THE HAMILTON PROJECT

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Tomorrow's Catch: A Proposal to Strengthen the Economic Sustainability of U.S. Fisheries

Christopher Costello

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Tomorrow's Catch: A Proposal to Strengthen the Economic Sustainability of U.S. Fisheries

Christopher Costello
University of California, Santa Barbara
and National Bureau of Economic Research

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BROOKINGS

Abstract

For wild fisheries in U.S. waters, economic prosperity and environmental sustainability go hand in hand. Yet the tremendous economic potential of U.S. fisheries is left largely untapped due to command-and-control style regulations that incentivize inefficient use of economic inputs, overexploitation, and overcapitalization. These perverse incentives can lead to economic, and often ecological, disaster. Fortunately, a collection of promising fishery management tools is available. This suite of solutions, collectively called catch shares, is based on the principle of property rights to individuals, cooperatives, or fishing communities; the policy and legal infrastructure for implementation of catch shares already exists in the United States. This proposal calls for an amendment to the Magnuson-Stevens Fishery Conservation and Management Act, the federal law currently guiding the management of U.S. fisheries, that would, for certain fisheries, require transparent comparison of the economic, social, and ecological trade-offs between status quo management and these alternatives. If executed carefully, this new approach could benefit all fishery stakeholders and lead to the design and adoption of fishery management approaches that significantly improve fishery value, recovery, and security for fishing communities, as well as ecological outcomes.

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Chapter 1: Introduction

Wild fisheries are immensely important to the U.S. economy and coastal heritage, and to consumers across the globe. Their management has tremendous implications for the health of ecosystems of the world's oceans. In contrast to many contemporary environmental challenges, economic and environmental objectives in fisheries can, in principle, go hand in hand: for fisheries to prosper in the long run requires stewardship of fish populations, taking advantage of their renewable nature so harvest can be maintained in perpetuity. Yet most fisheries worldwide, including many in the United States, are still managed with heavy-handed top-down command-and-control approaches that implicitly prioritize short-run inefficient exploitation over long-term prosperity. These outdated management approaches can encourage the race to fish, overinvestment in capital, and underinvestment in the underlying resources, often leading to stock depletion, dissipation of the economic rent from the resource, and ultimately the collapse of fisheries, communities depending on those fisheries, and marine ecosystems.

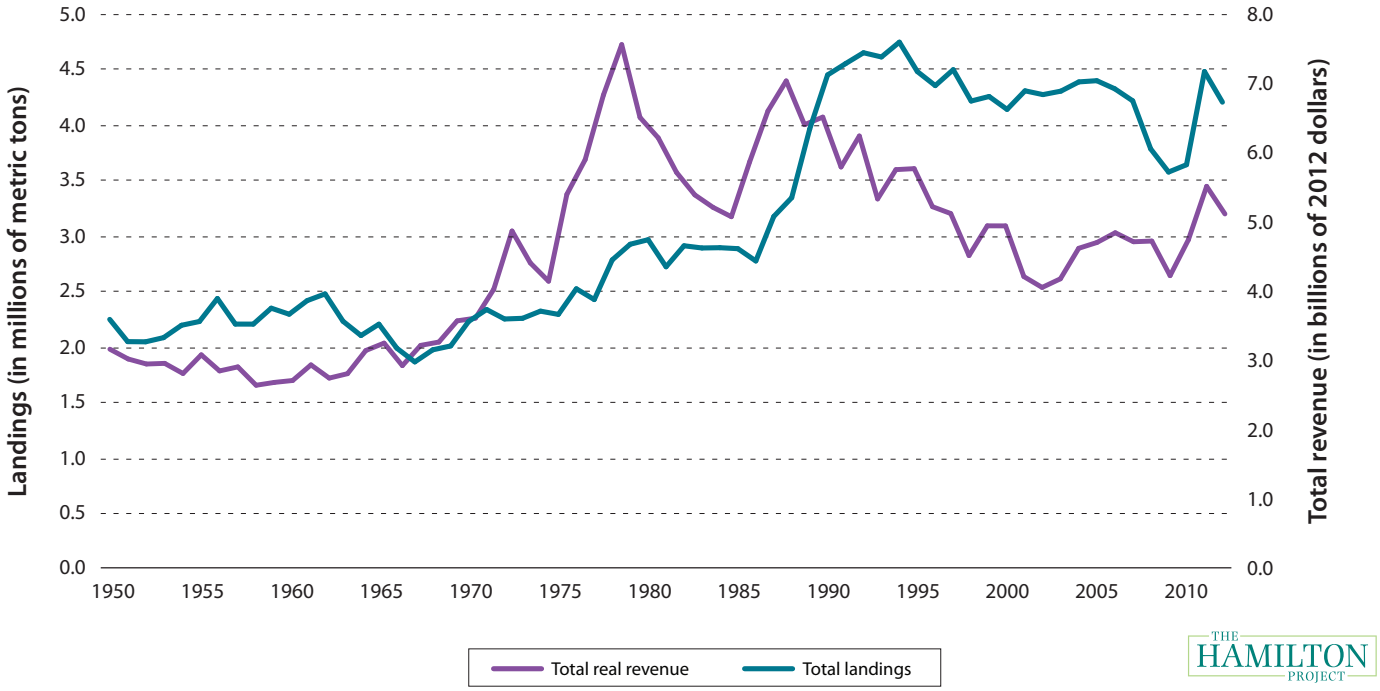
Global fisheries represent a wide variety of ecological, economic, and social conditions. Key ecological parameters include the growth rate of the population, from extremely fast-growing species such as sardines or shrimp to extremely slow-growing species such as rockfish and grouper; the home range or dispersal distance, from highly localized such as abalone to highly migratory such as tuna; and the sheer size, or carrying capacity, of the stock, from a localized reef-fish fishery in the developing tropics to an immense forage-fish fishery. The economic and social dimensions of global fisheries are equally diverse. Small-scale artisanal fishermen whose operations are characterized by extremely low capital investment, high labor input, and often only subsistence catches extract fish from more than 95 percent of the 10,000 or so global fisheries. But a small set of large-scale fisheries are exploited by industrial fleets with global reach and the ability to achieve extremely large catches. For example, the two largest single-species fisheries in the world—the anchoveta fishery of Peru and the Alaska pollock fishery of Russia and the United States—are harvested by a handful of fishing companies that extract over 10 percent of the total global fish catch annually. Overall, the United States extracts about 6 percent of global fish catch, and the ten largest-catch countries account for 60 percent of global catch annually.

In contrast to many contemporary environmental challenges, economic and environmental objectives in fisheries can, in principle, go hand in hand.

Wild fisheries in the United States have a rich heritage and contribute substantially to the U.S. economy. The most recent official data indicate landings of almost 10 billion pounds (4.5 million metric tons), revenue of about $5 billion with substantially higher value-added economic impacts, and 1.3 million jobs supported by the seafood industry (Fisheries Economics of the United States [FEUS] 2012). Key species include scallop, shrimp, Pacific salmon, lobster, pollock, and menhaden. Figure 1 displays the trends in landings and revenue over time: overall fish landings peaked in the mid-

FIGURE 1.

Total U.S. Commercial Fishery Landings and Revenues, 1950–2012



Source: National Oceanic and Atmospheric Administration commercial fishery statistics.

1990s at about 5 million metric tons (blue line) and revenue peaked in the late 1970s at almost $8 billion (purple line).

The enormous diversity of fisheries globally and in the United States strongly suggests that no single fishery management institution will be appropriate everywhere. I propose that a class of management tools, broadly defined as catch shares, could be designed to best achieve a variety of social goals in most of these diverse fisheries. Catch shares present a toolbox or class of management tools including individual transferable quotas (ITQs), cooperatives, and spatial use rights or territorial user rights fisheries (TURFS), that can be designed to achieve multiple objectives. While global catch share adoption has increased in recent years, fewer than 5 percent of fisheries and around 25 percent of global fish catch is managed this way. This leaves ample room for expansion of these approaches globally, while fully recognizing that the most appropriate catch share design in a small-scale artisanal fishery for near-shore shellfish will differ substantially from an appropriate design for an industrialized large-scale snapper fishery.

This proposal takes as a starting point that many United States–based wild fisheries are underperforming economically and that careful design and implementation of these well-established management approaches can catalyze their potential prosperity. But this potential is often masked by endless debate over marginal technical changes to status quo management. I propose that by requiring a comparison of likely outcomes under both the status quo management and various catch share management approaches, fishermen, policymakers, and other stakeholders will have a fuller set of information on which to base their advocacy and decisions over management.

In this paper I propose an amendment to the Magnuson-Stevens Fishery Conservation and Management Act (MSA), to require a comparative analysis of up to four management alternatives in fisheries that meet certain criteria. Examples of fisheries for which this policy would apply are those (1) considering a major management change, (2) on a risky ecological or economic trajectory, and (3) in which a sufficiently high fraction of vested fishermen request the comparative analysis. This amendment is consistent with the language in the MSA, and will more than pay for itself as management improvements take hold. By requiring a comparison of likely outcomes under various management approaches, fishermen, policymakers, and other stakeholders will have more information on which to base their advocacy and decisions over management, ultimately leading to more-sustainable fishing stocks and a more-prosperous fishing industry in the United States. Importantly, this proposal does not require the adoption or even explicit design of catch shares. Rather, it requires that the likely outcomes of catch shares be compared to those of the status quo management.

Chapter 2: Overview of Fishery Management in the United States

U.S. fisheries are tremendously varied and will benefit from transparent comparison of alternative management approaches, as proposed here. Most industrial high-value fisheries in the United States are located in federal waters, from three to two hundred nautical miles off the coast, and are thus under the purview of the Department of Commerce via the National Oceanic and Atmospheric Administration (NOAA), and eight U.S. fishery management councils.[1] Some of the species in these fisheries are also migratory, so they are shared either among U.S. states (e.g., many salmon fisheries), with other countries (e.g., Pacific halibut, which ranges between the United States and Canada), or with the global community on the high seas (e.g., many tuna stocks, which migrate between the high seas and U.S. waters).[2] This heterogeneity suggests an equally varied set of institutions will be required for effective management. And while U.S. fishery managers have been among the best in the world at measuring, monitoring, and protecting the fish stocks,[3] it could be argued that these managers have paid far less attention to designing fishery management institutions to generate economic prosperity.

