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Mr. Chairman, committee members, my name is Scott Matulich. I am a Professor of Agricultural Economics at Washington State University. I am here today to provide a brief overview of a recently completed research project funded by the Alaska Department of Fish and Game. I asked Mr. Whaley to provide each of you copies of that report, entitled *Efficiency and Equity Choices in Fishery Rationalization Policy Design: An Examination of the North Pacific Halibut and Sablefish IFQ Policy Impacts on Processors*. The report, No. 5J02-02, should also be available on the Alaska Department of Fish and Game web site by the date of this testimony.

While this report analyses how the largest IFQ policy in the United States impacted halibut and sablefish processors, its primary purpose is to provide insight into policy choices concerning future rationalization designs of other fisheries, including transferable quota systems or fishery cooperatives. The report accomplishes this objective by examining empirically the efficiency and distributional components of the IFQ policy design. As such, the results of this empirical study have important implications for IFQ deliberations by this committee and for Magnuson-Stevens Act reauthorization.

The policy design choice centers on policy "intent," i.e., whether policy makers intend to benefit harvesters to the detriment of processors, or whether they intend to recognize the prior economic interests of both sectors by allowing both to benefit from the rationalization policy. In the case of the halibut and sablefish IFQ policy, the North Pacific Fisheries Management Council expressed no intent for the IFQ policies to advantage one sector to the detriment of the other, in either an absolute or relative sense. Nevertheless, more than 82% of the halibut processing sector and 97% of the sablefish processing sector (raw fish weight) were left absolutely worse off. Halibut processors, on average, lost more than half of their pre-IFQ gross operating margin. This policy-induced loss is even more remarkable because the gross value of the halibut fishery nearly doubled due to the IFQ policy. Sablefish processors also were left worse off, losing 75% of their pre-IFQ gross operating margin. See Figure 1. Harvesters were the beneficiaries of the IFQ policy design.

The IFQ policy design was not win-win. It did not allow the processing sector to participate in the policy benefits. In fact, most processors were left worse off in both nominal and real dollars relative to historic levels. These detrimental outcomes were unintended and avoidable.

BACKGROUND

The switch from open access to individual transferable quota management is generally regarded a

resounding success because efficiency losses emanating from open access externalities are recaptured. But past analyses of transferable quota polices stop there. There has been little theoretical work and no empirical analysis of who wins, who loses and how much. Yet, these combined efficiency and distributional elements of welfare economics are essential to understanding policy design choices and to advancing desperately needed fishery rationalization policies, whether based on individual transferable quotas or fishery cooperatives. The conceptual framework for analyzing policy design choice is presented in the Appendix to this testimony.

Recent theoretical developments in the individual transferable quota literature argue that a harvester-only allocation of resource rights is beneficial to harvesters, though at the expense of the co-dependent processing sector. Six years after switching to IFQs in the two largest IFQ fisheries of the United States, there has been little evaluation of the economic impacts that the policy had upon the industry. In particular, no analysis inquired into the impacts on processors. The IFQ policy assured harvesters were left better off due to efficiency gains from fleet decapitalization and consolidation through fully compensated quota trading. Unlike the harvesters, however, the IFQ policy did not allow the pre-IFQ processing sector to be compensated for industry-wide decapitalization or to participate in the rationalization benefits, despite the fact that an overcapitalized fleet begets an overcapitalized processing sector. Simply put, the IFQ policy failed acknowledge the two sectors are inseparable elements of the open access externality that the IFQ policy intended to eliminate (Matulich, Mittelhammer and Reberte 1996 and Matulich and Sever 1999).

