Empirical Evidence on the Role of Distribution in Determining Level of Policy Support

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Abstract

Economists have characterized efficient policy remedies for market failures, but inefficient institutions persist. When changes in policy also result in a change in distribution of wealth, even the most efficient policies can be politically infeasible. In many settings, successful policy adoption requires a trade-off between efficiency and distribution. Individual transferrable quotas (ITQ), have encountered a considerable amount political opposition despite their well-documented improvements of harvesting efficiency and fishery health. This paper provides empirical evidence that political opposition is linked to distribution of benefits under the new management regime. Support among fishers is significantly lower among those with the smallest expected gains under ITQ management. I construct novel dataset linking a fisher's stated opinion on ITQs, given at a public forum, to catch history and expected quota allocation.

I utilize over 3,000 political participation records in the form of public testimony and written letters to link distributional concerns to opposition to property rights. Results show that fishermen who expect to receive less quota relative to their expected non-ITQ catch are more likely to oppose. For instance, a fisherman who missed one of the grandfathering years is around 20% more likely to oppose ITQs. Changes in the way a resource is managed have the potential to change industry structure. Political opposition is significantly higher for individuals that have downstream connections to fishing industry. These individuals are not directly involved in extraction of the natural resource, but live in communities and work in jobs that are built off the premise of the derby fishery. In many settings, successful policy adoption requires a trade-off between efficiency and distribution.

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"There are still ocean cowboys around who feel this is the last frontier. They think that anybody should have a right to fish, no matter what it does to the resource and whether or not it makes good economic sense." – Walter Pereya, Seattle Seafood Processor[2]

I. Introduction

Economists have characterized efficient policy remedies for common pool resources (taxes, cap and trade, etc.), but inefficient institutions persist. When changes in policy also result in a change in the distribution of wealth, even the most efficient policies can be politically infeasible. As a consequence of distributional concerns, policy design tends to trade-off between efficiency and distribution. In the context of implementing property rights based management for natural resources (e.g. fisheries, pollution), the initial allocation of rights may not impact economic efficiency (Coase, 1960), but can have a significant impact on distributive equity amongst stakeholders and therefore could influence whether or not the policy is adopted.

Many environmental and natural resources remain characterized by insecure property rights and open access conditions despite large potential gains from increased institutional control. One of the most extreme examples of inefficient resource use is in fisheries, where there are an estimated $50 billion in losses worldwide each year (Costello et al. 2016). A 2004 study by the FAO (2009) found that better management could alleviate losses by up to 50% of current fishery revenues (via Arnason, 2012).[3] As of 2015, there were 15 property rights based management programs in place in the United States (NMFS, 2015), but many fisheries are still

[2] May 11, 1989. San Jose Mercury News.

[3] The study by the World Bank and FAO (2009) found that in 2004 the global ocean fishery operated at a significant net economic loss financed in part by government subsidies.

managed using command and control methods. Many fisheries are managed under regulated open access conditions where rules restrict season length, gear type, and other methods of harvesting. These types of rules have been characterized as “regulation by inefficiency” because they promote a race to fish wherein overcapitalization is combined with high-cost and dangerous fishing practices. There is compelling and increasing evidence that property rights based management, the movement of a fishery to Individual Transferable Quotas (ITQs), improves both the economic and ecological health of a fishery (Arnason 1997; Grafton 1996; Dewees 1998; Danielsson 2000; Clark 1980; Costello, Gaines, and Lynham 2008). Yet inefficient management persists.

The difficulties of transitioning out of an inefficient management regime are linked to the cost of the process by which a new institution is created and adopted (Libecap 1989; 1993). A large amount of political resistance can result in delays or even stop the policy formation and adoption process. Political resistance to cap and trade policies, like ITQs, can be disaggregated into three main stages: capping, allocation, and trading (Heinmiller, 2007). The primary focus of this paper is political resistance at the allocation level. Understanding the distributional issues that determine opposition may allow policymakers to better design politically feasible property-rights based resource management programs.

In the context of US fisheries, decisions about resource management are mandated by the Administrative Procedure Act to incorporate stakeholder input (Turner et al, 2005).[4] It is

[4]The Administrative Procedure Act requires that all U.S. federal regulatory agencies “shall give interested persons an opportunity to participate in the rulemaking through submission of written data, views, or arguments with or without the opportunity for oral presentation” (Title 5 U.S. Code Section 553(c), 1988 edition). In Corrosion Proof Fittings v. Environmental Protection Agency (1991) the Supreme Court showed its willingness to require that public opinion be adequately consulted. (In this case, the court vacated proposed regulation because

apparent that political opposition has halted or delayed many resource management programs in the United States. When Congress reauthorized the primary law governing fisheries management in US federal waters, the Magnuson-Stevens Act (MSA, 1976) in 1996, political pressure from the processing industry and other equity concerns led to the issuance of a 6-year moratorium on the creation of new ITQ programs (Guide to U.S. Environmental Policy). Prior to the MSA reauthorization, Alaskan Pollock harvesters attempted to strengthen the institutions governing the fishery, but political protests from processors halted any new or pending plans to change management regimes in a way that allocated rights to individual harvesters.

In the formation of some of the earliest US ITQ programs, concern for small-scale fishermen and the takeover of fisheries by big business were cited as reasons for opposition. The concern has been publically acknowledged as a potential outcome from ITQs in congressional testimony.[5] Public opposition to ITQ systems is not limited to the United States. The Icelandic Cod Quota system, implemented in 1983, resulted in sweeping concentration of the fleet and the public naming the quota holders “Lords of the Sea” (Helgason, 1996). In Canada, opposition to ITQs has been so strong that one parliamentary committee in Ottawa went so far as to argue that evidence for New Zealand and Australia’s ITQ systems shouldn’t be used to justify Canada’s use of ITQs (Mctaggart et al. 2003).

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the Environmental Protection Agency prematurely ended public hearings and deprived the public of sufficient opportunity to “comment [on], analyse, and influence the [regulatory] proceedings”

[5]Rolland Schmitten. Assistant Administrator for Fisheries at the National Marine Fisheries Service in answering questions in congressional testimony in 1994: “Do ITQs promote ‘big-business’ as large companies have resources to buy or lease a significant amount of shares? This could happen, as experienced with grocery stores, agriculture, and other such enterprises… To the extent that larger firms are relatively better capitalized, they may be able to obtain more shares relative to their needs for efficient operation than could smaller firms.”

This paper explores the economics of political resistance to ITQ adoption. In changing the property right allocation from the status quo, some users may see net losses even if the overall gains are large. Other users do not foresee future losses but instead see opportunity to increase their share by holding out. These users may delay or prevent the adoption of a welfare-enhancing institution (Matulich and Sever, 1999). While this has been the case in the evolution of many ITQ programs in the United States and other countries, there is limited understanding of the specific economic factors which determine stakeholder position on ITQ and other property rights based management programs.

Prior research shows how ITQ design affects the distribution of benefits among and within sectors (Matulich and Sever, 1999; Costello and Grainger, 2015; Costello, 2015). This paper tests whether the distribution of benefits explains opposition using data from the adoption of the Alaskan Halibut and Sablefish ITQ program. The adoption of the Alaskan Halibut and Sablefish ITQ in 1995 culminated fourteen years of deliberations. As such, the program development process was noted as being “enormously complicated and controversial” with “extremely painful” deliberations (Pautzke and Oliver, 1997). In both fisheries, quota was allocated based on historic catch. Given the same catch pre- and post-ITQ, a harvester is expected to be at least as well off, in terms of catch, under the ITQ regime. Allocation is contentious when harvesters do not believe the initial allocation formula provides them an equivalent catch in the future as would occur under status quo management. For instance, individuals with inconsistent participation history in a fishery may receive an initial quota lower than what was actually caught in any year in which they participated.