Management of federal fisheries is delegated to the regional U.S. fishery management councils, which are responsible for the fish stocks that reside in their regions. All major fisheries within a council's jurisdiction will be part of a fishery management plan, which details the status of the stocks and the management measures in place to fulfill the requirements of the MSA. Council membership is by appointment and covers a broad constituency, often including members from the fishing and processing sectors. Proposed changes to the management of a fishery (such as a proposal for a catch share) are debated publicly at council meetings. For fisheries that reside uniquely within the jurisdiction of a single council, this process is relatively straightforward, though often contentious. More-nuanced jurisdictional issues arise when a fishery crosses from federal waters into state waters, in which case the state management agency and federal council must interact; when a fishery crosses into the high seas or into another country's exclusive economic zone, in which case a regional fishery management organization may attempt to coordinate on management; or when a fishery crosses between two or more federal regions, in which case multiple councils must interact.

2.1. TYPES OF MANAGEMENT SYSTEMS

For the purposes of this proposal, I define four existing classes of fishery management that span the range of management of global fisheries, and also roughly correspond to what seems to be a chronological evolution of fishery management around the world. The classes are open access, regulated open access, limited entry, and catch shares.

2.1.1. Open Access

Fisheries in this class are simply not managed. These fisheries lack any rules or oversight over fishing technology, fishery participation, or harvest levels. Two types of fisheries fall into this class: many small-scale artisanal fisheries in the developing world, and many large-scale industrial fisheries on the high seas. Despite their lack of regulation, bioeconomic theory does not necessarily predict the complete demise of these fish stocks: most fish become more costly to extract as their populations are driven down. This stock effect tends to lead to an outcome with very low—but not zero—fish stocks and high fishing pressure, earning no economic value and yielding low harvest rates.[4] From an economic standpoint, this is the worst-case scenario and typically leads to complete economic rent dissipation. To my knowledge, no federal U.S. fisheries are purely open access, though some state-level fisheries are essentially open access.[5]

2.1.2. Regulated Open Access

Fisheries in this class still leave fishing effort uncontrolled—that is, they allow free entry and exit of fishermen from the fishery—but they regulate other inputs such as gear type, fishable area, or season length. If we ignore the possibility of entry and exit and focus purely on fish stocks rather than on fishery profit, this approach makes intuitive sense: for a fixed amount of fishing effort, we can maintain safe harvest levels by, for example, controlling the size of nets used by fishermen. But this logic turns out to be flawed once economic behavior is considered: as soon as any economic value is generated by the regulations, new entrants will flock to the fishery.

This entry of excessive fishing effort has two important consequences: First, because the regulations (in this example, net size) were designed under the old amount of fishing effort, the harvest will be excessive, possibly leading to stock

collapse (or economic collapse; see section 2.1.1). Second, the new entry dissipates economic rents and may return an economic outcome no better than was achieved under open access (Homans and Wilen 1997). While no concrete numbers exist, this is likely to be the most common form of fishery management around the world. Many state-level U.S. fisheries and a few federal fisheries fall into this category.

2.1.3. Limited Entry

Fisheries in this category restrict entry of fishermen into the industry. This is typically accomplished by issuing a fixed number of permits to fishermen. Entry and exit is controlled either by allowing trade in the permits themselves or by forbidding trade but distributing new permits as active permits are retired. Harvest restrictions are achieved by regulating other inputs—typically the season length—to meet harvest targets. At first glance, this seems to solve all of the problems identified in the case of regulated open access. Indeed, this is the most common form of management of U.S. fisheries. If designed and implemented properly, this approach can lead to reasonably robust conservation of fish stocks. But the same cannot be said for its effects on the economics of a fishery.

Limited entry provides very strong incentives for a race to fish, an economically harmful situation under which each licensed fisherman will overinvest in fishing technology, gear, crew, and other inputs to maximize his take of fish, given the prescribed season length. It is easy to see how this dynamic plays out: in Year 1 the fishery manager makes an assumption about how much fishing activity will occur each day, translates that into the harvest, and sets the season length to meet a target. Fishermen then take the season length as a given and increase other inputs accordingly to maximize profits. This leads to a harvest that exceeds the prediction made by the manager, so the manager shortens the Year 2 season. This process occurs year after year until the season length is extremely short; in many U.S. fisheries the season length has been shortened to just a few days. Thus, this approach often leads to excessive harvest and accordingly low fish stocks. But even when regulations can effectively control harvest (indeed, for many U.S. stocks this is the case), the race described can be extremely inefficient, and can lead, once again, to severe economic rent dissipation. In the United States, then, the problem with limited entry is not so much the biological collapse of fish stocks, but rather the economic collapse of the fisheries that depend on that biological stock.

2.1.4. Catch Shares

This diverse class of fishery management instruments includes ITQs, cooperatives, and TURFs, all of which have precedent in the United States. While they are different from each other, the tools within this class have in common the principle that individual fishermen or small groups of fishermen are granted an exclusive privilege—either to harvest a given amount or to harvest within a given area—that persists over time. If designed properly, the owners of this privilege then have a strong financial incentive to harvest in a profit-maximizing manner and to steward the stocks to maintain future benefits. For example, many ITQ fisheries allocate shares of harvest to individual fishermen, which limits their individual harvest over the course of a season. This virtually eliminates the race to fish, which occurs when fishermen are attempting to capture a larger harvest for themselves.[6] Furthermore, because each fisherman must now match his catch to his quota ownership, it is far less likely that the actual harvest will exceed the harvest desired by the fishery manager.

While rarely used in the United States, TURFs provide a similar set of incentives. Consider a fishing port that is granted exclusive access to harvest lobster in a defined geographic area. This spatial exclusivity produces at least two beneficial incentives. First, it provides an incentive for the fishermen to cooperate over harvest, which reduces cost; and over marketing, which increases price. Both effects increase overall economic value and may be achieved by the formation of a cooperative. Second, it provides an incentive for the local fishermen to ensure that the stock is well-managed—in other words, that the stock is being harvested at an economically desirable rate.[7] This may be achieved, for example, by hiring a stock assessment scientist to work with fishermen to collect and analyze data. These are just a few of the many possible changes in incentives afforded by well-designed catch share programs.

2.2. FEDERAL OVERSIGHT: THE MAGNUSON-STEVENS FISHERY CONSERVATION AND MANAGEMENT ACT

Ultimately, any fishery management approach must conform to federal law. The main piece of legislation guiding the management and exploitation of U.S. fisheries is the MSA. Originally passed in 1976 as the Fishery Conservation and Management Act, it was most recently revised in 2006. The MSA is a comprehensive and durable piece of legislation that has withstood challenges from numerous constituents. While the MSA contains many intricate details for how and why U.S. fisheries must be managed, I next describe three guiding principles for the management of fisheries in the United States.

2.2.1. Guiding Principle 1: Promoting Fishery Recovery

Several MSA sections focus on overfished stocks and legislate the rebuilding of those stocks to attain the somewhat ambiguous goal of optimum yield. The theoretical underpinning of this objective lies within basic biology: when a fish stock is overfished, its population size is diminished, which means that it cannot sustain a high level of harvest over time. Furthermore, as noted in section 2.1.1, when the stock is small, the cost of fishing increases, which lowers the economic value of the fishery. For both of these reasons, recovery is essential to achieving economic efficiency. Importantly, the MSA has

focused on the size of fish stocks as it relates to optimum yield, which obscures the possibility that the management institutions may influence both the attractiveness and the optimal pace of rebuilding. There is a strong argument that well-designed catch shares give the industry an incentive to optimally rebuild the stocks under their purview.

2.2.2. Guiding Principle 2: Protecting Fishing Communities

The MSA sporadically refers to the importance of fisheries management in the economics of fishing communities. Yet in most instances, these references are defensive, such as where the MSA suggests that changes to fisheries management must be executed in a manner to minimize the negative economic effects on fishing communities. For example, section 301 states, "Conservation and management measures shall . . . minimize adverse economic impacts on such communities" (NOAA 2007, 301 a (8)). Again, I argue that the management institutions may indeed play a larger role on the economics of fishing communities than do the stock size or the sheer amount of harvest in a given year. When institutions induce a race to fish, it is easy to see why a community would believe it is adversely affected by a conservation or rebuilding program that restricts catch. To achieve benefits to fishing communities, the allocation of rights to fishery cooperatives or fishing ports, rather than to individual fishermen, may arise as the most effective design of a catch share. If that design were adopted, the communities would have a secure privilege into the future, which implies that they will be the future beneficiaries of today's conservation behavior. Thus, under catch shares, communities may become the biggest proponents of fishery rebuilding plans.

2.2.3. Guiding Principle 3: Managing for Optimum Yield

Perhaps the most relevant principle is that U.S. fisheries are to be managed for optimum yield on a continuing basis. The MSA is explicit that managing for optimum yield may force a deviation from the familiar objective of maximum sustainable yield, owing to economic, social, or ecological factors. This astute observation is consistent with the fisheries economics literature. For example, if the costs in a fishery are stock dependent, where higher stocks of fish reduce the cost of fishing, then achieving optimum yield may require building the fish stock to a relatively high level and maintaining it there by harvesting an annual yield that is smaller than the maximum sustainable yield. But this focus on the optimal stock size of a fishery cloaks what I see as a much more salient point: if economic prosperity from fisheries is one of our goals (in addition to the goals of food provision, ecosystem protection, etc.), then we must recognize that the management institutions may be at least as relevant as the stock size in delivering economic outcomes. Indeed, because catch shares lower the cost of fishing and raise the price received by fishermen, a catch share often may be the best way to achieve optimum yield.

Chapter 3: The Challenge

The basic premise of this proposal is that the current system of management in the majority of U.S. fisheries leads to suboptimal outcomes, meaning that they are not making the most of this valuable natural resource. The current language of the MSA acknowledges a broad set of goals (as outlined in section 2.2) for U.S. fisheries, but it does not sufficiently acknowledge the important role management institutions play in achieving them, nor does the MSA have any requirement for fisheries to compare alternative management approaches. I argue here that once the trade-offs of the alternative approaches are brought to light, it will become evident in many fisheries that conventional fishery management, which relies heavily on command-and-control input regulations, delivers substandard outcomes, and can be upgraded to a system designed for economic, social, and ecological prosperity.

The inefficiency of current management arises from two basic sources. First, when fishermen have little to no stake in the future productivity of the resource, economic theory predicts, and the data seem to confirm, that they will overexploit fisheries. For example, a recent study found that the unassessed fisheries of the world, which are largely managed with input controls, are drastically overharvested compared to other fisheries (Costello, Ovando et al. 2012). This excessive harvest drives down fish stocks, and the resulting fishery returns far less economic profit than would otherwise be possible. The second source of inefficiency is pecuniary—regulating inputs induces a race to fish and inefficient input use. This drives up cost and often drives down quality and price.

Ultimately this is a matter of inefficient resource use. Under conventional management, which lacks property rights, the fish stock itself is an inefficiently utilized input to production. Naturally, this has negative consequences for conservation. But even under a single-minded objective of economic prosperity of the fishing industry, conventional management often leads to inefficiently small resource stocks, and thus to lower profit. But the race to fish also leads to inefficient use of conventional economic inputs such as labor and capital. These inefficiencies have mostly financial and social implications. I will argue that carefully analyzing and comparing the likely outcomes of alternative management approaches can lead to the ultimate design and implementation of approaches that correct those inefficiencies.