Both the empirical and the theoretical literature show that a quota allocation only to harvesters damages co-dependent processors. Lindner, Campbell and Bevin (1992) first raised this issue concerning unintentional redistribution during the transition to an IFQ system as an empirical observation related the New Zealand individual transferable quota (ITQ) fisheries. Matulich, Mittelhammer and Reberte (1996) developed the theoretical framework explaining why a harvester-only IFQ unintentionally transfers wealth from processors to harvesters. Fleet consolidation reduces the harvest rate, which in turn creates excess daily processing capacity and therefore, excess demand for raw fish. Processors will bid up exvessel price to utilize the policy-induced excess capacity, transferring wealth to harvesters. Gardner Brown (2000), citing both studies in his survey of modern renewable resource economics literature, distilled the central policy issue concerning ITQ management. "The rule for allocating ITQs is the crux issue and may be a stumbling block to adoption (p. 895)."

Other than the paper by Matulich and Sever (1999), there has been neither thorough nor rigorous analysis of traditional IFQ allocations or of alternative initial allocation designs. This observation is surprising, since "Advancement of rights based fishing is stymied by industry and congressional concern over distributional issues arising out of traditional ITQ design (Matulich and Sever 1999, p. 203)." In fact, distributional issues arising out of fisheries rationalization policy seem to be the cornerstone of the recently enacted American Fisheries Act (AFA). For example, Senators Stevens and Gorton clarified the legislative intent of AFA in a letter to the Honorable Janet Reno, U.S. Attorney General.

The purpose of the legislation was to rationalize, Americanize and decapitalize the Bering Sea pollock fishery. The cooperatives established in the AFA were designed to ensure that ***both*** *[emphasis added] harvesters and processors benefited from the rationalization* (Stevens and Gorton 1999).

It would seem that fishery rationalization is evolving beyond the simplistic economic story that assigning transferable rights to harvesters assures gains from trade. Indeed, quota trading among vessels results in fleet consolidation that promotes efficiency. Moreover, no harvester can be made worse off because all trades are fully compensated. This is good. But what about the co-dependent processing sector that was capitalized to

process the glut of fish that hit the docks following the derby-style open access fisheries?

In the case of the halibut fishery, over 5,000 vessels landed 50 million pounds in "three or four, one- to two-day openings just prior to introducing IFQs (North Pacific Fisheries Management Council 1997)." Processors were capitalized to stabilize this enormous quantity of fish before it spoiled. Introduction of IFQs liberated the market by encouraging fleet consolidation and allowing the season to elongate eight months. Instead of having to divert 83% of the halibut to a lower-value, frozen market, IFQs stimulated product conversion so that 59% of the fish is now sold in the higher-value, fresh market. Gains were made from both the market side and harvesting cost reductions arising from efficient fleet consolidation. No such product form change occurred with sablefish; it remains a frozen product destined for Asian markets. This juxtaposition of fundamentally different market outcomes provides a near-perfect opportunity to evaluate whether the ability of industry to take advantage of new market opportunities underpins differential impacts on processors.

PROJECT SUMMARY AND RESULTS

Introduction of IFQs in 1995 changed the structure and operating behavior of the halibut and sablefish processing sectors. The resulting changes in absolute and relative economic welfare were measured as changes in gross operating margins or revenues net of variable costs (more formally, changes in quasi rents) that occurred before and after IFQs. This welfare measure captures the extent to which processors participated in the benefits of rationalization. Specifically, the analysis evaluated whether the policy left processors no worse off and possibly better off, or whether processors were left worse off. A second aspect of economic welfare considered whether processors and harvesters were relatively better or worse off, i.e., whether they shared the joint fishery benefits in the same relative proportions before and after IFQs. Both welfare measures can be decomposed into changes in market share and changes in gross operating margin as a share of wholesale price. The two-years, 1992-1993 represented the pre-IFQ period and the two-years, 1999-2000 represented the post-IFQ period.

Measuring market share changes was easy because state and federal regulations require statewide buying data to be reported to the Alaska Department of Fish and Game, Division of Commercial Fisheries. The Commercial Operators Annual Reports were used to measure changes in market share. Measuring changes in gross operating margin, however, required knowledge of variable processing costs through the first point of wholesale. There is no requirement to report such cost data. Nor are there any cost studies or economic models to estimate variable processing costs. Accordingly, a cost of production survey was conducted. Changes in net benefits per pound of fish (i.e., changes in the fraction of wholesale price retained by processors, net of variable processing costs and raw fish costs) and ultimately, changes in sector-wide welfare, were measured as a composite of these two elements. A firm that gained or lost market share may have gained or lost absolute or relative economic well-being, depending upon the degree to which it gained or lost its retained share of the wholesale price.