This paper links political opposition due to allocative concerns to fisherman characteristics: parties from remote communities, harvesters with high volatility in landings, and low volume fishermen. ITQ programs were implemented in the Alaskan Halibut and Sablefish fisheries simultaneously in 1995. I exploit differences in the locations and characteristics of harvesters and other stakeholders to disentangle the underlying economics of opposition. I construct a unique dataset by coding available public comments made between 1987 and 1992. Public comments are in the form of oral testimony and written communication. This time period captures the initial reaction to the ITQ management proposals and is the time period where all major modifications were made to the ITQ/fishery management plan. The names of commentators are linked to individual characteristics, including location, vessel ownership and landings data. The combined data are used to statistically test the role of participation history and location in determining levels of support for ITQ implementation. Results show that being a vessel owner increases the likelihood of being in favor of ITQs by 30 percentage points, while being located in a remote location decreases likelihood of being supporting ITQs by about 30 percentage points. Larger harvesters are more likely to be in favor of ITQs and variation in annual landings is negatively related to ITQ support.

Identifying and quantifying the underlying reasons certain harvesters, remote community members, and industry members may lose under certain policy designs can assist in the design of management institutions, reduce the amount of opposition and the length of time to implementation, and improve overall implementation efficiency. Understanding opposition allows policy to be designed to achieve a variety of social goals. For instance, to achieve the most effective design incorporating benefits to fishing communities, rights can be allocated to fishing cooperatives or fishing ports, rather than to individual fishermen (Costello, 2014). In this paper, I demonstrate how the institutional setting in which policy is implemented affects the distribution of benefits and hence political support. This paper highlights the trade-off between efficiency and distribution necessary to achieve political feasibility.

The paper is organized as follows: Section II provides background on ITQs and the role of public input in the formation of fisheries management in the United States; Section III provides a detailed breakdown of the distribution of costs and benefits and develops testable predictions; Section IV describes the data and empirical design; Section V provides the results of the statistical analysis; concluding remarks follow.

I. Background

Changes under Fishery Rationalization

The implementation of ITQs has been linked to political opposition attributable to the redistribution of rents under the new regime (Matulich et al 1996). The fisheries examined in this paper transitioned to ITQ management from regulated open access management. Under regulated open access management, command and control regulations, such as vessel size restrictions, gear restrictions, and season limitations dominate. Such regulations result in a "derby style" fishery associated with a great deal of inefficiency as well as safety concerns. A derby fishery is typically characterized by a large, and often times unrestricted, number of vessels operating during a short time period. As more vessels enter the fishery, regulators shorten the season to avoid overfishing. The consequences of derby fishing on safety are severe: "[p]eople went out in bad weather, boats were overloaded, and crews worked to exhaustion (Woodfurd, 2016)."

One of the major steps towards property rights based management of a fishery is determining who has the right to fish. Similar to cap and trade programs aimed at controlling pollution, harvesting rights are typically allocated by grandfathering where harvesters receive a certain percentage of that year's catch based on average historic catch. When a grandfathering scheme is used, allocation is contentious because individuals prefer the time period when their harvest levels were greatest (Grainger and Parker 2013).

The adoption of property rights hinges on the acceptance by the resource users and other stakeholders. As stated by Hanneson (2004): "those who expect to gain will promote the new institution, those who expect to lose will fight with equal or greater vigor." Stakeholders demand a voice in the process of defining and allocating rights, which often times results in "delays, ambiguities, and transaction costs (Colby, 2000)," but the extent to which distribution determines a stakeholder's position has been largely overlooked in economic literature.

Overall efficiency gains associated with ITQs are large, but vessel owners may oppose if they prefer alternative management techniques or believe they will fare better under status quo management. As Costello and Grainger (2015) point out, the inframarginal rent enjoyed by high skill resource users may, upon the transition to property rights, be capitalized into asset values and transferred to all permit owners. However, they also find that as long as the initial allocation is at least 30% of historic catch, all users will be better off. Guyader and Thebaud (2000) find that many harvesters have preferences for input regulations such as gear restrictions, which are perceived to give equal opportunity to all participants and award the most skillful.

This paper suggests that opposition to ITQs can be traced to the institutional setting in which individual fishing quota is allocated and the resulting distribution of benefits. Grandfathering of quota results in relatively lower gains (or even losses) to vessel owners with inconsistent vessel landings. When quota is grandfathered, newer participants or participants missing a year or more of fishing, will receive a percentage of quota lower than their actual catch in any given participating year. Individuals displaying higher variation in annual landings due to exogenous shocks (broken arm, etc.) may feel their allocation under grandfathering is not reflective of their actual skill level. Both absent and inconsistent vessel owners may object to or delay property rights adoption until the calculation of quota share reflects internal beliefs about future landings potential. In other words, a harvester may try to delay ITQ implementation if she thinks average harvest will increase over time, and past harvest is not reflective of future potential harvest.

Differential valuation of expected future catch by individuals relative to the grandfathering allocation scheme is analogous to the process of unitizing oil fields. Oil lease production is influenced by firm management policies, details of which are not publically available. This leads to internal calculations of lease value that differ from value calculations that are made using publically available data. If a firm believes the estimated lease values calculated using public information are too low, or that delay will reveal new information leading to a larger allocation, the firm will object to unitization (Libecap & Wiggins, 1985). In the case of the fishery, if a vessel owner believes historic landings data is not reflective of future earning potential, the vessel owner may object to and delay rationalization. Libecap and Wiggins (1985) also point out that a firm may resist joining if holding out will result in concession from other parties.

Community Incentives

ITQs can result in changes in fleet size and the timing and location of landings. When landings move from one port to another, factor markets must also move. Many remote Alaskan communities serve as factor markets for the fishing industry, providing fish processing, boat and dock services, and points of sale for fish. Most economic analysis of fisheries management has assumed that individuals act as autonomous agents, maximizing profit under budget constraints (Guyader, & Thebaud, 2000). However, residents of coastal communities worry about the effect of fleet consolidation on non-harvesting employment and economic activity (Reimer, Abbott, Wilen, 2013 8, 16-19). ITQs generate rents through the elimination of excess capital and consolidation of harvest to the most efficient vessels (Reimer, Abbott, Wilen (1-4)). Fleet consolidation results in a reduction in the total number of crew jobs, although the remaining jobs are more consistent and over a longer season (Abbott & Wilen, 2010). The Canadian Halibut fishery experienced a reduction in the number of crew employed on active vessels and a consolidation of the fleet after ITQs were implemented. These two effects resulted in a 32% decrease in employment (Abbott & Wilen, 2010).

The degree to which adverse impacts may occur depends on the relative importance of the fishery to the community's local economy (Stewart, 2006). Many small communities rely on the small-boat fleet and processing industry as a source of local employment. Jobs created by local fishery resources include crew positions, as well as downstream fishery industries including cannery production, and vessel equipment, supply and repair business. Members of small communities participating in Alaskan fisheries may receive allocations of fishing rights in line or above historic harvest levels, but the concern for coastal communities persists, particularly those in remote rural areas.