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Multiple sectors are affected by these inefficiencies. While a complete analysis is beyond the scope of this proposal, I contend that the implications of the inefficient management of U.S. fisheries are diverse, far-reaching, and not necessarily aligned across all sectors. The most obvious sector affected is the commercial fishing sector where, on average, individuals are severely harmed by inefficiency. Recreational fishermen are also likely to be harmed by inefficiency in the commercial sector due to overexploitation, though there are political-economy arguments for why they may prefer to battle it out in the status quo rather than move to a property rights system with increased transparency over allocation. Finally, various actors in the supply chain can be affected in different ways by inefficiently managed commercial fisheries. For example, restaurants specializing in local, fresh seafood or large chains with a long-term stake in sustainability are likely to benefit

from a transition to property rights. But many fish processors, who wield immense market power under the status quo and who may lose that power under a reform, may prefer the current (inefficient) system.

Two observations are clear. First, the inefficient management approach is likely to have important effects on the welfare of all sectors of the fishing industry. Second, the current application of MSA does not provide any transparent comparison of the likely effects of alternative management options that can, in some cases, bolster the economic efficiency of the fishery. There exists no one-size-fits-all solution to the multifaceted economic, social, and ecological conditions of United States–based fisheries. Rather, the property rights–based management approaches, which fall under the category of a catch share, rest on the tenets of secure privileges and stewardship incentives. As such, these approaches replace a race-to-fish mentality engendered by the current dominant command-and-control approach.

A natural question is, "Why, given the documented successes of catch shares around the world, have U.S. fisheries been reluctant to adopt catch shares more broadly?" I submit that there are three main reasons. First, until recently catch shares were viewed quite narrowly as a one-size-fits-all solution with little flexibility in design. The ITQ model for industrial fisheries, which has worked well in many global fisheries, may conflict with social and even economic objectives of many U.S. fisheries. Second, while the aggregate gains from catch share adoption can be large, the distributional effects may also be significant. If some politically powerful players stand to lose from the transition, they may wield sufficient political influence to block adoption. Finally, as is common with new institutional regimes, there has been a general lack of information about catch shares with which to make sound decisions. Fortunately, all three challenges can be overcome with information.

Chapter 4: The Proposal

In this paper, I propose to change federal policy to require a transparent comparison of the likely economic, social, and ecological effects of alternative fishery management approaches. For many fisheries, I believe this transparency will ultimately lead to the efficient design and adoption of catch shares tailored to individual U.S. fisheries.

4.1. AN AMENDMENT TO THE MAGNUSON-STEVENS FISHERY CONSERVATION AND MANAGEMENT ACT

I propose an amendment to the MSA that would require analysis of the status quo and up to three alternative management approaches, including the catch shares approach.[8] Each approach would be evaluated for the fishery in question along economic, social, and ecological dimensions.

Not all fisheries would be required to undergo this analysis in my proposal. Rather, one of three triggers would require a fishery to conduct such an analysis: (1) any fishery considering a major management change, (2) any fishery demonstrated to be on a risky economic or ecological trajectory, and (3) any fishery in which a significant fraction of participating fishermen (I suggest 33 percent) request the analysis.

The alternatives the council would analyze include the status quo management approach; one version of a catch share designed for economic prosperity, such as an ITQ or sector allocation; one catch share with community or cooperative allocation; and possibly a fourth management alternative at the council's discretion. A key aspect of the evaluation would be the risk of collapse, ecological or economic, under each management approach. Methods and results of this analysis should be subject to public scrutiny during the process.[9]

I envision approximately a one-year process for each fishery, with analyses of several fisheries running in parallel, that would involve an initial scoping meeting in which the set of alternative management approaches for analysis would be selected, evaluation criteria determined, and methods discussed. The analyses would draw on existing literature, empirical evidence, and case studies; results would be tailored to the specific fishery in question, and would not be generic to all fisheries with the same management approach. All analyses, including an explicit write-up of all model assumptions and data sources, would be made publicly available, and the public would have an opportunity to comment before analyses were finalized. Ultimately, the analyses could serve as a starting point for design and adoption of management reforms.

Under this approach, the fishery management council would provide standardized information to stakeholders. Once the economic, social, and ecological trade-offs are made clear by this new requirement, stakeholders can engage in the fishery management reform process in a much more productive manner. With appropriate stakeholder involvement in the design process, the fishery management council ultimately will be in a better position to adopt the fishery management approach that is most likely to meet the objectives of the fishery's stakeholders.

During an initial phase-in period, Congress would appropriate new funds—perhaps on the order of $10 million to $20 million—to NOAA to support fisheries in their analysis of alternative management structures. In addition, NOAA would expand its support for the design, implementation, and monitoring of catch shares, and continue to allow fisheries to share in the economic upside of catch shares, consistent with its Catch Share Policy of 2010 (NOAA 2010b). While the combination of funding for catch share adoption and a rent capture (or royalty) program has not been successful in incentivizing catch share adoption to date, I expect that the implementation of triggers requiring further analysis of fishery management structures combined with additional NOAA support will be sufficient to lead to markedly higher adoption of catch shares in U.S. fisheries.

4.2. THE CATCH SHARE CLASS OF MANAGEMENT APPROACHES

I have argued that there exists no one-size-fits-all solution to the diverse economic, social, and ecological conditions of United States–based fisheries. I believe my proposal will ultimately lead to the efficient design and adoption of catch shares tailored to individual U.S. fisheries. This approach, based on property rights, rests on the tenets of secure privileges and stewardship incentives, which replace a race-to-fish mentality engendered by the current dominant command-and-control approach. Catch shares are immensely customizable, so can be designed to meet extremely variable conditions and objectives for any given fishery, while retaining the core incentive structure that

ensures long-run prosperity. The most common form of catch shares, and the first general class of property rights approaches in the industrialized world, is the ITQ model, which grants exclusive access to portions of the total allowable catch to individual fishermen and allows trade across fishermen.

In an important departure from most existing catch shares, I propose extending the ITQ approach to allow the allocation of rights to fishing communities, ports, and cooperatives to help bridge an important gap that has emerged between property rights advocates and community heritage advocates.[10] Given the strong interest in preserving fishing community heritage among fishing communities, the general public, and the MSA itself, this community allocation may even become the default catch share approach, supplanting the current individual allocation approach. The second general class of property rights approaches is the fishery cooperative, where a group of fishermen explicitly cooperate on harvest strategies, comanagement, scientific evaluations, and/or marketing.[11] The third class is the TURF, which grants to a community or cooperative exclusive spatial harvest rights. This approach has been applied extensively outside the United States, but has not been utilized in any systematic way here, primarily due to legal constraints.

One primary benefit of the catch share approach is its flexibility to accommodate fisheries with different characteristics. Within these three main approaches (ITQ, cooperative, and TURF) lie hundreds of customizable program designs. This is necessary to maintain considerable flexibility for fishery managers to design a program, perhaps a unique program, that meets the often peculiar conditions and objectives of individual fisheries. For example, a locally based groundfish fishery with rich cultural heritage may be better served by an ITQ allocated to cooperatives or ports rather than to individuals, and a salmon fishery with highly variable run sizes may benefit from a cooperative rather than an ITQ.[12]

Thus, catch shares represent a class of solutions, not a one-size-fits-all approach; my proposal simply requires the elucidation of trade-offs across management approaches. Ultimately, the fishery manager retains considerable flexibility to design privileges and responsibilities to match the idiosyncratic characteristics and goals of their fisheries. It is also crucial to acknowledge that these approaches are not new; they have been designed and implemented in hundreds of fisheries worldwide, including many in the United States.[13] Thus, not only is the legal and policy infrastructure already in place in the United States, but also there is a rich history of experience on which to draw for the design of future programs.

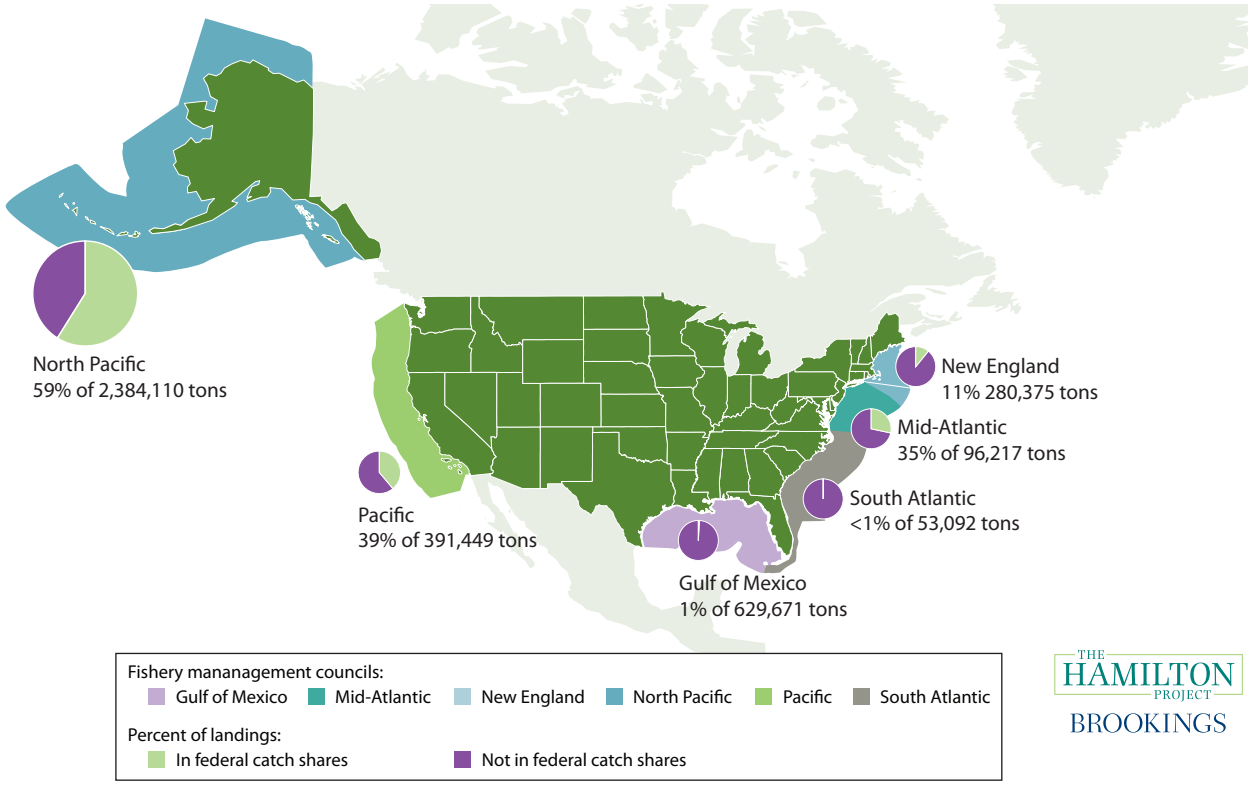
Although this proposal does not presume that catch shares will always be selected after the trade-offs are made clear, there is mounting evidence that a well-designed catch share can outperform command-and-control approaches across a range of objectives. While outcomes are generally viewed as being quite positive, some results have been mixed, which has facilitated improved design over time.