All firms purchasing at least 100,000 pounds of fish in any of the four years were surveyed, while only a sample of small firms (<100,000 pounds) were surveyed. Survey coverage totaled 88% to 96% of all halibut and sablefish purchased during the four years, 1992-1993 and 1999-2000. Considerable care was given to authentication and verification of survey data. Data not collected in person from original invoices or historic source documents (i.e., sales and production summaries and general ledgers) were authenticated and verified as accurate by an ex post audit of historic internal financial documents and reports, including

audited financial reports. An outlier test was conducted for the few participating firms that could not be verified in person. Retained survey data verified as authentic account for 52% and 61% of landed halibut (54% and 59% of landed sablefish) in the pre- and post-IFQ periods, respectively. Audit verification coverage totaled 78-93% of the survey data (measured in pounds of raw fish), depending on year.

The empirical evidence provided in this study supports the theoretical literature that a harvester-only allocation of quota redistributes wealth from processors to harvesters. The harvester-only allocation redistributed the pre-IFQ share of joint economic benefits to such an extent that the policy was not win-win.

Both halibut and sablefish processors were impacted in strikingly similar ways, despite the fact that IFQs liberated higher-value fresh market opportunities for halibut, but not for sablefish. The similar outcomes derive from the fact that fleet consolidation under a harvester-only quota allocation creates excess processing capacity and therefore, excess demand for raw fish. The exvessel price concessions required to eliminate excess processing capacity redistribute wealth from processors to harvesters, regardless of product form.

Referring to Figure 1, the pre-IFQ processing sector is estimated to have lost, on average, 56% of its 1992-1993 revenues in excess of variable costs. This loss occurred while wholesale revenues increased. The relative proportion of joint benefits retained by processors dropped 78% between the pre- and post-IFQ periods. Similarly, most of the sablefish processing sector lost revenues in excess of variable costs, though a precise estimate is somewhat more tenuous because the 46% increase in wholesale price did not fully mitigate the 12.1 million pound (41%) decrease in landings. Adjusting for this supply-side effect by holding the wholesale price and purchases at 1992-1993 levels, approximately 97% of the entire sablefish industry (raw fish weight) were financial losers. The sablefish processing sector lost, on average, 75% of their pre-IFQ revenues in excess of variable costs.

Closer examination of the halibut industry impacts portrayed in Figure 1 amplify the extent of policy-induced wealth redistribution. IFQs were responsible for nearly doubling total revenues at the first point of wholesale, up from $79.3 million to $155.5 million. The gross operating margin retained by the pre-IFQ processing sector shrank from $15.5 million to $6.8 million. The harvesting sector, on the other hand, more than doubled exvessel revenues on falling variable fishing expenses.[(1)]

Revenues doubled between the pre-and post IFQ periods because the average wholesale price of halibut increased 66%, from $1.82/lb to $3.01/lb, while total catch increased 19% from 43.6 million pounds to 51.7 million pounds. Harvesters, unlike most processors, were left better off in both fisheries. They captured the entire increase in total revenues; they captured efficiency benefits of reduced harvesting costs; and they captured most of the losses incurred by the processing sector. Those harvesters that exited did so fully compensated, such that none were worse off. Those harvesters that remained increased their gross operating margin. The redistribution, both absolute and relative, was solely a consequence of the IFQ policy design.