Fisheries Management and Public Input

Public input plays an important role in the formation of US fishery regulation. In the United States, regional fishery management councils have considerable power in fishery management decisions. The methods used by fishery councils to make decisions and solicit public comment provide the key data source for this paper and here this process is discussed in detail. The North Pacific Fishery Management Council (NPFMC), which regulates the Alaskan sablefish and halibut fisheries, consists of eleven voting members including seven private citizens—five from Alaska and two from Washington— appointed by the Secretary of Commerce from lists submitted by the Governors of Alaska and Washington.[6] Council members appointed by governors may have electoral accountability if reappointment to the council is dependent upon public satisfaction with their performance, and this can result in council members voting for politically favorable or neutral policies.

The fishery management council makes decisions under the authority of the Magnuson-Stevens Act (1976). The council is able to modify and create a fishery management plan (FMP) for fisheries within its jurisdiction. FMPs characterize the way a fishery is managed and changes to management (amendments) are considered by the council at each meeting. The council composition is designed so that all stakeholder groups are represented. Meetings are open to public comments—written, emailed and oral—and council decisions are made by recorded vote in a public forum. After the council has voted, the final decision is sent for a second review to the Secretary of Commerce. The Secretary receives further public comment, and if approved, the Council makes the decision final.[7] Minimum time for regulatory change is over a year, with duration increasing if the regulation is complex or contentious. In the United States, the incubation period for ITQ policy has ranged anywhere from 1 year to 17 years

[6] The council also includes four non-voting members representing the Pacific States Marine Fisheries Commission, the U.S. Fish and Wildlife Service, the U.S. Department of State, and the Coast Guard.

[7] All rules and policies must conform to the Magnuson-Stevens Act, Endangered Species Act, Marine Mammal Protection Act, Regulatory Flexibility Act, the National Environmental Policy Act, executive orders, and other applicable law.

(author's calculations). In the late-1980s and early-1990s the NPFMC floated proposals for ITQs for five fisheries under their jurisdiction: halibut (1988) and sablefish (1987); Bering Sea and Aleutian Island crab (1991); Pollock (1990); Non-Pollock Groundfish (1991); and Rockfish (1991). These proposals were opened to public comment and comments were solicited via meetings and letters until ITQ adoption. The first ITQ scheme was adopted in the halibut and sablefish fisheries in 1995.

Individual Transferrable Quotas (ITQs) were first proposed as potential management methods for Alaskan Sablefish and Halibut in 1987 and 1988, respectively[8]. ITQs offer net gains to resource users, but face pushback from the general public, vessel owners, and industry members. The contentious nature of the ITQ policy resulted in an eight year lag between policy proposal and its implementation. Stakeholders voiced their position on ITQ management at council meetings, through phone-calls, petitions, and written letters. In the time period studied, the fishery council met in Anchorage five times per year and received input from a variety of advisory groups including the science and statistical committee (SSC), Advisory Panel (AP) and "plan teams" on the proposed fisheries policy. The AP consists of members representing user groups, recreational fishermen, environmentalists, and consumer groups.

Between 1987 and 1992, official council meetings were held exclusively in Anchorage although scoping meetings were held in other cities in Alaska and Seattle. The meeting structure is determined by an agenda that is posted by the council. The public may propose changes to regulations by testifying to the AP or making a comment to the Council during the public comment period. These comments may be made in person at the meeting or by writing. At each meeting, the council members and staff receive a briefing book, which contains

[8] Though limited entry had been contemplated since 1981 (NPFMC, 1997).

summaries of background information for each agenda item, reports and materials for each item, and written public comment. Between 1987 and 1992 the council received over 3000 letters and signatures from vessel owners and other interest groups stating their preferences regarding the ITQ policy.

Halibut and Sablefish ITQ: Management History and Policy Design

Commercial harvest of Halibut can be traced back to the early 1900s, and the fishery mostly produced fresh-fish until the 1970s (Homans & Wilen, 2000). Higher halibut prices in the 1970s and the implementation of limited entry programs for salmon fisheries contributed to the growing number of vessels entering the halibut fishery. During the 1980s, the fishery experienced an influx of many larger vessels from crab fisheries as crab stocks declined (IPHC 1987). Even as the total allowable catch stayed steady or increased, the season length shortened due to increased entry (FAO, 2009). The halibut fishery experienced growth when other fisheries experienced low years, and the relatively low cost of entry into the fishery also made the halibut attractive as a “supplemental” fishery.

Halibut and sablefish fishermen often overlap, as both require use of longline gear and similar vessels. However, sablefish are harvested further off the coast at depths of 400m, requiring larger vessels and more specialized gear than halibut harvesting. Halibut are a flatfish caught in waters as shallow as 90 feet, allowing vessels as small as skiffs to harvest halibut close to shore. Sablefish vessels are on average larger than halibut vessels, and a few large vessel operators target exclusively sablefish. Most of these fishers operate vessels 60 feet or more in length, enabling them to fish in less-protected areas, such as the Bering Sea and Aleutian Islands (FAO, 2009).[9]

Pre-ITQ command and control regulations resulted in a race to fish in which vessels and gear are chosen to maximize quantity harvested in a short time period (Homans & Wilen, 2000). This derby setting was particularly dangerous if the season opening happened to occur during inclement weather. Non-participation on bad-weather days would result in missing an entire season. Between 1980 and 1988, an average of 31 individuals died at sea (ADFG, 2016)[10]. In 1993, the mortality rate for Alaskan fishers was 34.8 per 100,000 workers, which was 7 times the national occupational average (CDC, 1993).

The council responded to the rapid growth and overcapitalization of the early 1980s halibut fishery by proposing a moratorium on entry into the fishery. The moratorium was the first limited entry policy proposal for Halibut, and was recommended by the NPFMC to the Secretary of Commerce for review under the authority of the Northern Pacific Halibut Act of 1982. Regulations recommended by council must be approved by the Secretary of Commerce, acting through NOAA and National Marine Fisheries Service (NMFS) before they become law. Secretarial review, which considers federal policies and stances on management approaches, precedes publication of proposed federal regulations.

The public had mixed reactions to the proposed halibut limited entry management, and the policy underwent substantial scrutiny by federal reviewers. In 1983, the Office of Management and Budget (OMB) ruled the proposed halibut limited entry regulation to be inconsistent with

[9] http://www.fao.org/docrep/005/y2684e/y2684e22.htm

[10] http://www.adfg.alaska.gov/index.cfm?adfg=wildlifenews.view_article&articles_id=757

Executive Order 12291[11]. Though the council directed a “plan team” to continue to examine limited entry for the halibut fishery, the proposal was abandoned in 1985 and the fishery, along with its inefficiencies, continued to grow.

Similarly, the sablefish fishery attracted an increasing number of vessels from 1980 to 1990. The council first adopted allocative measures for sablefish in 1985, when the total allowable catch was split between geographic areas and gear types (NPFMC, 1997), but the advent of new fishing technology, increasing vessel size, and increased entry led to further growth of the sablefish fishery. Between 1985 and 1990 the number of sablefish harvesters grew from 371 to 800, and problems manifesting in the halibut fishery, such as shortened season, congestion externalities, and racing for fish, also plagued the sablefish fishery. The eastern Gulf sablefish season decreased from 180-days in 1984 to 20 days by 1990; the Central Gulf fishery decreased from a 254 day season in 1984 to a 60 day season in 1990 (Pautzke and Oliver, 1997).