I illustrate the diversity of designs and success of global catch shares with two brief examples. The first is the British Columbia Integrated Groundfish Program that came into full force in 2010. This program combines a number of different fisheries into a single comprehensive catch share covering nearly seventy species, about half of which receive annual individual quota determinations. This multispecies type of catch share is increasingly being adopted globally, with elements of the British Columbia system replicated in several countries.[14] Concerns over the effects of catch shares on fishing communities and crews are being addressed with quota set-asides, though the majority of quota shares are owned and operated by individual fishermen or fishing firms. The program also addresses bycatch (the accidental harvest of nontarget species) by implementing innovative monitoring systems that record the catch of each boat. These, and other innovative features, arose as a consequence of careful and lengthy debate about the objectives of fishery management in this region and the ways in which a comprehensive catch share could be designed to best achieve those objectives.

Catch shares represent a class of solutions, not a one-size-fits-all approach; my proposal simply requires the elucidation of trade-offs across management approaches.

FIGURE 2.

Percent of Landings in Catch Shares, by U.S. Fishery Management Councils



Source: Author's calculations.

Note: Caribbean and Western Pacific Fishery Management Councils, which have no catch shares, are not displayed.

The second global example illustrates a completely different type of catch share in a developing economy. The Chilean system of over 700 TURFs was initiated in 1991, primarily to provide individual fishing cooperatives with exclusive rights to specified areas of ocean to manage the *loco*, an abalone-like sea snail that commands a premium price. Recent statistics indicate a harvest of about 5,000 metric tons and an export value of about $50 million per year. While most management responsibility is devolved to the individual TURF, often made up of ten to fifty fishermen members, there remains federal oversight over management. Each TURF is required to conduct a form of spatial stock assessment from which its total allowable harvest is determined; the TURF allows approximately 30 percent of the available stock to be extracted. Beyond that simple oversight, the cooperative is free to engage in harvest, marketing, and exclusion of nonparticipants. While fine-tuning continues to take place, the program is largely considered a success at meeting the goals of ensuring economic sustainability of an important artisanal fishery, maintaining or increasing the abundance of key species and their sustainable catches, and improving economic performance.

Catch shares have also been adopted in the United States, although by only a minority of U.S. fisheries. By early 2014 about 30 percent of federal fisheries had adopted catch shares, though almost no state fisheries had done so. The geographical distribution of both harvest under catch shares (figure 2) and species under catch shares (figure 3) are highly skewed, however, with wide-scale adoption on the West Coast and far lower adoption in the Gulf of Mexico and on the East Coast.

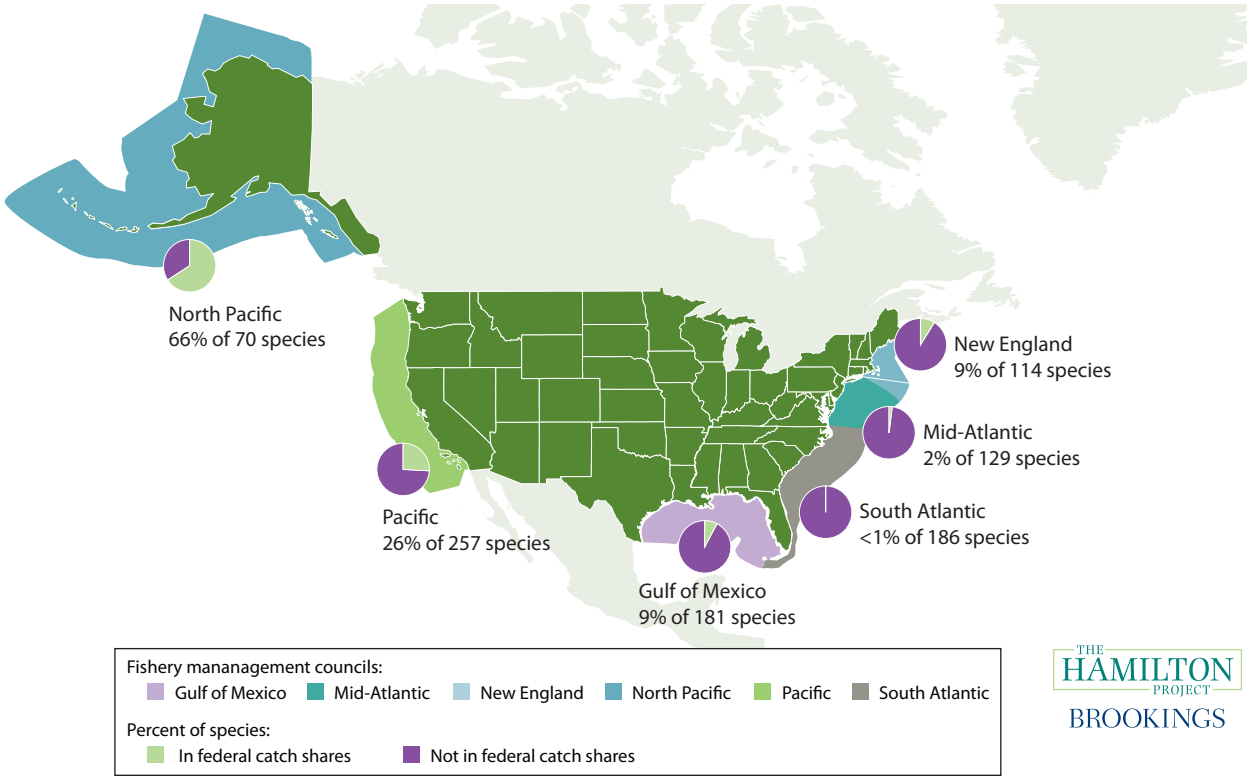
Figures 2 and 3 show that, despite their voluntary nature, many catch shares have already been adopted in the United States. Since 1990 the United States has added an average of one catch share per year, which represents a mix of ITQ, community development quota (a version of ITQ in which communities receive allocation of catch), harvest cooperatives, and sector management (an allocation of catch to distinct sectors of the fishery).[15] Figure 4 depicts the timeline of adoption of fifteen prominent U.S. catch share programs.

The earliest catch share shown is the Atlantic Surfclam and Ocean Quahog ITQ, implemented in 1990. The most recent is the final ruling in 2011 to implement the Gulf of Alaska Rockfish program, although the pilot program began in 2007.

Today, about 2 million metric tons of fish are landed every year under U.S. catch shares (this amount has been relatively stable since 2005), which represents about a third of total U.S. fish

FIGURE 3.

Percent of Species in Catch Shares, by U.S. Fishery Management Councils

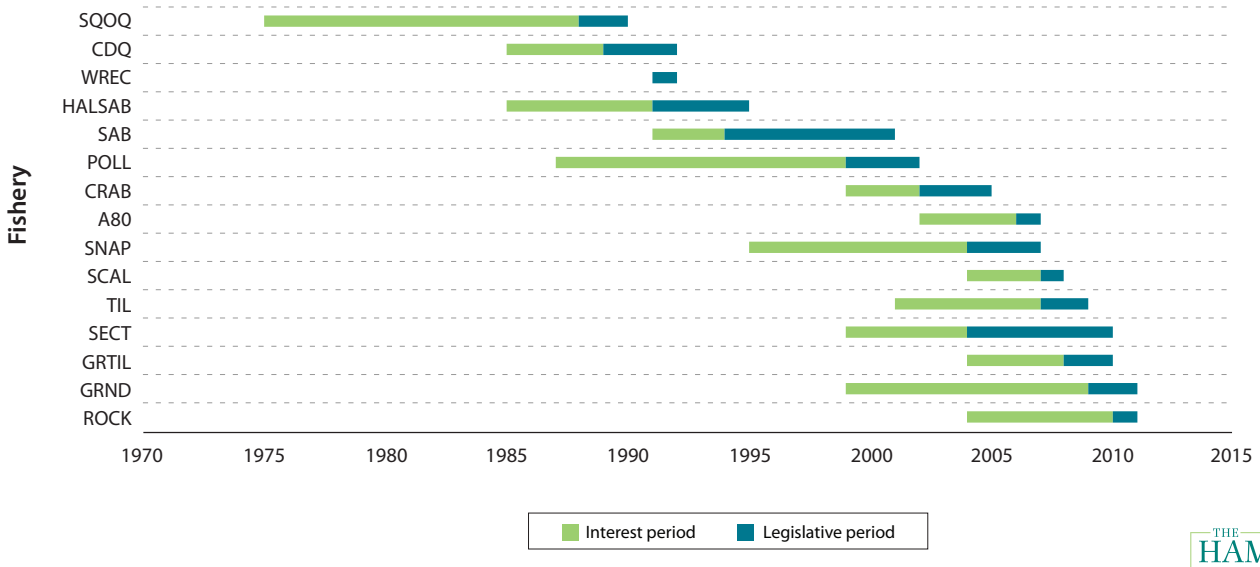


Source: Author's calculations.

Note: Caribbean and Western Pacific Fishery Management Councils, which have no catch shares, are not displayed.

FIGURE 4.

