this way, the cfa partnership might be seen to ameliorate tendencies of poorer, less developed resource owners to convert their natural resource based assets into capital assets, to their longer-term disadvantage. The developed partner may have the economic and political luxury of taking a longer-term view of development and exploitation and may, by rents transfer or technology and market sharing, facilitate the economic growth of the third-world partner, while simultaneously stewarding the resource stock. By pairing these two partners, with distinctly different "exploitation" objectives, both interests may be served.

The competitive market for access may bring together demanders and suppliers of access with very similar rates of time preference.⁸ In this case, the pattern of exploitation of the fish stocks

⁸ Assume that the sole owner's objective is the maximization of the total discounted net revenues derived from exploitation of the fishery resource. The objective may be expressed as: $R^*(\alpha) = \max \int_0^{\infty} e^{-\alpha t} [p - c(x(t))] h(t) dt$, subject to: $dx/dt = F(x) - h(t)$, $x(0) = x_0$, where $\alpha' = (p, \delta, x_0)$, $x(t)$ is the biomass level of the fishery resource, $h(t)$ is

should be approximately *optimal*⁹, from the perspective of each party. This may not, however, necessarily result in the long-term conservation of the resource. For example, the market may bring together two parties which share very high effective rates of time preference, with respect to exploitation of the fish stock in question. Under these circumstances, a pattern of exploitation which might be regarded as "destructive overfishing", by others with lower discount rate, may emerge. The outcome may, nonetheless, be rational and economically efficient, from the perspective of the cfa partners. The question then becomes, is there a greater "common" interest in conserving the stock, and an institutional means to achieve it? While beyond the scope of this paper, these questions do present an interesting challenge for future research.

Finally, stable cfa's depend upon *balancing equity and efficiency considerations*, as they pertain to the distribution of benefits between the cfa partners, and the realization of comparative advantage opportunities for both the demander and supplier of access.

We conclude that it is, at least in part, through the emerging market for access that these important elements of stability in cfa's can be assured. What is becoming apparent from this research is that the *trading* environment has changed. In fact, what has begun to develop under these new resource endowment rules is trade, not only in the traditional sense of seafood products, but also in *access* to the raw material base. That is, sales are occurring that grant buyers the right to utilize the living marine resources of the seller's *extended jurisdiction zone*.

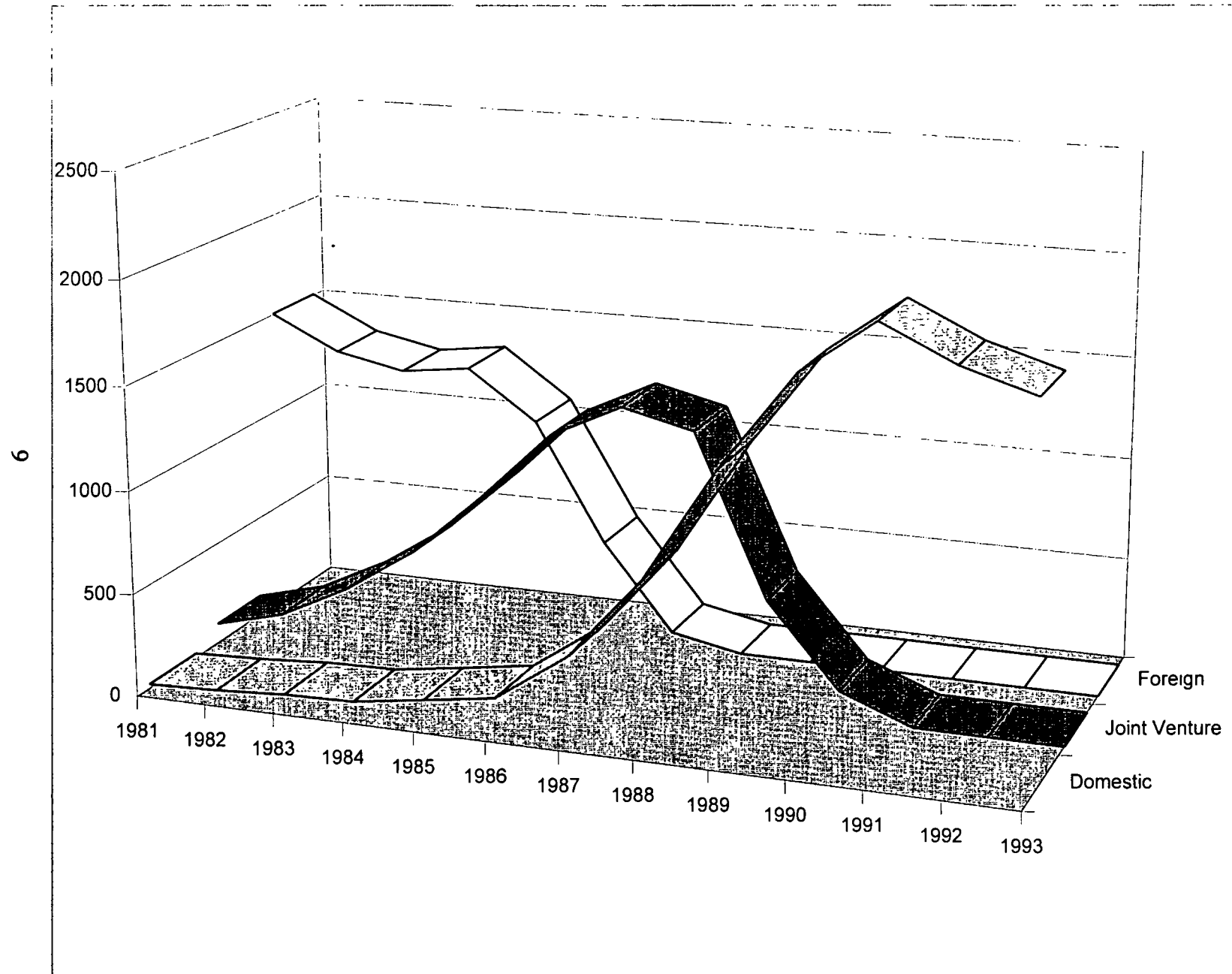
We treat some of the complexities of this issue elsewhere (Queirolo, et al., "Cooperative Fishing Arrangements: The Influence of Contract Duration, Rates of Time Preference and Institutional Context", unpublished.) For example, the existence of heterogeneous fish stocks around the world gives a *quality* or *product form* dimension to competition (and suggests that elements of the Chamberlinian model of *monopolistic competition* may be present). The fact that uncertainty may encourage the formation of short term contracts, rather than the indefinite tenure arrangements discussed in this paper, returns us to the need to consider monitoring as a feature of such contracts. Even under these conditions, however, competition may prevail and could, potentially, spawn an industry of providers of monitoring services.