The Council began reviewing sablefish license proposals in 1987 and conducted several industry surveys. In the summer of 1987, the Council called for sablefish management proposals, and, in the fall of 1987, adopted a Statement of Commitment declaring the Council’s intent to pursue alternative management methods for the sablefish fishery including strategies for license limitation or individual transferable quotas (ITQs). In 1988, the council voted that status quo management was not an acceptable policy and directed its staff to create five alternative sablefish management plans. In January 1988, the council directed its staff to specifically analyze ITQs and license limitations alternatives, and the final ruling on the preferred management method was scheduled for June 1988. ITQs were a contentious topic in

[11] http://www.archives.gov/federal-register/codification/executive-order/12291.html

council meetings, and many Alaskan vocally opposed the policy. The council's final decision on a preferred management option was repeatedly postponed. In 1989, the fishery management plans were further reviewed at a public hearing, and three plans were selected for review and refinement over the next two years.

In 1990, ITQs were selected as the preferred management for sablefish and the council also elected to include the halibut fishery in the implementation of the sablefish ITQ policy. By this time, there were already area and gear restrictions in place for both species, but the policy as proposed in 1990 would undergo many changes before the final version would be selected as the preferred management alternative. Many of these changes specifically address distributional concerns highlighted by harvester and stakeholder input. Between 1988 and 1992, over 1,000 vessel owning halibut and sablefish harvesters expressed their position on the proposed ITQ policy to the Council and many voiced concerns over distributional impacts of ITQs on small operations, new harvesters, and small communities. More than 2,000 other members of the general public participated in the policy formation process by speaking at council meetings, writing letters, and signing petitions.

The ITQ program was anticipated to distribute the total allowable catch of halibut and sablefish. Each participant would receive quota based on documented catch from 1984 and 1990. Newer entrants to the fishery would receive substantially less than they currently were catching, while others would receive more than their current average catch. According to council analysis of quota recipients of shares, 5,484 halibut vessel owners would be given shares in the initial allocation of quota. The number of vessel owners participating in the halibut fishery grew from 2,479 in 1985 to 3,883 in 1990. For sablefish, the annual number of vessel owners ranged from 244 in 1985 to 706 in 1988. In total, 1,094 vessel owners received sablefish shares in the initial allocation process.

Changes were made to the ITQ plans of both species to address distributional concerns, and the preferred ITQ policy was selected in the end of 1991. The structure of the ITQ policy varied slightly by species, but the programs were implemented simultaneously. Both species were allocated by area, and shares were initially allocated to vessel owners and leaseholders making at least one landing between 1988 and 1990 (NPFMC, 1997). The three year eligibility window was intended to account for exogenous negative shocks such as sickness, vessel damage, or the Exxon Valdez oil spill, which may have caused a fisher to be absent in a given year. The initial grandfathering of quota for sablefish was calculated using the best five of six harvest years for 1985 through 1990, and the best five out of seven years for 1984 through 1990, for halibut (NPFMC, 1997).

III. Predictive Framework

Stakeholder characteristics expected to influence level of support for ITQ policy include vessel ownership, stakeholder location, and production characteristics. According to the ITQ policy design, individuals owning and leasing vessels that participated in the sablefish and halibut fishery receive quota share, a sellable asset, but crew, processors, and other industry members receive no quota share. The quota holder is expected to receive a greater share of the ITQ benefits relative to non-quota holding stakeholders. The first prediction of this paper:

Prediction 1: Vessel ownership increases the probability a stakeholder is in favor of ITQs.

The extent to which vessel ownership influences position on ITQs likely depends on the location of the stakeholder. Stakeholders in small, remote Alaskan communities have fewer local employment alternatives outside of fisheries. There are three common justifications for why remote communities may expect to benefit less from ITQs than their non-remote counterparts, beyond factors related to quota allocation: (i) individuals from remote locations may anticipate reduced market access; (ii) the wellbeing of the individual's community may be a consideration (Carothers, 2000); (iii) the "culture" of remote locations may be one that mistrusts government or resents government control (Karpoff, 1985). The processing of fresh fish requires access to major port towns as fish are highly perishable and need to be flown to their final destination using commercial passenger planes (Interview with Trident Seafood). Processors located in remote areas will not be able to access the fresh market, but will be required to compete with fresh fish processors for raw materials. Remote community members could easily anticipate a diversion of fish away from their ports, as most fishing communities were aware of the changes that occurred when the BC halibut fishery rationalized a few years prior. There, the season lengthened from 5 days to 8 months and the amount of product sold to the fresh market increased from 42% to 94% (Casey, 1992). Additionally, congestion externalities associated with the derby fishery may be less severe in remote locations due to inaccessibility of fishing grounds. For these reasons, the prediction 2 relates to the location of the vessel owner or stakeholder:

Prediction 2: Remote harvesters and stakeholders are more likely to oppose ITQs

The second part of the predictive framework focuses on distributional impacts to vessel owners. Larger firms may be less sensitive to a quota share lower than expected catch, because they internalize more of the benefits of the more efficient institution (Wiggins and Libecap, 1987). Relative to a small operation, larger operations are expected to experience greater gains from ITQs through decreased coordination and investment costs. Higher average landings may indicate greater investment in the resource and hence more stake in the long-term stability of the resource. The following prediction summarizes this argument:

Prediction 3: Opposition to ITQs will be decreasing in average quantity of fish landed.

Support for ITQs is expected to be increasing in annual landings and decreasing in harvesting volatility. I build upon the earlier work on oil field unitization by Wiggins and Libecap (1985, 1987) and develop a simple, testable model of a harvester's decision to oppose or support property rights in a fishery setting. When deciding whether or not to support property rights, the vessel owner maximizes the expected value of her quota with respect to the date ITQ begins, t_r. The vessel owner will decide her position on ITQ implementation by calculating the difference between expected earnings under ITQ and status quo. Let $E[PV_i^{ITQ}]$ and $E[PV_i^{SQ}]$ be harvester i's expected present value of earnings under ITQ management and status quo management, respectively. If at any given date in the future the difference in vessel owner's expected present value of income under ITQ management and status quo management is greater than zero, the vessel owner will be in favor of rationalization at this time. That is, a vessel owner favors rationalization at time t* if and only if:

$$\mathrm{E}\left[\mathrm{PV_i^{ITQ}}(\mathrm{t^*})\right] > \mathrm{E}\left[\mathrm{PV_i^{SQ}}(\mathrm{t^*})\right]$$

An individual's expected future catch is based on catch history during years active in the fishery (i.e. if he chose not to fish one year, this year would not be used in calculating expected catch when participating). Individual *i's* expected future catch is based on an average of catch during participating years. h_i^t is the actual harvest in time t, and T_i is the set of all years where $h_i^t \neq 0$, then expected catch is:

$$(1)\ EC_i = \frac{\sum_{t\in T_i} h_i^t}{Y_i^t}$$

where Y_i^t is the number of years individual *i* participated in the fishery at year *t*.

The general quota calculation is a function both harvester *i's* participation history and that of all other *N* participants:

$$(2)\ EQ_i = \frac{\sum_{t\in T_i} h_i^t}{\sum_{i=1}^{N} \sum_{t\in T_i} h_i^t}$$

Given an expected quota allocation EQ_i, individual *i* will harvest $\tilde{h}_i$ pounds of the total allowable catch under an ITQ system. Given a level of total allowable catch in a future year, τ, harvest will be:

$$\tilde{h}_i^{\tau} = EQ_i \cdot TAC^{\tau}$$

The single period gain in harvest over status quo management is[12]:

$$(3)\ G_i = EQ_i \cdot TAC - EC_i$$

Equation 2 was used to calculate expected quota allocation until policy changed in a way that allowed for a harvester to drop low harvest years. In 1991, the council changed the initial allocation of halibut quota so that halibut harvesters could drop the two lowest performing years and sablefish fishers the single lowest. The harvester's expected value (income) under status quo vs. ITQ management depends on the individual's expected future landings (weight and value). The probability a harvester opposes rationalization is increasing in the difference between their private value of expected future landings and historic average catch.[13]

[12] Note this gain is in terms of fish harvested. In terms of value, if trading is allowed, then Gi is the lower bound of this gain.