Timing of Interest in, Legislative Implementation of, and Final Adoption of Fifteen Prominent U.S. Catch Shares, 1970–2011

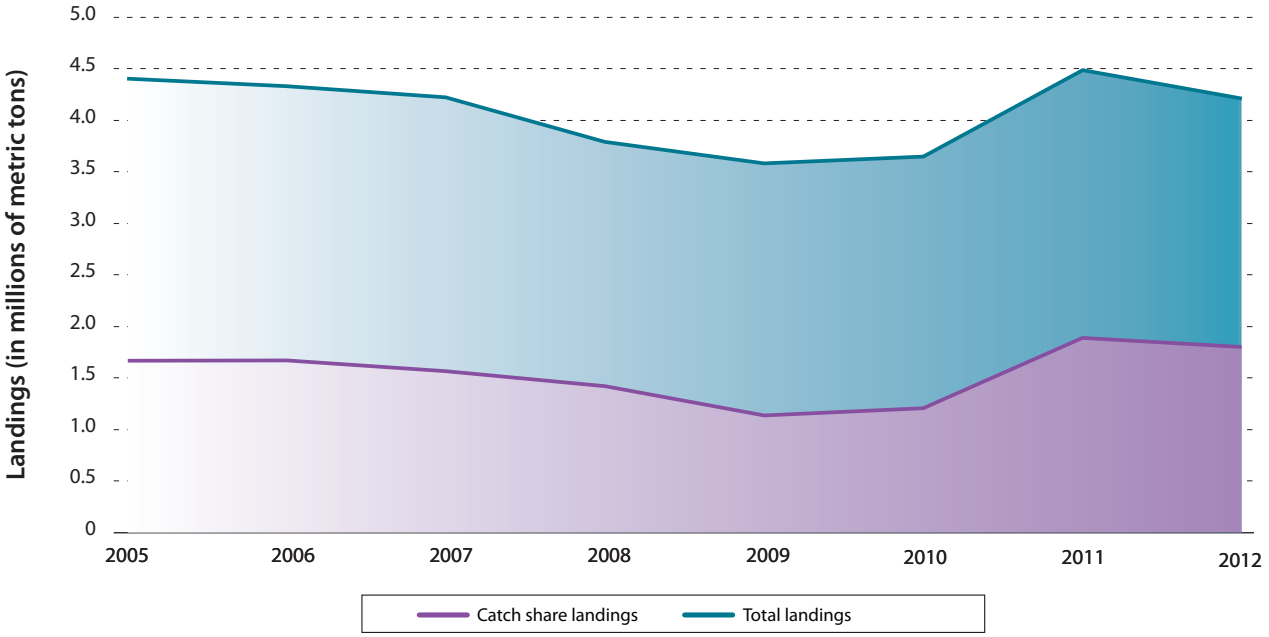


Sources: Data assembled by Sarah Poon, Environmental Defense Fund.

Note: The green bar indicates the timing of interest. The blue bar indicates the length of legislative implementation and the right side of the blue bar indicates the final adoption of catch shares for that fishery. SCOQ = Atlantic Surfclam and Ocean Quahog ITQ Program; CDQ = Western Alaska Community Development Quota Program; WREC = South Atlantic Wreckfish ITQ Program; HALSAB = Alaska Fixed-fear Commercial Halibut and Sablefish Individual Fishing Quota Program; SAB = Pacific Sablefish Permit Stacking Program; POLL = Bering Sea Pollock Conservation Cooperative American Fisheries Act Program; CRAB = Bering Sea and Aleutian Islands Crab Rationalization Program; A80 = Bering Sea and Aleutian Islands Non-Pollock (Amendment 80) Cooperative Program; SNAP = Gulf of Mexico Commercial Red Snapper Individual Fishing Quota Program; SCAL = Atlantic Sea Scallop Individual Fishing Quota Program, Limited Access General Category; TIL = Mid-Atlantic Golden Tilefish Individual Fishing Quota Program; SECT = Northeast Multispecies Sector Management Program; GRTIL = Gulf of Mexico Commercial Grouper and Tilefish Individual Fishing Quota Program; GRND = Pacific Coast Groundfish Limited Entry Trawl Individual Fishing Quota Program; ROCK = Central Gulf of Alaska Rockfish Cooperative Program.

FIGURE 5.

Proportion of U.S. Commercial Fishery Landings Under Federal Catch Share Programs, 2005–12



Sources: NOAA commercial fishery statistics, Environmental Defense Fund catch share database.

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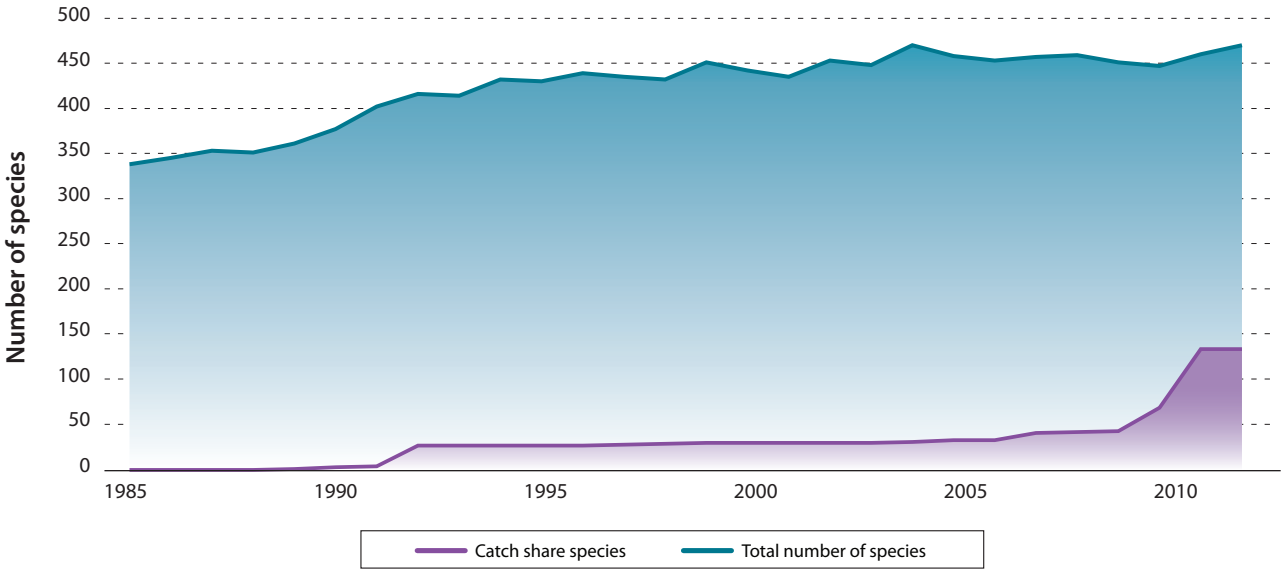
FIGURE 6.

Proportion of U.S. Commercially Targeted Species Under Federal Catch Share Program, 1985–2012



Sources: NOAA commercial fishery statistics, Environmental Defense Fund catch share database.

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landings (see figure 5). While the number of species covered under catch shares has increased markedly over the past six years, primarily due to the adoption of several multispecies catch shares (see figure 6), only about 25 percent of species caught in U.S. fisheries are managed under catch shares.

If designed with care, these catch shares—which will surely take very different forms in different fisheries—will simultaneously promote economic prosperity, community development, and ecological stewardship of the nation's fishery resources. The evidence to date strongly suggests that catch shares will do this in a more effective and timely manner than will other forms of fishery management, including the status quo; because effects will depend on a fishery's economic, social, and ecological setting, however, these trade-offs must be analyzed and made transparent. This challenge is deepened when one considers state fisheries, which operate within a completely different regulatory and policy framework than do federal fisheries. While this proposal focuses on federal fisheries and federal legislation, a similar proposal to the one developed here could apply in many states.

In addition, the adoption of catch shares has been hindered by provisions in the MSA. Somewhat ironically, the 1996 amendments to the MSA actually established a moratorium on all catch share programs. Following volumes of research on the effects of catch share systems in the United States and elsewhere, the moratorium was lifted in 2002; while moratoria have been proposed after 2002, they have not been enacted. Instead, section 303A of the MSA as revised in 2006 provides explicit guidance for the design, goals, and implementation of catch share programs (NOAA 2007). Any of the eight fishery management councils may submit a proposal for a catch share to the Secretary of Commerce.[16] The MSA contains specific language that the catch share (1) must not be viewed as a right but rather as a privilege, (2) must be consistent with rebuilding plans and capacity reduction plans, (3) must include provisions for enforcement, and (4) must accommodate the economics of the fishing communities to which it applies. It also deals with issues of participation, allocation of privileges, and program review. None of these provisions seems excessively restrictive or burdensome, but at the same time the MSA does not appear to promote catch shares. My view is that the MSA undersells, or is agnostic about, the strength of the scientific and economic understanding of the benefits of well-designed catch shares, and it certainly does not require comparing a fishery's likely fate under catch shares with that under status quo management.

BOX 1.

Explicit Catch Share Provisions in the MSA

In a follow-up to the MSA, NOAA adopted the NOAA Catch Share Policy, effective in November 2010. This document provides guidance on the design and implementation of catch shares in federal fisheries. In contrast to the MSA, it draws on the scientific and, to a lesser extent, economic literature on the effects of catch shares. The Policy states, "To achieve long-term ecological and economic sustainability of the Nation's fishery resources and fishing communities, NOAA encourages the consideration and adoption of catch shares wherever appropriate in fishery management and ecosystem plans and their amendments, and will support the design, implementation, and monitoring of catch share programs" (NOAA 2010b, ii).

Because this policy is relatively new, it remains to be seen how it will be interpreted or utilized to motivate the design of effective catch share programs. But one thing is clear: it mandates nothing. Rather, it serves as a resource or incentive for the design of catch share programs. In what follows I make several observations about NOAA's Catch Share Policy that are relevant for the proposal presented here.

The policy casually states, "Catch shares may not be the best management option for every fishery" (NOAA 2010b, ii), yet this statement is left unsupported by the Policy.[17] The spirit of my proposal is to examine if, and under what circumstances, catch shares will be the best management option for a given fishery.

The policy provides numerous useful guiding principles for catch shares, including discussion of allocation, transferability, duration, cost recovery, and review.

The policy provides an exciting and completely unexploited opportunity for royalty generation and self-retention in a fishery. It states that any fishery can initiate a royalty recovery scheme.[18] The Policy explicitly states that if royalties are collected, all such revenue will be deposited in a special account that can be utilized only by the fishery from which the royalties came.[19] The policy goes on to dedicate NOAA (and other federal agency) resources to help support catch share design and implementation. This cooperation will be essential to the success of my proposal.

Perhaps of most relevance, neither the MSA nor NOAA explicitly requires the adoption of catch shares, the design of candidate catch shares, or even the comparison of likely effects of catch shares versus the status quo management approach. In other words, catch shares remain entirely voluntary and, without some policy change, could exist perpetually behind a veil that masks their potential for economic, social, and ecological prosperity.

4.3. ALTERNATIVE PATHWAYS FOR CATCH SHARE ADOPTION

While it seems that the academic literature strongly supports the adoption of well-designed catch shares over conventional fishery management, several political economy concerns suggest that a forceful top-down implementation of catch shares is unlikely to succeed. Naturally, alternative pathways exist with which to implement catch shares more broadly. Here, I briefly mention two broad approaches and discuss why I believe they are less likely to succeed than is the main proposal I have put forth.

First, the most direct way to implement catch shares in all federally managed U.S. fisheries is simply to mandate that fisheries will be managed with catch shares. With one fell swoop, this would cause the transition of all limited entry and regulated open access fisheries into catch shares, and would surely set the fishery management councils scrambling to attend to the many design, implementation, and monitoring details that would be required. This basic approach was followed by New Zealand in the mid-1980s; that country unquestionably is the global leader in catch share implementation. In that case, nearly all New Zealand fisheries adopted a canonical form of a catch share (an ITQ).[20] To accomplish this in the United States would likely require an extremely controversial amendment to the MSA.