Market share impacts were dramatic in both fisheries. Less than one-third (30%) of the halibut processing firms and slightly more than one-third (37%) of the sablefish processing firms survived IFQs. Half of these surviving halibut processors doubled their aggregate market share from 18% to 37%, while the surviving market-share losers lost more than half of their pre-IFQ market share (down from 68% to 28% of the market). Overall, surviving halibut processors lost 14% of their pre-IFQ market share; exiting firms, of course, lost 100% of their market share. Surviving sablefish processors, in contrast, gained an additional 10% share of the market. Surviving market-share winners nearly doubled their aggregate sablefish market share (up from 33% to 64%). Surviving losers lost almost half their sablefish market share (down from 45%

to 24%).

The share of wholesale price retained by processors dropped dramatically for processors in both fisheries. Halibut processors lost, on average, nearly two-thirds of their pre-IFQ share of the wholesale price net of variable costs. A few surviving firms gained sufficient market share to become financially better off (at least no worse off), but participated in joint fishery benefits at a rate less than their pre-IFQ share. Prior to IFQs, halibut processors retained a 19.6% share of wholesale revenues. Following IFQs, the gross operating margin for both traditional processed halibut and fish custom processed for others dropped, on average, to 6.7%. Sablefish processors lost nearly three-quarters of their pre-IFQ share of the wholesale price, after adjusting for supply-side effects. Surviving sablefish processors lost, on average, slightly more than two-thirds of their pre-IFQ retained share of the wholesale price. Very few surviving firms gained sufficient market share to remain no worse off or to become better off. Surviving sablefish processors retained, on average, just 6.9% of the wholesale price after IFQs were introduced, down from 24.2% prior to IFQs.

IFQs encouraged significant entry of both primary processors and broker/reprocessors. These new entrants tend to be innovative, low cost (efficient) firms that have an operational advantage in not having to invest much permanent capital, or to service the associated debt. The product form change in halibut enabled new entrants, including broker/reprocessors, with relatively little capital to purchase, process and market fish. These new entrants were not responsible for the product form change. All firms faced the same profit incentive to switch toward the higher valued fresh product. Recall that the average wholesale price for halibut rose roughly 66% as the dominant product form shifted from frozen to fresh; processing costs remained roughly the same between the two policy periods and between the two product forms. Pre-IFQ firms located near the limited Alaska road system or where alternative shipping modes support the fresh market faced similar, if not identical incentives. Remote firms were less able to take advantage of the fresh market. This fact was accentuated by season elongation, which allowed vessels to travel to fresh buyers, redistributing landings toward ports that can support the fresh market.

Fifty-one new firms became primary processors/buyers of halibut, capturing one-third of the halibut market. Four of these new entrants were large (1 million pounds) that captured nearly one quarter of the post-IFQ market. Entry also occurred through brokers/reprocessors, though these firms are not reflected in the COAR data. Entry was less important in the sablefish fishery, presumably because capital cost requirements remained high. Still, twenty-five new entrants, all small firms, collectively captured 12% of the market. Broker/reprocessors remain relatively unimportant in the sablefish fishery.

Overall, this study helps clarify the policy choice among future rationalization designs by providing empirical evidence that the initial quota allocation has dramatic welfare ramifications. A harvester-only IFQ allocation (in any manifestation) does not recognize the prior economic interests of both harvesting and processing sectors. It does not allow both sectors to benefit from rationalization. Instead, a harvester-only IFQ policy benefits harvesters to the detriment of processors, precisely as an allocation of quota only to processors would damage harvesters, or an allocation of all quota only to me would damage both sectors. If rationalization policy is intended to benefit both harvesters and processors, a different initial allocation--one that acknowledges prior economic interests of both sectors--is required. Preserving the opportunity for new entry in both the harvesting and processing sectors will enhance the efficiency gains from future fishery rationalization.

Limitations/Caveats

There are three important limitations/caveats to this study. First, examination of pre- and post-IFQ impacts

on the processing sector does not necessarily imply causality. This analysis assumed the two-year period 1992-1993 represents an open access long-run equilibrium, consistent with the fisheries economic literature. As such, it is regarded as a reasonable proxy for both a "before" and "without" scenario in a before and after, with and without policy analysis. Nevertheless, the way in which industry restructured may be partially dependent on things other than the switch from license-limited open access to IFQ management.