[13] Even if TAC or price changes under different management regimes, the likelihood of opposition is still increasing in this difference.

There are many reasons an individual's private valuation of future landings may exceed actual average catch. Public comments indicate that individuals with higher volatility in catch and those not present in the fishery for all qualifying years oppose rationalization. These harvesters may optimistically view historic catch by making excuses for low harvest years and believing good years more accurately represent skill. It is also anecdotally the case that individuals with higher volatility in catch claim to have had a shorter history of participation and believe they have yet to reach potential, i.e. learning is possible. This is consistent with economic theory. If a high year of catch is used to form the expected future catch, whether this belief is rational or not, for instance $EC_i = \max h_i{}^t$, then the difference between this value and the allocated share will be greater for high volatility harvesters.

Fishers expected to have high volatility in annual landings include: those with missed years, new entrants to the fishery, and those with less dependable skill or negative productivity shocks resulting in inconsistent catch from year-to-year. These high volatility fishers are expected to gain less or lose from ITQs, and hence have increased likelihood of opposing ITQs. These arguments lead to three testable predictions:

Prediction 4a: Vessel owners with greater difference in expected quota allocation and actual average landings are more likely to oppose ITQs.

Prediction 4b: Vessel owners with higher annual variation in landings are more likely to oppose ITQs.

Prediction 4c: Vessel owners with shorter history of participation in the fishery are more likely to oppose ITQs.

New vessel owners can be expected to have higher volatility in landings due to low number of years of landings and inexperience. As outlined in prediction 4a and 4b, higher volatility results in higher levels of opposition. In fisheries distributing initial quota shares by grandfathering, harvesters who spent years not fishing, or just learning about the fishery, will rationally expect their future landings to increase. Prediction 4c is supported by Grainger and Costello (2014), who show analytically that new entrants are likely to oppose ITQs.

IV. Data and Empirical Design

Data

During the period from 1987 to 1992, individuals, companies, NGOs, and many other groups publically stated their position on ITQ adoption by written or oral communications. I coded these state positions from actual transcripts and written communications, and then linked to the vessel registry. The final data set consists of observations from 900 vessel owners that own a total of 1,212 vessels. The vessel owners are further broken down into groups by species harvested—5 32 harvest only halibut, 55 harvest only sablefish, and 306 harvest both species.

I define an observation as a public comment recorded at a Council meeting or a letter addressed to council regarding IFQ implementation. The entire dataset consists of 3,210 comments made by 2,904 unique individuals via meeting participation or letter writing between the years of 1987 and 1992. I code participation records according to stated position on ITQs, and records that are ambiguous are dropped from the sample. Of the original 3884 participation records, 674 are dropped because the stated position on ITQs is uncertain, undetermined, or unaddressed by the record. The primary focus of this analysis is on a subsample (N=900) of the commenters that owned 1,012 vessels harvesting halibut, sablefish or both species during the qualifying period for initial quota allocation (1987-1990). My analysis utilizes a variety of data sources including NPFMC meeting minutes, NPFMC newsletters, and Alaska Federal Vessel Registry as described in Table 1. Column one provides the agency or source from which data was obtained. Column two provides a description of the types of data obtained from the source, and column three provides details on the actual data used in this analysis. The council keeps record of policy decisions, agenda items and public comment in “meeting binders” stored in Anchorage, Alaska. I visited the NPFMC office in Anchorage, Alaska and made copies of all meeting binder materials to build a data set of political participation.

To the best of my knowledge, the data described above represents the entire population of comments for the period 1987 to 1992. Up to 70% of individuals harvesting sablefish and 30% harvesting halibut between 1987 and 1992 made a public comment (written or oral) pertaining to ITQ implementation. An additional 2,310 individuals or companies not owning vessels harvesting halibut or sablefish participated in the political process, either by mail or by speaking at a meeting. Although the overall number of sablefish harvesters is smaller, a much larger percentage of sablefish harvesters chose to participate in the political process.

Variables describing support or opposition and harvester characteristics are listed in Table 2. A comment is coded to determine demographic characteristics and the stance of the commenter on IFQ implementation. For most observations, the individual clearly states whether she is in favor of the proposal. For observations in which the individual’s stance is not clear, the observation is coded as “uncertain.” Each observation consists of a date, name, affiliation, occupation, location, vessel ownership status, and the comment/opinion expressed. Observations recorded from letters do not always contain affiliation of the individual(s), but consist of date of comment, name, and whether or not the individual is in favor of ITQs. A sample data letter is provided in the figures section of this paper (Figure 1).

Vessel owners in the state of Alaska are required to register their vessel in a vessel database. A unique file number identifies every individual or entity owning a vessel, and specific vessels owned are given a unique vessel number. When harvesters land fish in Alaska, they are required to fill out fish tickets, providing vessel and catch information including vessel number, date, and weight and value landed. To determine whether or not an individual owned a vessel, I searched the Alaskan State Vessel Registry for all participants by name, address and vessel name provided in the comment or letter. In this way the comment database is matched with the vessel registry database. If the individual owns one or more boats, all vessel information is recorded. This individual will typically have one unique file number with many vessel numbers. Other information provided by the vessel registry includes vessel name, homeport, mailing address, ADFG (Alaska Department of Fish and Game) number, vessel length, gear, year, and ownership information.

Each vessel is assigned a unique vessel (ADFG) number, which is consistent over time. Upon making a landing, the vessel operator is required to fill out a fish ticket form containing information on the location, weight, value, date, and species landed. For the years the individual owns the vessel, the vessel's landings data are recorded from ADFG fish tickets. In this way, catch is matched to the vessel and then to the public comment.

An individual's catch and catch volatility is measured for each species (halibut and sablefish) for the four years 1987-1990, which are years for which catch data is available and for which actual quota allocation was to be based at the time letters were written. Annual standard deviation in catch and coefficient of variation (CV) are used as measures of harvester volatility. The coefficient of variation is equal to the standard deviation divided by total landings. CV is used in addition to standard deviation to control for increased magnitude of standard deviation as landings increase.

The participant's address (either return address, stated address, or address from vessel registry) is used to classify whether the individual is from a remote location. Remoteness is defined by whether or not the individual lives within driving distance of a town with a direct flight to Seattle. If the town of residence or homeport does not have direct air access to Seattle or is not within driving distance of such access, it is classified as remote (R_i=1). All towns with known location with airport access outside of Alaska are classified as non-remote (R_i=0). All observations with unknown locations are dropped from the analysis.

Empirical Design

The ideal experimental setting would randomly assign vessel ownership and annual catch, then individual position on ITQ management would be observed. Because this generating process is not observed, this paper does not directly establish causality; treatment of annual catch and vessel ownership is not exogenous. A concern in experimental design is that position on ITQs is endogenous to the characteristics of the individuals that determine catch. This is most concerning for individuals located in close proximity. Including a fixed effect for individual city helps to provide a strong argument for external validity.