Such an approach certainly would have its pros and cons. An obvious benefit is that entrenched or minority views against catch shares could not block their adoption. But while this approach would almost surely get the job done—if, somehow, the political will to adopt such a drastic amendment to MSA could be mustered—it would do so in such a top-down, big-government manner that it is unlikely to succeed in the long run. The reason has to do with my original thesis—that there is no one-size-fits-all solution. If one accepts the argument that every fishery has its economic, sociological, and ecological idiosyncrasies, and therefore that the most appropriate catch share design will differ across fisheries, then it follows that sound catch share design will require positive, motivated input from diverse stakeholders. For this reason I think the heavy-handed top-down approach of mandating catch shares will ultimately fail: it will disenfranchise too many stakeholders to subsequently harness their ingenuity for solid design.

Second, an incentive-based approach could be linked to avoided disaster payments. The evidence strongly suggests that fisheries that adopt catch shares are more stable and thus are less likely to collapse. This reduction in risk to fishermen also implies a reduction in financial risk, via avoided disaster payments, to the federal government. If viewed in this way, the Department of Commerce could use these funds as an incentive for effective catch share design and implementation. While this approach seems to hold some promise, and could be pursued in parallel to the other approaches discussed in this paper, it is unlikely to solve the problem on its own. Establishing credibly the degree of risk reduction is difficult and prone to political manipulation.

Chapter 5: Benefits and Costs of the Transition

My basic proposal is to require explicit comparison of the likely effects of alternative fishery management approaches. The policy would be triggered by a number of events, including fisheries already considering major changes to management, fisheries with demonstrated and significant declines over time, and fisheries in which a sufficient fraction of fishermen request the analysis. The analysis would cover economic, social, and ecological effects, and would draw on the scientific literature, expertise from NOAA, and input from fishermen. The goal of the amendment is to enhance transparency about the pros and cons of different management approaches and is directed at diverse fishery stakeholders. I believe this approach would bring a number of positive attributes, including the following:

1. The proposal is designed around the collection of information that would be useful in the evaluation of different approaches to management. It does not mandate the adoption of any particular approach.

2. As these novel approaches to fishery management are increasingly adopted, data concerning their effects mounts, which both facilitates improved design over time and eases the implementation burden of the analysis proposed here.

3. In terms of the transition from analysis to actual program design, the responsible fishery management council could use the analysis as an important starting point for the actual design of the fishery management change; this will reduce the design burden to the council.

4. The information provided by this analysis will draw on multiple stakeholders' expertise, and will level the playing field across these stakeholders, ensuring that asymmetric information is not being used for political or special interest gain.

5. Requiring a comparison across a number of alternatives ensures that we do not get stuck in marginal thinking about any one design.

6. Perhaps most importantly, because the ultimate goal of this proposal is to improve fishery management, the new amendment will pay for itself through improvements in economic efficiency of our nation's fisheries.

An important underlying principle for this proposal is that fishery management institutions can have very different economic, social, and ecological effects and that highlighting the trade-offs across these objectives when choosing a fishery management approach will ultimately catalyze prosperity in U.S. fisheries. This principle rests on the evidence that realigning incentives can slow, or even end, the race to fish; this realignment can also increase economic opportunity, and do so while enhancing ecosystem and community benefits. Indeed, of the hundreds of catch share programs worldwide, very few have ever been revoked.[21]

In the following sections I review empirical evidence and transition costs, focusing on the evidence of the benefits and costs of catch share adoption, drawing primarily on global empirical analyses.

5.1. EMPIRICAL EVIDENCE

The robust conceptual basis for catch shares leading to prosperous fisheries has, until recently, been untested empirically. This is because most catch share programs are young, and little systematic data collection has occurred. But over the past decade several large-scale studies have analyzed the aggregate effects of catch shares on economic and ecological outcomes.

Prosperous fisheries require robust fish stocks, so it should come as no surprise that the economic and ecological outcomes are linked under catch shares. Simply put, maximizing economic returns from fisheries requires sustainable management. Except for the rare case of extremely slow-growing stocks, fisheries attain a higher value from harvesting at moderate levels in perpetuity than they do by mining the entire stock and investing the proceeds in alternative investments.[22] To the extent that industry can influence extraction rates, economic theory predicts and anecdotes seem to bear out that fishermen will apply political pressure to reduce exploitation (if excessive) as a consequences of catch shares. Theory would not predict this kind of political pressure in the absence of catch shares.

This argument suggests a tight coupling between fish stock management and economic returns from a fishery. But a second, and perhaps more powerful, pathway to prosperity can arise from catch shares. Catch shares change incentives for

investment and harvesting behavior that tend to (1) reduce the cost of fishing, (2) increase the price received, and (3) increase safety of fishing. While the magnitude of these three effects will depend on program design and fishery characteristics, one or more of these effects tends to emerge in all catch shares. When put together, catch shares produce three mechanisms that drive economic prosperity. First, they lead to more-efficient use of economic inputs; this lowers the cost of fishing, often by 30 to 50 percent. Second, they lead to a higher-quality, higher-value product that raises prices, typically by 10 to 40 percent, as fish are sold on the fresh, not frozen, market. And third, they incentivize the efficient management of fish stocks, which leads to a higher harvest over time (Heal and Schlenker 2008) and reduces fishery collapse (Costello, Gaines, and Lynham 2008).

Catch shares change incentives for investment and harvesting behavior that tend to (1) reduce the cost of fishing, (2) increase the price received, and (3) increase safety of fishing.

While there is increasing empirical evidence on the economic effects of catch shares, it remains a surprisingly difficult issue to study. Unlike a failing company that is bought out, reformed, and then sold, it is difficult to obtain market prices that reflect the value of a fishing operation before and after catch share implementation. Yet several empirical studies use clever approaches to estimate the economic effects of catch shares. Grafton, Squires, and Fox (2000) examine microlevel data on the transition to ITQs in the British Columbia halibut fishery. They uncover several dimensions of economic efficiency gains, and also find evidence that further restrictions (e.g., on transferability of rights) can hinder efficiency. Newell, Sanchirico, and Kerr (2005) carefully follow ITQ prices in New Zealand fisheries over time, starting with the adoption of ITQs in the mid-1980s. They find that these markets behave according to basic financial principles, and also find evidence that long-run conservation measures (e.g., reducing harvest in one year to increase the stock) are linked to higher asset values. And Grainger and Costello (2012) focus on a single U.S. fishery, the red snapper fishery in the Gulf of Mexico, that switched to a catch share in 2007. They were able to obtain the price of transferable limited entry fishing permits prior to catch shares and compare that with the value of ITQ rights after the transition. Since each permit or ITQ share represents an asset, which in principle reflects the capitalized value of the resource, this is a valid way to compare the change in economic value before and after the ITQ. While the focus of their study is on the distributional effects of catch shares, they also estimate the aggregate economic benefits of adoption that range from a twofold increase in economic surplus to a tenfold increase in market capitalization.

Numerous other anecdotes exist, including the dramatic lengthening of the halibut season from about 4 to about 200 days; much higher prices, mostly due to accessing the fresh market; efficiency gains from cost reductions (Weninger 1998); and other effects. The Organisation for Economic Co-operation and Development (Costello, Kinlan et al. 2012) reports on a recent bioeconomic analysis of eighteen prototype fisheries. The purpose was to estimate the economic value of implementing catch shares, where the increase in value arose both from purely pecuniary sources (price increases or cost decreases) and from optimizing the yield. While every fishery examined showed an increase from catch shares, the range in response was also large: from just 8 percent to over 400 percent, with a conservative average of more than a doubling of value of the fishery from the adoption of catch shares.

Péreau and colleagues (2012) examine whether ITQs can be designed to achieve a triple bottom line in which economic, social, and environmental goals can be achieved simultaneously. They find that with careful design this can often be the case, but they also identify circumstances under which important trade-offs are induced. These trade-offs raise significant questions about society's objectives and how those objectives translate into program design. Catch shares may also have important effects on consumer welfare. Typically the slower pace of fishing leads to a higher fraction of catch being sold as high-quality fresh rather than frozen product (Homans and Wilen 2005). Although this almost always entails a price increase, it arises from a quality increase, so overall consumer welfare may actually increase. Furthermore, if overall fish catch increases, such as due to stock rebuilding, consumers may benefit in the long run.

Since the proposal made here would simply require information provision, it is hard to see how it could affect any party adversely. On the other hand, one could make a political economy argument that certain actors benefit from asymmetric information and the inefficiencies of status quo management. But aside from the direct costs involved in conducting the analysis proposed here (see section 5.2), it is hard to argue that providing such a comparative analysis could be detrimental to social welfare.

5.2. TRANSITION COSTS

Next, I consider two classes of transition costs. First, I address the anticipated fiscal costs of the proposed amendment that requires, for some fisheries, a comparison across management approaches. Second, I consider the transition costs of actually adopting catch shares in the event that a catch share is found to outperform other approaches.

For any given fishery, the costs of the comparative analysis are expected to be fairly small, and are very likely to pay for themselves because they will motivate efficiency gains in management. The burden would primarily fall on the fishery management councils but would be offset by the proposed increase to NOAA funding. I recommend, as does the Catch Share Policy, that a cost recovery plan be developed so a small fraction of the efficiency gains (from eventual improved management) could be captured to pay back the costs of the analysis. But even if the fishery itself does not explicitly pay back the costs, the federal government is likely to save money in the long run because of reduced disaster claims. Since an explicit requirement of my proposal is analysis of the change in risk associated with management alternatives, then to the extent that an approach that reduces risk is more likely to ultimately be selected, the government stands to save in cost (e.g., through reduced disaster payments in the future). A further dimension of cost savings involves the dynamics of this policy recommendation. The first few fisheries to undertake the analysis are likely to bear the greatest cost as methods, data, and process are worked out. But subsequent analyses should get progressively less expensive.

While the costs of actually implementing the proposed amendment to MSA are likely to be small, there may be larger costs associated with actually reforming the management of a fishery, should the council decide to do so. For example, an ITQ allocated at the individual level may require on-board observers or cameras to observe the catch so that low-value catch is not wastefully discarded at sea. If privileges are transferable, those trades must be tracked by the relevant agencies. And different kinds of catch shares may require different kinds of scientific information for their implementation. For example, a catch share that allocates fractions of the allowable catch must be in a position to determine the allowable catch, which usually requires an estimate of fish biomass.[23] Good data from around the world can shed light on this challenge; the costs of implementing different forms of catch shares are becoming better known (see Grafton and McIlgorm 2009), and this information can be used in the design phase. But two important insights emerge from this analysis. First, it immediately becomes clear that many of these costs are not additional. That is, they are costs that would need to be borne by any fishery management system that wished to achieve similar goals.[24] Second, the increase in value that accrues from a catch share can be tapped, often at a very small fraction, to cover any additional management costs that do arise.[25] This second point arises because short-term costs of management reform are more than overcome by long-term increases in fishery value from improved management.