the harvesting rate, and $F(x)$ is the natural growth rate. In this case, the Hamiltonian and Lagrangian functions are identical $L = H = e^{-\delta t} [p - c(x(t))]h(t) + \lambda [F(x) - h(t)]$ and $\partial H / \partial \delta |_{\text{optimal path}} = -te^{-\delta t} [p - c(x^*(t))]h^*(t) = -te^{-\delta t} m(t, \alpha)$. Let M be the above bounded value of $m(t, \alpha)$. According to the dynamic envelope theorem, we have $\partial R^*(\alpha) / \partial \delta = - \int_0^{\infty} te^{-\delta t} m(t, \alpha) dt \leq -M \int_0^{\infty} te^{-\delta t} dt = -M / \delta^2 < 0$. Thus, the maximum present value of net revenue generated from the resource is negatively related to the discount rate, i.e., the higher the discount rate, the smaller the maximum present value. Consequently, when distant water fleets are arrayed from lowest to highest rate of time preference, the resulting discount rate/willingness to pay relationship can be viewed as the "demand" for access. Conversely, the "supply" relationship can be similarly constructed for the coastal nations.

⁹ We acknowledge that under "real world" conditions, market imperfections and other externalities may preclude attainment of the true optimum. Nonetheless, with compatibility between the rates of time preference of the contracting parties approximation of the optimum solution will be enhanced.

And finally, new geo-political pressures seem to be emerging which may potentially portend yet another evolutionary change in control of access to the living marine resources of the *ocean commons*. That is, with concerns over exploitation of fish stocks present in high seas or *commons* areas, but important to adjacent countries with extended jurisdiction claims to the resource during portions of its natural migration, pressure to extend quasi-property interest and control over areas beyond the current 200-mile zone seems to be increasing. Several examples come to mind; pollock in both the Bering Sea's "donut hole" and the Okhotsk Sea's "peanut hole"; cod in the "loop hole" (*Smuthullet*) of the Norwegian Sea; and most recently, Greenland halibut (turbot) harvested by Spanish vessels operating in the "nose and tail" of the Grand Banks, just outside Canada's 200-mile zone off Atlantic North America. These and many other examples may produce a demand for further reductions in areas of the world's seas which are governed as a *common property resource*. Should this happen, the market for cfa's may expand and merit even closer scrutiny by policy-makers and analysts.

Groundfish Catch in the U.S. EEZ Off Alaska
(1,000 metric tons)



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