The choice of participation is not exogenous to catch characteristics or position on ITQs. This paper is interested in actual participant position on ITQs- not the choice of whether or not to participate. I do not analyze what determines political participation. This analysis is performed in chapter two. Cost of participation in the political process is very low, and individuals with more extreme preferences are assumed to participate in the political process. Political participants accounted for 37% of total Alaska species landings value for the period of 1984-1991 and 12.75% of all sablefish and halibut harvesting vessels. Political opposition during the ITQ policy formation causes delays in implementation and changes to policy design. I address the question, amongst political participants, what determines opposition? In other words, external validity can only be assumed for individuals electing to participate in the political process.

The goal of this paper is to addresses whether explanations for opposition are consistent with observed behavior. Aspects of the design of the ITQ policy change through the formation process including the initial allocation formula, qualifying requirements, and selling/leasing rights. The design changes that occur are likely not exogenous of comments made previously.

An individual will be in favor of ITQs if she expects to be at least as well under the new policy setting. The position of party i, Y_i, on the implementation of ITQs is equal to one if in favor of ITQ implementation and zero if opposed. Y_i is regressed on the characteristics of party i that are expected to affect his or her position on ITQs using three different regression equations. All regressions are run using a linear probability model. A linear probability model allows the coefficients of the regressors to be interpreted as percentages and makes fewer distributional assumptions.

Regression equation (1) is performed on the entire sample of commenters and includes a dummy variable for vessel ownership, remoteness, and a dummy if the comment occurs in1992 or later, $L92_i$, when ITQ design changed. The dummy variable for vessel ownership, VO_i, is equal to one if the commenter is linked to a vessel ownership record during the study period. Equation (1) is used to test Predictions 1 and 2 by examining the coefficients on vessel ownership, VO_i and remoteness, R_i:

$$(1)\ Y_i = \alpha + \gamma R_i + \beta VO_i + \delta L92_i + u_i,$$

The subsample of commenters that own vessels is used to analyze the direct relationship between expected monetary benefits under ITQs and stated position on ITQs. All variables are specific to an individual or entity, denoted as subscript i. Variables specific to harvesters including Log Lbs, CV, SD, and percent participation, are specific to individuals and species, denoted as superscript F. Fish species F is equal to either S, sablefish, or H, halibut.

The anticipated change in distribution of wealth is mainly due to the redistribution of catch under ITQ management. The term D_i^F is the percent difference between the harvester's "participating average," the average when only including years fished, and the harvester's actual average when including all years. This term represents the disparity in expected quota allocation and expected future catch under status quo management. Variables CV, SD, and Percent Years Participating are included in place of D_i^F in some specifications.

Regressions performed on vessel owners include a dummy variable indicating whether or not individual *i* is a sablefish harvester, S_i. This dummy variable S_i equals one if the individual harvests sablefish and zero otherwise. Regression equations two and three differ by whether they include the log of standard deviation in annual landings of individual *i* for species *F*.

$$(2)\ Y_i = \alpha + \gamma R_i + \theta S_i + \sum_F (\psi^F D_i^F) + u_i$$

$$(2)\ Y_i = \alpha + \gamma R_i + \theta S_i + \sum_F (\psi^F D_i^F + \Omega^F LogLbs_i^F) + u_i$$

Similar to specifications (1)-(4), prediction 2 is tested by examining the coefficient on remoteness, γ, and is expected to be negative—being from a remote location decreases the likelihood a vessel owner supports ITQs.

Prediction 3, that support for ITQs will be increasing in size of operation, is tested by including the coefficient on LogLbs, Ω, and is expected to be positive if higher landings contribute to increased probability of supporting ITQs. Including the variable LogLbs in the regression helps to isolate the effect of volatility on support by controlling for the size of operations (e.g. if larger operations inherently have higher standard deviation in annual catch).

Prediction 4a states vessel owners with greater difference in expected quota allocation and actual average landings are more likely to oppose ITQs. Prediction 4a is tested by examining the coefficient on D_i^F in regression equation (3) which is expected to be negative if a greater difference in expected quota allocation compared to actual average landings increases the likelihood of opposing ITQs.

Prediction 4b, vessel owners with higher annual variation in landings are more likely to oppose ITQs, is tested by substituting variables CV or SD in place of D_i^F. Coefficients on CV and SD are expected to be negative if higher variation in annual landings leads to increased likelihood of opposition. The CV variable is used in place of SD to control for correlation between size of operation and standard deviation in landings. Prediction 4c, regarding participation history support for ITQs by harvesters is tested by including the coefficient on Percent Years attending, and is expected to be negative if non-participation during the qualifying period decreases the likelihood of support.

V. Results

The descriptive statistics found in table 3 serve as prelude to results. Average landings for both species, measured in log pounds, are higher for individuals in favor of ITQs, which is consistent with prediction 2. Consistent with predictions 4a, 4b, and 4c vessel owners in favor of ITQs have a lower difference between expected catch and expected quota allocation; a lower average CV; and higher percent years participation than opposed vessel owners. While the conditional means appear to show vessel owners with standard deviation in landings are more likely to be in favor of ITQ, there is high correlation between pounds landed and standard deviation. This necessitates a statistical analysis to disentangle effects of variation in catch and size of operation.

Table 4 provides results for empirical specifications performed on the entire sample of commenters. Prediction 2 states that remote harvesters are more likely to oppose ITQs. I test this prediction by including a dummy variable for remoteness in all specifications. The first four specifications are used for the entire sample to compare vessels owners to the entire population of commenters. In all four specifications vessel owner have a higher likelihood of support. In (2) and (3), remoteness is shown to reduce the probability overall that commenters are in favor, and (4) includes an interaction of remoteness with vessel ownership to test the sensitivity of vessel owners to being located in a remote location relative to other stakeholders. The magnitude on the coefficient on remoteness, -.303, can be interpreted as the non-vessel owner's change in base-line probability of ITQ support resulting from being located in remote location. The coefficient on vessel ownership, coincidently, offsets the effect of being remote entirely. Thus, remote vessel owners have a likelihood of opposition just of the interacted term (-.205). This result indicates vessel owners are sensitive to being located in a remote location, but that this effect is similar or less than that of non-vessel owning commenters. The remote variable is an important predictor of an individual's position on ITQs and is significant at the 1 percent level in all regressions in which it is included.

Table 5 provides results for empirical specifications (5-12) performed on vessel owners only. Prediction 3 states that opposition to ITQs will be decreasing in average quantity of fish landed. The effect of average landings on probability of supporting ITQs is tested by including the log of average pounds landed for each species in (5), (7), (8), (10), and (12). The coefficient on log of average pounds is consistently positive for both species and significant at the 1 or 5 percent level for sablefish. Increasing the log of average pounds landed by 1 percent, increases the probability an individual is in favor of ITQs by ~0.045 percentage points for sablefish and ~.01 percentage points for halibut.

The magnitude of the coefficient is small for small changes in average catch. However, given the high variance of average landings for both species, the effect may also be quite large. A 1% increase in average sablefish landings at the mean of sablefish harvest translates to harvesting an additional 61lbs of sablefish. However, the standard deviation of sablefish landings is 122,602lbs, meaning increasing average sablefish landings by one standard deviation results in a 90 percentage point increase in probability of supporting ITQs. The coefficient on the log of average halibut landings is only significant in (8), which includes standard deviation. The magnitude of the coefficient on halibut average landings is smaller than that of sablefish, with a maximum value of 0.0184, indicating a one percent increase in average halibut pounds harvested increases the probability of being in favor of ITQs by 0.018 percentage points.

