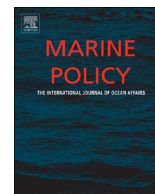


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The impact of catch shares on multiregional fishery participation and effort: The case of west coast harvesters in the Alaska fisheries[☆]

Lily Hsueh^{a,*}, Stephen Kasperski^b

^a Assistant Professor, School of Public Affairs and Senior Sustainability Scientist, Julie Ann Wrigley Global Institute of Sustainability, Arizona State University, 411. N. Central Ave., Suite 455, Phoenix, AZ 85004, United States

^b Supervisory Economist and Program Manager, Economic and Social Sciences Research Program, Alaska Fisheries Science Center, National Marine Fisheries Services, National Oceanic Atmospheric Administration, United States

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ABSTRACT

Rationalization in fisheries has been shown to lead to the slowing of fishing activity, input and effort consolidation, cost savings, and new market and product development. The effects of rationalization on fishermen's behavior become more complex when one accounts for the spillover effects that catch share programs can create in other fisheries and regions. Recently available annual costs and earnings data allow us to quantify the average marginal effects of the U.S. West Coast Groundfish Trawl Catch Share Program on fisheries in Alaska. Empirical results indicate that the primary drivers of harvest in the Alaska fisheries are vessel size and operating costs for catcher vessels that deliver to West Coast mothership processors and shoreside processing plants. Rationalization does not appear to have a statistically significant impact on whether and to what extent catcher vessels that are endorsed to fish in both regions actually fish in Alaska. The advent of catch shares on the West Coast has in effect harmonized fishery management across the two regions. Conditional on fishing in Alaska, the advent of catch shares in the West Coast groundfish trawl fishery has lengthened the number of days at sea in Alaska for the West Coast catcher vessels that participate in the Alaska fisheries. This result is in line with the fact that after rationalization, catcher vessels have increasingly harvested in one region rather than fishing in both regions.

1. Introduction

Economic theory predicts and empirical studies show that “rationalization” or the change to catch share management leads to input and effort consolidation and cost savings, new market development and end-product creation, among other benefits [36,44,45]. By and large, the empirical studies on the direct effects of catch share programs—such as, employment and remuneration, rent generation, production decisions, capacity utilization, fishing effort, among other economic outcomes—have matched theoretical predictions (e.g., [43,2,4,8,16,18,12,13,35,28,30,15,34,5,24]).

The effects of rationalization on fishermen's behavior become more complex when one accounts for the spillover or indirect effects that catch share programs can create in neighboring fisheries, some of which may be managed by different fishery management councils and have not (yet) rationalized [10,27,3,32,33]. Employing a quasi-experimental approach, Cunningham, Benneer and Smith [10] find that the New

England Groundfish Sector Program caused spillover into adjacent Mid-Atlantic fisheries, a region that uses effort controls to enforce the total allowable catch (TAC), resulting in increased aggregate Mid-Atlantic harvest volume among sector members after the policy change. Moreover, the authors find leakage in individual fisheries with similar gear and high market substitutability with sector species.

Yet, prior theory has shown that catch share leakage is not universal. Theoretical modeling by Cunningham et al. [10] demonstrates that positive, negative, and no leakage are possible. This is because the magnitude of the leakage depends on the regulatory framework of the other fisheries adjacent to the newly rationalized fishery. If the other fisheries are under catch share management the interregional leakage could be small. By contrast, if other fisheries are open access fisheries or various kinds of limited entry fisheries, the spillover effects might be significant, depending on the flexibility of the fleet in the fishery which has moved from open access or limited entry to a catch share program.

This study examines on how a recently implemented catch share

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* Corresponding author.

E-mail addresses: Lily.Hsueh@asu.edu (L. Hsueh), stephen.kasperski@noaa.gov (S. Kasperski).

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program in 2011 on the U.S. West Coast—the West Coast Groundfish Trawl Catch Share Program—has impacted fishery participation and effort in Alaska, a neighboring region managed by a different fishery management council. Unlike the Mid-Atlantic fisheries, the Alaska fisheries have by and large transitioned to catch share management between 1995 and 2008.¹ The introduction of catch shares in the groundfish trawl fishery of the West Coast in effect harmonizes fishery management across regions. As such, in this case, theoretically, one would expect that interregional leakages or spillovers to be minimal, because, with the advent of catch shares in the West Coast groundfish trawl fisheries, harvesters endorsed to participate in catch share fisheries in both regions possess secure harvesting privileges, which they can deploy based on market conditions.

In other words, with a halt or slowdown in the race to fish, harvesters have the flexibility to make decisions about fishery participation and effort allocation based on market fundamentals in order to maximize profits. By and large, rights-based fishery management in both regions allows harvesters to no longer be constrained by trip and landings limits, seasonal closures, or other regulations aimed at limiting the “race for fish.”² Moreover, catch shares also contribute to bycatch avoidance by reducing the pressure to fish as fast as possible [20]. Instead, harvesters are free to respond to changing fish prices and their individual fixed and variable costs in making decisions about fishery participation and effort allocation.