Chapter 6: Questions and Concerns

If it is indeed the case—as I speculate here—that the proposed analysis will lead to greater adoption of catch share regimes, a number of concerns arise. Switching from a regulation-based regime to a catch share regime necessarily alters incentives, behavior, and outcomes. When property rights systems have gone awry in the past, it has generally been because the goals of the program have not been well articulated at the outset. The fact that different goals are achieved through different fishery management approaches motivates my proposal. Still, some designs have been tested only in developing countries or in contexts dissimilar to those found in the United States. In this section I articulate some of the key challenges, discuss how they might be overcome through innovative and careful design, and, in the process, identify some emerging opportunities that would be made possible by a transition to property rights.[26]

HOW WILL CATCH SHARES AFFECT FISHING COMMUNITIES?

The welfare of fishing communities features prominently in fishery legislation in the United States. Rightly so—America's port towns have rich histories that are often built on the fishing industry. Because fisheries were mismanaged through the 1990s, and fish stocks declined, fishery management plans were left with no choice but to drastically cut catches or to cease harvest entirely, with palpably adverse short-run consequences to fishing communities. After a decade or more of these drastic cuts, it is easy to see how a fishing community would be wary of further changes to management.

Effects of catch shares on fishing communities are complex and highly dependent on design. For example, the canonical catch share applied in New Zealand (the ITQ) is specifically designed for economic efficiency. The consequence is that the most efficient fishermen often acquire, through voluntary trade, the rights of inefficient fishermen. This leads naturally to industry consolidation and is a natural process of reducing overcapitalization in the fleet. Despite the fact that this consolidation occurs voluntarily, with the less-efficient fishermen compensated for exiting the industry, and that it mirrors other labor transitions in the U.S. economy, it is often seen as a downside of ITQs. Furthermore, there may be differential effects on the owners of fishing rights and on the labor (i.e., crew) in the fishery. While the long-run employment effects have not been studied extensively, there is some evidence that the number of part-time jobs will decrease and the number of full-time jobs will increase, while total employment will remain about the same (Grimm et al. 2012).

Yet catch shares can in fact be designed for community prosperity. As discussed in this paper, I suggest analyzing an approach in which rights are allocated to groups such as communities, ports, or cooperatives.[27] The design could include a stipulation that the fish harvested under that quota must be landed and processed in that port. It may also include detailed provisions for participation (e.g., only fishermen with a history in the port), recruitment of new fishermen (e.g., in an apprenticeship program), and public goods provision (e.g., a communal distribution, ice, or retail facility) that are made possible by the ownership of privileges at the community level. If consolidation is a concern, the catch share may limit ownership by any single entity.[28] Some of these provisions surely will have economic trade-offs. For example, the requirement that only local fishermen can utilize quota from that port may exclude a more efficient fisherman. And a cap on consolidation ensures that economic efficiency is not achieved. But when preserving local fishing heritage is a primary goal, these may be acceptable trade-offs.

CAN THIS APPROACH BE EXTENDED TO STATE FISHERIES?

Thus far the discussion has intentionally focused on federal fisheries, which make up the majority of fish catch in the United States. While they are much more numerous, the policy circumstances under which state-level fisheries operate are much more heterogeneous; it is difficult to think about how federal policy could implement catch shares at the state level. Yet the federal government stands to benefit in several ways from catch share adoption in state fisheries and may thus wish to influence catch share adoption at that level. First, to the extent that catch shares improve welfare of U.S. citizens (primarily fishermen, but also consumers and downstream industries), the federal government should be interested. To the extent that fishery profits rise, the federal government stands to gain through increased income tax revenue.[29] Furthermore, many fisheries straddle state and federal jurisdictions; similarly, the same fisherman will participate in a state and a federal fishery. Harmonizing the management

systems across these jurisdictions would likely have add-on benefits, such as reducing monitoring and enforcement costs.

But how can federal policy motivate the design and implementation of catch shares at the state level? I believe there is strong scope for tailoring my main proposal—that comparison of alternative fishery management approaches be required—to state-managed fisheries. While the details for such a system would need to be worked out, the basic idea is for the federal government, through the Department of Commerce, to provide strong incentives and perhaps even a mandate for states to analyze the likely effects of alternative approaches for managing fisheries.

CAN CATCH SHARES BE USED FOR TRANSBOUNDARY STOCKS?

Several prominent U.S. fish stocks traverse other countries' exclusive economic zones (transboundary stocks) and/or the high seas. In both cases, U.S. harvest policy is necessarily strategic: the United States must determine how much to harvest given some assumption about the harvest of its competitors. In some cases, international agreements have been signed, with varying (although mostly poor) records of success.[30] What does the transboundary nature of a stock suggest about catch share adoption in a fishery? First, in a purely competitive fishery (i.e., with no real cooperation among the harvesting countries), the United States should still strive for economic efficiency in its own harvest. Whatever the harvest will be, I argue that this is often most efficiently extracted (i.e., with lowest cost and highest price) with a catch share. Second, in cases in which a harvest agreement exists across countries, the adoption of a transboundary catch share can greatly improve economic efficiency. Such a system could be designed to allow both intracountry trade (i.e., trade of harvest rights among fishermen within a country) as well as intercountry trade (i.e., trade of harvest rights across countries).

ARE RECREATIONAL FISHERIES EVER INTEGRATED INTO CATCH SHARES?

A central challenge in U.S. fishery management that is also present in some other countries is that many stocks are shared by a commercial and a recreational sector. Under conventional management the fishery management council must decide on a division of the available harvest for each sector (X percent for the commercial sector, 100 – X percent for the recreational sector). There is a rich and growing literature on the possibility of using catch shares in recreational fisheries. For example, a tag system, similar to the tags used for big game hunting, could be used for game-style fish in a recreational fishery, such as for tuna. For other fishery types, a cooperative style of management may be more attractive.[31]

There are also important interactions between commercial and recreational fisheries that must be accounted for in design of catch shares. First, without strict oversight it is probably a mistake to institute a catch share in only one sector, leaving the other open access. This is because the benefits that should seemingly accrue from catch share adoption will typically be dissipated by the open access sector, thus reducing or completely eliminating any benefits from the catch share.[32] But when both sectors are included in the catch share, many benefits are likely to arise. For example, a cross-sectoral ITQ program would allow recreational boat captains to acquire more harvest rights to extend their season to accommodate high recreational demand. Or commercial fishermen could acquire more rights when fish prices are high. In a cross-sectoral TURF program, recreational TURFs could be managed more like clubs—for example, with catch and release only, or with small bag limits. This spatial separation between sectors could improve welfare of both sectors.

ARE CONSERVATION EFFECTS ACCOUNTED FOR BY CATCH SHARES?

One of the greatest conservation challenges in fisheries management is the incidental catch of species of concern. As examples, Pacific long-line fleets often catch sea turtles, bottom trawlers catch unmarketable rockfish, and shrimp fisheries catch red snapper, substantially reducing snapper populations. Well-designed catch shares can help mitigate these problems through a variety of means. First, in truly multispecies fisheries such as the New England groundfish or Pacific groundfish fisheries, a catch share such as an ITQ can be applied to all species, and not just to the species targeted by fisheries. That is, a quota is issued for each species independently and that quota is tradable. Species that are caught only incidentally and that have dangerously low population levels, such as a yelloweye rockfish in the Pacific groundfish fishery, are given a small quota, so their trading price is high. This provides a strong market signal to fishermen to use fishing approaches (gear type, when to fish, where to fish, etc.) that minimize the catch of those species. Thriving species are given higher quotas, and so have lower trading prices, and less effort will be expended avoiding them. This market approach can provide strong conservation incentives in multispecies fisheries.[33] Naturally, the same approach can be used for incidental catch of sharks, turtles, or other charismatic species. In those cases, there may be a social or ethical motivation for species protection; for instance, there are conservation organizations that focus attention only on shark or turtle conservation.

In the absence of a catch share, those groups' only recourse is to advocate for legislation banning the take of the species. A catch share provides a vehicle under which a conservation organization may purchase quota (e.g., in an ITQ fishery with quota on the bycatch of sharks) and choose not to fish it. This purely market transaction allows conservationists to participate in a market alongside fishermen.

WHAT WILL BE THE EFFECTS OF CLIMATE CHANGE ON FISHERIES? CAN CATCH SHARES HELP US ADAPT?

There is strong and mounting scientific evidence that climate change will have important consequences for the world's fisheries (Sumaila et al. 2011). Anticipating these changes in the design of catch shares or other management approaches could help limit the damages or enhance the benefits. While a review of the scientific literature on climate change and fisheries is beyond the scope of this paper, some of the key changes that are expected over the coming fifty years include (1) higher ocean acidification, which can harm a species' ability to develop a shell; (2) generally warmer water pushing a species' range poleward; and (3) more-variable oceanographic conditions. While these are some of the anticipated effects, there is still a large degree of uncertainty about the extent to which the natural system will be able to adapt to climate changes. This suggests that there may be a great deal to be gained from designing management institutions that are robust to, or facilitate adaptation to, the kinds of changes we anticipate.

Some catch share designs are naturally more adaptive than others. For example, an ITQ, which allocates harvest privileges as fractions of a total allowable catch, is naturally adaptive in the sense that the total catch can easily be altered over time as the true effects of climate change are revealed. A cooperative can also be naturally adaptive because cooperatives often monitor, measure, and respond to changing conditions. A TURF fixed in a given location, particularly if the scale of the TURF is smaller than the scale of climate change–induced range shifts, may be less adaptive, though owners may then be incentivized to acquire multiple TURFs to account for the possible range shifts that might occur.

WHAT ARE THE DATA NEEDS UNDER CATCH SHARES?

Effective catch share implementation often requires more data than does traditional fisheries management. Revisiting the fishery management rubric from section 2, we see that open access fisheries require essentially no data. Regulated open access fisheries may require some basic monitoring of catch trends or other data, but because they do not limit entry, they will constantly be playing catch-up as the fleet expands and develops new technology. Limited entry fisheries require reasonably good data because they almost always require setting a total allowable catch for the season. Yet for two reasons they often end up collecting less data than would a similarly designed catch share. First, they often lack careful individual monitoring of catch, which partly explains why quotas are often exceeded fishery-wide. Second, they often fail to monitor the catch of nontarget species, which is why bycatch rates are so high. Depending on design, catch shares often require careful (even daily) monitoring and reporting of catch by species, and often by vessel. These data are combined with sophisticated stock assessments to monitor the fishery's progress (e.g., toward a rebuilding target) and to set allowable catches the following season.