Predictions 4A, 4B and 4C, relating to the expected change in landings distribution under ITQ management, are tested by examining coefficients on percent of years present in fishery in specifications (6) and (7), standard deviation of annual landings in (8), coefficient of variation (CV) landings in (9) and (10), and the difference in expected catch under quota system vs. status quo in (11) and (12). Log of average pounds is predicted to be an important determinant of position, prediction 3, but is excluded from (5), (8), and (10) to test the coefficients on the variables testing predictions 4A, 4B and 4C, with which it is highly correlated. When log of average pounds is combined with volatility variables, the explanatory power of the coefficients is weakened but the signs of the coefficients remain stable.

The coefficient on percent of years present in fishery is expected to have a positive effect on the probability of being in favor of ITQs, but all other coefficients are expected to be negative. The coefficient on percent years in attendance is used to directly test prediction 4c*:* vessel owners with shorter history of participation in the fishery are more likely to oppose ITQs. The sign of the coefficient on total years is consistently positive, but the magnitude is quite small for both species. An increase of one percent in the percent of years in attendance increases the probability of being in favor of ITQs by around 1 percentage point in specification (7). The coefficient on percent years participating is only statistically significant for Sablefish in (6) at the 10 percent level.

The coefficients on CV and SD are used to test prediction 4b: vessel owners with higher annual variation in landings are more likely to oppose ITQs. The coefficient on both halibut and sablefish SD is insignificant for both specifications used, and the sign on the sablefish SD deviates from predictions. These estimates are imprecise because standard deviation is highly collinear with total catch. Larger boats tend to be in favor of ITQs, but also have, on average, higher standard deviation. The coefficient of variation is used as an alternative measure to SD of harvester volatility over time. The CV, provides a control for the high degree of correlation between average landings and standard deviation. Unlike the coefficient on SD, the coefficient on CV is consistently negative for both species in all specifications, and is significant at the 5% level for sablefish in (9).

VI. Conclusion

This paper analyzes the role of distributional concerns in determining a harvester's preference for the Alaskan sablefish and halibut ITQ program. It provides strong evidence that the allocation of quota share helps explain the stated preference, for or against, of a stakeholder or vessel owner. Using a unique data set of individual comments on ITQ adoption, catch history and vessel ownership, I find political support for ITQs to be higher amongst vessel owners, agents located in non-remote locations, high volume fishers and low volatility fishers. These results are consistent with theoretical predictions and are the first empirical results on the factors that lead to opposition to rights based management in fisheries.

The Alaskan halibut and sablefish ITQ program, as initially proposed, did not account for individual production shocks or inconsistent fishing in determining initial quota allocation. The original program was never implemented. After five years of public debate, the final version of the ITQ policy was designed in such a way that increased the distribution to small fishermen, new participants, and fishermen incurring negative productivity shocks. This was accomplished by dropping the lowest performing years when calculating quota shares. Ultimately, the initial grandfathering of quota for sablefish was calculated using the best five of six harvest years for 1985 through 1990, and the best five out of seven years, 1984 through 1990, for halibut (NPFMC, 1997).

The adoption of property rights hinges on the acceptance of resource users and other stakeholders. These parties receive benefits under status quo management, and can oppose changes using the political process. The intended permanence of the rights and the fact that trading of rights can provide windfall gains provides stakeholders with incentive to jockey for position in the initial allocation process. This paper provides insight into the political economy of transitioning out of inefficient resource management and its findings echo Hanneson (2004): “those who expect to gain, will promote and support the new institution, those who expect to lose will fight it with equal or greater vigor.”

Much of the existing economic literature focuses on policies that achieve economic efficiency and sustainability goals. However, the role of distribution in the implementation of new policy is less frequently addressed. To achieve political feasibility, trade-offs between addressing distributional concerns and economic efficiency are often required. The tradable aspect of individual quotas allows the resource to be continuously reallocated to its highest valued uses, but rights are rarely fully tradable in fishery property rights programs. Like many cap-and-trade and property rights based management programs, fishing rights deviate from traditional economic models by including provisions to limit distributional impacts. Two major policy design aspects altered to address political concerns in the formation of the halibut and sablefish ITQs are ownership restrictions (concentration caps) and changes to the initial quota allocation formula. Support for the ITQ program significantly increased with the grandfathering allocation formula changed to be more flexible.

When distributional concerns generate political opposition, policy makers may look to reformulating the way quota is initially allocated to achieve political feasibility. The initial allocation of rights should be independent of achieving economic efficiency (Coase, 1960). Providing “forgiving years” can help achieve political feasibility without sacrificing the cost savings provided by fully transferable aspect of quotas. Utilizing grandfathering rules as a method of addressing distributional issues under the new property rights regime may allow policymakers to design politically feasible management systems without sacrificing efficiency.

VII. Sources

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VIII. Table and Figures

Tables

Table 1: Data Sources (Years 1987-1992)

Source	Description	Details	Managing Agency
NPFMC Meeting Minutes	Minutes of council meetings covering agenda items (proposed changes to management).	Name, location, agency, comment, date	NPFMC
NPFMC Newsletters	Quarterly newsletter to inform public of changes to FMPS and agenda items for upcoming meetings. Includes upcoming events, forums, and fishery news.	Proposed/Implemented changes to FMP	NPFMC
ADFG Fish Tickets	Log of all landings made in the state of Alaska.	ADFG number, species landed, weight, value, port, year and month of landings	ADFG
Alaska State Vessel Registry	Listings of vessels licensed by the state of Alaska to participate in commercial fishing activities.	ADFG number, ownership information (name, address, phone), vessel characteristics, years of ownership, home-port	CFEC

Table 2: Variables Description

Variable	Description	Calculation	Source
Sablefish	Dummy variable for whether or not entity harvests sablefish between 1987 and 1990.	Sablefish=1 if total weight landed between 1987 and 1990>0; =0 otherwise	CFEC Fish Ticket Data; AK Vessel Registry
Remote	Dummy variable for whether or not entity's mailing address is located in a remote community.	Remote=1 if city of residence is classified as remote (1); =0 otherwise	Based on criteria described in text
CV	Variable measuring coefficient of variation in catch for each species at date of comment.	=SD Annual Landings/ Average Landed Weight	CFEC Fish Ticket Data
Log Lbs.	Measure of the log of the average landed weight by species at date of comment.	= LOG(Average Lbs.)	CFEC Fish Ticket Data
SD	Measure of the standard deviation in annual landings for each species at date of comment.	= Standard Deviation in Annual Landings	CFEC Fish Ticket Data
Percent Years Participating	Measure of the percent of years present in each fishery (harvest>0) at the date of comment.	=Participating years/Total Years	CFEC Fish Ticket Data; AK Vessel Registry
D	Measure of the difference between "participating average," the average when only including years fished, and the harvester's actual average when including all years	=(Participating Average-Actual Average)/Participating Average	CFEC Fish Ticket Data; AK Vessel Registry

Table 3: Summary Statistics

	Sablefish		Halibut	
Variable	Opposed	In favor	Opposed	In favor
Log Average Pounds	9.48	11.18	9.24	10.18
Standard Deviation (SD)	56,094.32	127,334.70	16,972.31	25,967.58
Coefficient of Variation (CV)	2.11	1.78	1.85	1.55
Percent Difference Quota	69.61%	61.09%	61.26%	51.91%
Percent Years Participating	30.51%	39.11%	39.05%	48.78%
Remote	76.47%	32.18%	85.29%	34.26%