Second, empirical economic analysis of fisheries policies, particularly retrospective analysis, often is problematic in U. S. fisheries because costs of production data are not collected. This study is no exception. While the changes in market share reflected all halibut and sablefish landed in Alaska, the economic component was based on an industry cost of production survey that required participants to access 10-year-old data. Inferences drawn in this study assume the survey data are representative of the entire processing sector.

Third, policy inferences from this study are intended to guide the design of **future** rationalization programs in other fisheries. No aspect of this study is intended for the purpose of revisiting/changing the policy designs of these two Alaska IFQ programs. Rather, this study is premised on the principle that once the rules of an IFQ program are established and individuals make investments based on those rules, changing the rules in fundamental ways can strand assets and create losers in much the same way as an initial allocation of quota only to harvesters damaged processors.

APPENDIX

CONCEPTUAL FRAMEWORK FOR POLICY DESIGN

The essence of policy design choice and evaluation of policy outcomes are conceptualized in Figure 2. This figure illustrates both the efficiency and distributional components of welfare economics that can arise from different rationalization policy designs. The vertical axis measures net economic benefits to harvesters  , i.e., revenues in excess of variable costs, while the horizontal axis measures net benefits to processors  . Let point A be the initial distribution of net benefits between the two sectors under a long-run, open access equilibrium. The downward sloped, 45-degree line passing through A, therefore, defines how the level of open access efficiency (joint benefit) is divided between harvesters and processors. Every point on that 45-degree line represents the same level of joint or composite benefits and thus, the same level of overall efficiency. At point A, harvesters earn  and processors earn  . Any other point along that line indicates a different distribution of the same initial total welfare,  .

An outward shift of the downward sloping 45-degree line represents the efficiency gain due to rationalization. If both sectors share in the rationalization benefits in the same relative proportions as under open access  , then, efficiency gains would occur on the ray out of the origin through point A. Point B represents such an outcome, where  =  .

Two other aspects of this diagram are important to understanding the welfare implications of rationalization policy design. The vertical and horizontal lines emanating from point A define the "win-no-lose" boundaries for processors and harvesters, respectively. Along these boundaries, efficiency gains accrue only to one of the sectors

without adversely or beneficially impacting the other sector. For example, point C indicates all of the efficiency gains accrue to harvesters without changing the net benefits retained by processors. Point D reverses the policy beneficiaries; processors capture all efficiency gains from rationalization, while harvesters are left no worse off. The area north and east of the win-no-lose boundaries defines the win-win policy space, where the economic well being of both sectors is improved by the rationalization policy, i.e., both sectors benefit from rationalization. Conversely, any outcome in the crosshatched area leaves one or both sectors worse off. All points left of the vertical win-no-lose line leave processors absolutely worse off, earning lower net benefits than they did under open access. All points below the horizontal line leave harvesters worse off. All points below the initial 45-degree line are inefficient (lower joint benefits) and leave one or both sectors worse off.

Figure 2 focuses the policy design choice on "intent," i.e., whether policy makers intend to benefit one sector to the detriment of the other, or whether they intend to recognize the prior economic interests of both sectors by allowing both to benefit from the rationalization policy. A related design issue concerns political economy. If either sector has political veto power over detrimental policies (the crosshatched area), passage of a particular rationalization policy is at risk. Absent explicit intent to leave one sector worse off, it follows that the default policy designs lead to outcomes in the area, north and east of the win-no-lose boundaries--win-win fishery rationalization policy. Efficiency would be maximized, subject to other social objectives, and both sectors would participate in the benefits anywhere between points C and D. Only at point B would the relative share of joint policy benefits be distributed in precisely the proportion fishery benefits were shared under open access.

[1] Although changes in harvesting costs and derivative gross operating margins were not measured, efficiency gains from quota trading and season elongation imply variable harvesting costs per pound dropped. The added cost of longer running distances to fresh market ports may partially offset these gains.

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