Yet two key points must be made here. First, high-quality data are required to manage any fishery well. The fact that catch shares make this explicit should not be viewed as an additional requirement arising from catch shares. Second, because catch shares often produce a fishing asset whose value is tied to the effective management of the resource, the fishermen themselves have a stake in the long-term health of the fishery, and thus in the data collected from the fishery. Anecdotal experience from New Zealand, the United States, and elsewhere suggests that the fishing industry tolerance for, involvement in, and funding for data collection are substantially increased with catch shares. So, while catch shares often insist on higher-quality and thus on more-expensive data, the consequence is a better-managed, more-predictable fishery with higher asset value for the fishermen or communities who hold the privileges. Ultimately, an efficient design will balance the costs and benefits of higher-quality data.

Chapter 7: Conclusion

The basic premise of this paper is that many U.S. fisheries are substantially underperforming—primarily along economic and social dimensions, but in some cases also along ecological dimensions—but that this can be remedied by adopting more-efficient forms of fishery management. Catch shares are not a one-size-fits-all solution. Rather, they are a class of management tools encompassing diverse approaches such as TURFs, ITQs, and cooperatives. The common thread among these approaches is that they all provide some kind of secure privileges for their users that provide a long-term incentive for appropriate investment in and efficient exploitation of the underlying fishery resource. If designed with all the idiosyncrasies and diverse goals of a fishery in mind, catch shares can deliver markedly better outcomes than does the status quo. While some slow progress has been made in adopting catch shares at the national level, much work, and many exciting opportunities, remain.

Establishing the conceptual basis for adoption of catch shares, and identifying policy levers to implement those reforms, are two different concepts. I have discussed several possible vehicles for motivating broad-scale catch share adoption in the United States. For a variety of reasons, the approach that would mandate catch share adoption seems likely to fail. The approach that relies entirely on incentives that NOAA can provide to fishery management councils has been tried, with little uptake. I propose a new alternative that would require each fishery via its relevant fishery management council to conduct and make public an analysis that compares the status quo management approach to several alternatives, including a catch share designed for profit maximization and a catch share allocated at a community level. If the conceptual basis put forth in this paper—that catch shares can outperform conventional management under most reasonable objectives—is valid, then this proposed approach may result in significant uptake of efficiency-enhancing fishery management approaches. Furthermore, whichever approach is ultimately selected, the comparative analysis proposed here will serve as a useful starting point for the design and adoption of the actual management reform.

A conservative estimate, based both on empirical findings from U.S. fisheries that have already transitioned to catch shares and on bioeconomic models of the likely effects of these reforms, is that fishery value will more than double from the implementation of catch shares. This confers enormous benefits to the rest of the U.S. economy, and will move our increasingly disenfranchised, marginalized, and depressed fishing ports from a defensive position of blocking any fishery policy change to an assertive position of strength and prosperity.

Numerous implementation questions remain to be answered. How will the design of alternative management approaches (to be analyzed) be determined? What technical expertise can and should be provided by NOAA? What will be the timing of this rollout? While these are important questions, none of the problems they imply seems insurmountable, particularly given the stakes and opportunities at hand.

Author

Christopher Costello

University of California, Santa Barbara
and National Bureau of Economic Research

Christopher Costello is a professor of economics at the Bren School of Environmental Science and Management, University of California, Santa Barbara; and a research associate at the National Bureau of Economic Research. He has authored over fifty peer-reviewed articles on property rights and fishery management that have been published in journals such as *Science*, *Nature*, *Proceedings of the National Academy of Sciences*, and *Journal of Environmental Economics and Management*. He is co–principal investigator of the Sustainable Fisheries Group at University of California, Santa Barbara, and regularly consults with conservation organizations and the fishing industry about fishery management design.

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Endnotes

1. The councils are North Pacific, Pacific, Western Pacific, Gulf of Mexico, Caribbean, South Atlantic, Mid-Atlantic, and New England.
2. The high seas are the area of ocean falling outside any country's exclusive economic zone and represents 58 percent of the global ocean.
3. There are some exceptions. The most recent report (NOAA 2012) shows that 19 percent of U.S. federal fish stocks are in an overfished condition.
4. Some species exhibit an Allee effect, where low population levels lead to eventual extinction.
5. The few fisheries that remain open access are usually in that category because very little information has been gathered with which to establish credible and effective regulations.
6. See Costello and Deacon (2007) for exceptions under which ITQs will not, by themselves, end the race to fish.
7. This incentive exists for all catch shares, though individual incentives may differ from group incentives.
8. The actual analysis would ostensibly be undertaken by the fishery management council in charge of the fishery, but would presumably draw on expertise within NOAA, academic researchers, and fishermen and other stakeholders.
9. For example, the models and other assumptions used in forecasting the likely effects of each management alternative should be made explicit and should be publicly available. In many cases, doing so would not require completely novel analysis, but could instead draw on results from existing analyses.
10. An admittedly imperfect version of this extension, called the sectors program, has been applied in the Northeast United States. For more information, see NOAA (2010a).
11. Some forms of cooperatives may not be viewed as catch shares. Bonzon and colleagues (2010) and NOAA (2010b) provide guidance about cooperative designs that achieve different kinds of objectives.
12. The "Catch Share Design Manual," produced by the Environmental Defense Fund (Bonzon et al. 2010), provides a detailed technical discussion of design options and how they can be matched with fishery objectives. NOAA's Catch Share Policy (Anderson and Holliday 2007; NOAA 2010b) provide further institutional detail and guidance about catch share design principles.
13. If one considers traditional fishery management approaches in the developing world, such as customary marine tenure, then there are thousands of catch shares worldwide.
14. An important example of the British Columbia system is the U.S. West Coast Groundfish program.
15. The first U.S. catch share, initiated in 1990, was an ITQ program for Atlantic surfclam and quahog. The most recent catch share is the program for the Gulf of Alaska rockfish.
16. The number of catch shares adopted by the fishery management councils are North Pacific (6), Pacific (2), Western Pacific (0), Gulf of Mexico (2), Caribbean (0), South Atlantic (1), Mid-Atlantic (2), and New England (4). In fact, the MSA requires a fisherman referendum in New England and the Gulf of Mexico in order to submit a catch share proposal to the secretary of Commerce.
17. That is, the Policy does not provide any indication of the characteristics of fisheries for which catch shares would fail to be the best option.
18. Importantly, this is essentially a sharing of the resource rent or profit from the fishery between fishermen and the government. This is fundamentally different from cost recovery, which deals with recovering from the fishery the costs of management.
19. I am aware of no U.S. fishery that has initiated a royalty program. In designing a royalty program, one must carefully consider the change in incentives it may provide to harvesters.
20. It seems that the broad-scale adoption of catch shares in New Zealand followed national-level policy toward a more market-based economy.
21. I have come across only two that were revoked: (1) the Chignik salmon fishing cooperative in Alaska, which was disbanded in 2004 due to a state law that prohibits a fisherman from profiting from a fishery in which he is not an active harvester (the cooperative shared profits among members); and (2) a very small sea cucumber fishery in Ecuador that attempted an ITQ in 2004, and reneged the following year due partly to concerns over the initial allocation process.
22. The exception is when the intrinsic growth rate of the population (i.e., the highest possible growth rate) is lower than the discount rate. In such cases, it can be more profitable to harvest the resource and invest the proceeds in an alternative investment than to harvest sustainably; see Clark (1973).
23. It is extremely costly to count fish. A single typical stock assessment may cost $500,000.
24. For example, if a fishery manager wants to avoid unreported at-sea discards of charismatic species such as sea turtles, then at-sea monitoring will be required whether or not a catch share is in place. Still, adopting a catch share remains a challenge because a resource-constrained fishery management agency may view the short-run costs of the status quo as significantly smaller than the often large setup cost of designing and implementing an effective catch share.
25. Tapping this increase may distort some of the incentives described above, however; fishery management councils should carefully consider such distortions before proceeding (Johnson 1995).
26. Several of these issues are also addressed in the MSA and/or NOAA's Catch Share Policy (NOAA 2010b).
27. See Grimm and colleagues (2012) for data on the fraction of quota that has been allocated to communities in U.S. catch shares.
28. Such limits are common in U.S. catch shares.
29. This revenue could be substantial. A doubling of fishery profits would more than double the income tax revenue the federal government receives from commercial fisheries.
30. For example, agreements have been signed by regional fishery management organizations.
31. This cooperative style of management of recreational fisheries has been coined an Angler Management Organization.
32. Some form of regulation in the non-catch share sector can help alleviate this. For example, bag or size limits in the recreational fishery can help limit catch, and will reduce, but almost surely not eliminate, rent dissipation.
33. A key consideration here is cost. To set reasonable total allowable catches will require some form of stock assessment, even on the extremely low-value species. It may be worth exploring other fishery approaches (e.g., marine protected areas) to protect the very low-value, and costly to measure, species in the ecosystem.

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THE HAMILTON PROJECT

ADVISORY COUNCIL

Highlights

Christopher Costello of the University of California, Santa Barbara proposes an amendment to the Magnuson-Stevens Fishery Conservation and Management Act (MSA), the federal law guiding the management of U.S. fisheries. The amendment is intended to give fishing communities the information necessary to advocate for management approaches that reflect their economic, social, and ecological goals.

The Proposal

Require fisheries meeting certain criteria to undertake a transparent comparison of the economic, social, and ecological trade-offs between status quo management and alternative management structures. The comparative analysis would include property-rights structures that fall into the broad class referred to as catch shares. Catch shares are designed to give fishing communities a greater stake in the sustainability of fisheries, thereby preventing their depletion and building their long-term economic prosperity.

Increase funding for the National Oceanic and Atmospheric Administration (NOAA) to support fisheries in their analysis of alternative management structures. In addition, NOAA would expand its support for the design, implementation, and monitoring of catch shares.

Benefits

The transparent comparison of status quo management to several alternatives will provide fishermen and other stakeholders with the necessary information to better advocate for management approaches that reflect their diverse goals. Costello maintains that transparent comparison will prompt many fisheries to adopt catch shares. Drawing on a growing body of empirical evidence, Costello contends that catch shares produce three mechanisms that drive economic prosperity. First, they promote the efficient use of economic inputs, lowering the cost of fishing, often by 30 to 50 percent. Second, they improve the quality and value of the product by dramatically extending the season length, which typically raises prices by 10 to 40 percent as fish are sold on the fresh, not frozen, market. Third, they encourage the efficient management of fish stocks, increasing harvest over time and reducing fishery collapse.

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(202) 797-6484

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