Table 4: All-Population Regressions

	(1)	(2)	(3)	(4)
Variable	Position (1=support)			
Remote		-0.362***	-0.364***	-0.303***
		(0.0711)	(0.0702)	(0.0654)
Vessel Owner	0.156**	0.154*	0.157**	0.303***
	(0.0783)	(0.0803)	(0.0794)	(0.0646)
Remote x Vessel Owner				-0.205**
				(0.095)
Letter Year>1991			0.0455*	0.0417
			(0.0274)	(0.0273)
Constant	0.113	0.373***	0.360***	0.318***
	(0.069)	(0.0625)	(0.0603)	(0.0602)
Observations	3,071	3,071	3,071	3,071
R-squared	0.038	0.236	0.239	0.252

Robust standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

Table 5: Vessel Owner Regressions

	(5)	(6)	(7)	(8)
Variables		Position (1=support)		
Log Lbs: Sablefish	0.0462***		0.0451**	0.0502***
	-0.0173		-0.0179	-0.0175
Log Lbs: Halibut	0.00971		0.00673	0.0165***
	-0.00846		-0.00868	-0.00595
% Years Present: Sablefish		0.260*	0.0441	
		(0.137)	(0.124)	
% Years Present: Halibut		0.0358	0.0619	
		(0.0455)	(0.0505)	
SD: Sablefish				1.39E-08
				(7.06E-08)
SD: Halibut				-1.41E-06
				(8.75E-07)
Remote	-0.397***	-0.430***	-0.398***	-0.393***
	(0.112)	(0.106)	(0.111)	(0.106)
Sablefish	-0.211*	-0.161*	0.221*	-0.231*
	(0.123)	(0.0882)	(0.125)	-0.132)
Letter Year>1991	0.102***	0.0968**	0.0999***	0.0945**
	(0.0349)	(0.0373)	(0.0362)	-0.0363)
Constant	0.335**	0.436***	0.341**	0.291***
	(0.135)	(0.0829)	(0.135)	(0.11)
Observations	900	900	900	900
R-squared	0.381	0.359	0.383	0.384

Robust standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

Table 6: Vessel Owner Regressions

Variables	(9)	(10)	(11)	(12)
Log Lbs: Sablefish		0.0407**		0.0438**
		(0.0182)		(0.0175)
Log Lbs: Halibut		0.0112		0.0113
		(0.0107)		(0.0106)
CV: Sablefish	-0.122**	-0.0455		
	(0.049)	(0.0553)		
CV: Halibut	-0.00984	-0.0283		
	(0.0157)	(0.0231)		
% Difference Quota: Sablefish			-0.297**	-0.0504
			(0.134)	(0.141)
% Difference Quota: Halibut			-0.00307	-0.0677
			(0.0399)	(0.0591)
Remote	-0.420***	-0.396***	-0.427***	-0.399***
	(0.105)	(0.11)	(0.107)	(0.111)
Sablefish	0.489***	-0.0838	0.449***	-0.17
	(0.132)	(0.211)	(0.141)	(0.177)
Letter Year>1991	0.0970**	0.103***	0.0979***	0.103***
	(0.0374)	(0.037)	(0.0369)	-0.0362)
Constant	0.459***	0.375***	0.448***	0.366***
	(0.0883)	(0.126)	(0.0901)	(0.129)
Observations	900	900	900	900
R-squared	0.364	0.385	0.359	0.383

Robust standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

Figures

Figure 1: Example Letter

AGENDA C-4
JUNE 1990
SUPPLEMENTAL I-114

RECEIVED
JUN 23 1990

June 19, 1990

Mr. Don Collinsworth, Chairman
NORTH PACIFIC FISHERY MANAGEMENT COUNCIL
P. O. Box 103136
Anchorage, Alaska 99510

Dear Chairman Collinsworth:

I would like to go on record as being actively opposed to the implementation of an individual fishing quota system for sablefish in Alaska.

The system as proposed would be detrimental to the coastal communities and to the fishing industry. I believe that if the IFQ plan were to be approved by the Council, that the entire nature of the fishery would change and the losers would be Alaskans.

I urge you not to approve the proposed IFQ method for management of our sablefish fishery.

Sincerely,

KODIAK FISHERMAN
MARC [redacted]
[redacted] KODIAK, AK
99615

Marc [redacted]

Other Figures and Tables

Timeline of ITQ development

Year	Month	Council Action
1987	December	Council states intent to develop LE or ITQ for sablefish fishery.
1988	December	Council to expand and analyze two options for sablefish management: ITQs and license limitation.
1989	October	Sablefish Management Alternatives Go to Public Review; Halibut ITQ management review scheduled for Jan 1990
1990	January	ITQs Considered Preferred Alternative for Sablefish Fixed Gear Management
1990	April	Decision on sablefish ITQ delayed and later tabled.
1990	December	Halibut added to Sablefish ITQ program
1991	October	Council approves preferred alternatives for ITQ program for the sablefish and halibut fixed gear fisheries.
1991	December	Council approves ITQ system for the fixed gear sablefish and halibut fisheries.

ITQ Policy Design Details

Species	Time Period	Start Date	Participation Requirement	Qualifying Years	Quota Calculation
Sablefish	1987-1988	1991	1984, 1985, 1986 or 1987	1984-1987	Average or best of historic landings.
Sablefish	1989	1991	1984, 1985, 1986 or 1987	1984-1988	Average or Best of historic landings.
Halibut and Sablefish	1990	1991	1984, 1985, 1986, 1987 or 1988	1984-1989	Average of 6 years landings, more credit for recent participation.
Halibut and Sablefish	Late 1991-1995	1993	1988, 1989, or 1990	1984-1990*	Best five years from the qualifying period.

*Historical catch of sablefish will be counted from 1985-1990. Historical catch of halibut will be counted from 1984 -1990.

Variable Names and Descriptions

Variable Name	Description	Calculation
EC	Expected catch	Average percent of TAC landed (total weigh) for participating years.
EQ	Expected quota allocation	Using formula from table 2.
Diff	Difference in Expected catch and expected quota allocation.	Expected Catch-Expected quota allocation
D	Distance	Aerial Miles from Anchorage, AK
City	City of Residence	City of residence fixed effect.
Year	Year of Observation	Year fixed effect.
Y	Participation Measure	Binary Variable equal to one if individual participates.

Position by Year of Comment

	Oppose	Support	Undecided	Total
1982	0	3	0	3
1987	5	5	4	14
1988	16	19	15	50
1989	23	17	32	72
1990	131	38	11	180
1991	389	56	8	453
1992	193	82	3	278
1993	3	2	0	5
1994	7	0	2	9
1995	1	4	1	6
Total	768	226	76	1,070

Position by Mode of Participation

	Oppose	Support	Undecided	Total
Letter/Written	236	163	32	431
Petition	464	9	0	473
Public Testimony	67	54	40	161
Resolution	3	0	0	3
Total	770	226	72	1,068
	72.10%	21.20%	6.70%	

Average Difference in Expected Catch and Expected Quota by Participation

		Round 1	Round 2	Round 3	Round 4	Round 5
Sablefish	Non-Participant	2.90E-04	3.10E-04	3.40E-04	3.80E-04	4.30E-04
	Participant	5.00E-04	6.40E-04	1.10E-03	8.30E-04	4.10E-04
Halibut	Non-Participant	5.60E-05	6.40E-05	7.70E-05	8.10E-05	8.80E-05
	Participant	2.30E-04	2.10E-04	1.80E-04	2.20E-04	1.60E-04

*Differences calculated as a percent of the total allowable catch