To investigate how the introduction of catch shares in the West Coast groundfish trawl fishery has impacted a harvester's choices regarding participation and effort allocation in the Alaska fisheries, this study employs a double hurdle model [6,9] to explore a harvester's decisions to 1) participate in a fishery and 2) the intensity of that participation or fishing effort. A vessel's participation and effort decisions are modeled as related but separate choices that happen sequentially: the first stage is a probit model of a harvester's decision to participate in the Alaska fisheries vis-à-vis the West Coast groundfish trawl fisheries. The second stage is a truncated normal regression of a harvester's days at sea while fishing in Alaska. Unlike the Tobit model (which is a special case of the double hurdle model) which assumes that the same mechanism generates both the zeros and the positive values of fishing effort, the double hurdle model allows different variables and parameters in the two tiers of estimation.

This study's approach is an empirical contribution to the literature where by and large the relatedness of a fishermen's participation and effort decisions is ignored or assumed away. Yet, specification which ignores the relatedness of the decisions could lead to biased and inconsistent estimates of participation and effort allocation by harvesters.

Another contribution is the explicit accounting of the impact of fishing cooperative membership and vessel ownership on the participation and effort decisions of harvesters through cooperative and company fixed effects. An important institutional factor in the regional fisheries is cooperative management. A majority of the catch share programs on the West Coast and in Alaska employ fishing cooperatives as the primary mechanism through which the annual TAC of fish is allocated, typically based on historical catch levels, and then split among individual harvesters. By contractual agreement, members manage their allocated percentage share of the cooperative's annual TAC themselves and decide how the cooperative will meet other fishery management goals such as reducing incidental bycatch and increasing

¹ Source: <http://www.st.nmfs.noaa.gov/economics/fisheries/commercial/catch-share-program/> (Retrieved April 18, 2017).

² With that said, some regulatory strictures, particularly those that serve other conservation and/or social objectives may be retained after the adoption of rights-based management. For example, under the American Fisheries Act, the BSAI pollock fishery remained subject to seasonal allocations, gear restrictions, prohibited species catch limits, and area closures. Similarly, implementation of IFQs in the Alaska halibut and sablefish fisheries resulted in provisions to address several other objectives of the program in addition to ending the derby-style fishery [1].

retention and utilization. The allocations allow the cooperative members the freedom to choose which (and how many) vessels to operate when landing their allocation and allow fishery participants to coordinate fishing efforts amongst themselves [12].

Cooperative management is distinct from secured fishing rights in the form of individual fishing quotas (IFQs) allocated to individual vessel owners of fishing permits licensed for operation for their exclusive use [47], the latter of which are also a component of the West Coast Groundfish Trawl Catch Share Program. Of the sixteen federally managed catch share programs, six include fishing cooperatives as a means to allocate the annual total allowable catch, and four of the six Alaska catch share programs include a cooperative component [22].

Effort and participation decisions are likely to be made at the fishing company level, and companies can own multiple vessels. This study controls for vessel ownership by taking advantage of unique ownership data for the West Coast vessels that also fish in Alaska. There is heterogeneity across companies regarding their economic stakes on the West Coast versus in Alaska. Moreover, vessels travel to the West Coast from Alaska for shipyard repairs in the Pacific Northwest based on vessel repair schedules. Importantly, this study's analysis allows for strategic behavior on the part of companies that operate multiple vessels to allocate vessels as they deem fit between the West Coast and Alaska.

Another contribution that this study makes is the use of vessel-level costs and earnings data before and after the implementation of catch share management, as part of a recently implemented Economic Data Collection (EDC) program that collects mandatory economic data from *all* fishery participants in the West Coast Groundfish Trawl Catch Share Program.³ The unique costs and earnings data—along with detailed fishery catch data, product revenues and prices, and TACs—allow for the calculation of the average marginal effect of changes in West Coast species TACs, prices of West Coast species, and costs on the expected number of days that vessels spent fishing in Alaska. In addition to quantifying the spillover effects that catch share management in one fishery can create in other fisheries, this study discusses implications of changes in participation and effort decisions by harvesters for fishery management on both the West Coast and in Alaska.

The study proceeds as follows. Section 2 presents background information on the recently implemented U.S. West Coast Groundfish Trawl Catch Share Program and the multiple fisheries and target species on the U.S. West Coast and in Alaska. The empirical focus is on the catcher vessels that experienced rationalization of the West Coast groundfish trawl fishery in 2011, as opposed to the catcher-processors that have been under cooperative management since the late 1990s. Section 3 describes the data and variables of interest and explicates the empirical identification strategy and models. Section 4 presents empirical results and a discussion of the results. Section 5 concludes.

2. Background

The U.S. West Coast groundfish trawl fishery takes place off the coasts of Washington, Oregon and California, and targets over 90 different species of fish, most of which live on or near the ocean bottom (e.g., Pacific hake, lingcod, Pacific halibut, rockfish species). The Pacific hake, also commonly known as whiting,⁴ is the most abundant commercial fish species on the U.S. West Coast and the sixth largest commercial fishery by volume in the U.S. (~371 million pounds in 2012 by all fishery participants) with an annual product value of around \$125 million dollars [17,29]. The commercial fishery has four components: limited entry with a trawl endorsement, limited entry with

³ Response rates by the catcher vessels for the mandatory EDC surveys have been nearly 100 percent since the implementation of the U.S. West Coast Groundfish Trawl Catch Share Program [37], Table 2.1).

⁴ The Pacific hake is commonly referred to as whiting. This study will use hake and whiting interchangeably.

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