Policy-Induced Market Failure Under the American Fisheries Act

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This paper explores the political economy of using fishery cooperatives to advance voluntary decapitalization and rationalization that the U. S. Congress intended to benefit both vessels and processors. Game theory offers insights into the likelihood of achieving congressional intent. It is argued that the American Fisheries Act introduces a potential new market failure while attempting to rid the fishery of the open access externality.

Key words: voluntary fishery cooperatives, rationalization, non-cooperative game, market failure.

1. INTRODUCTION

The United States Congress recently passed a unique law that creates a voluntary approach to decapitalize, rationalize, and end the race for fish in one of the world's largest open access fisheries, the North Pacific pollock fishery. The American Fisheries Act (1998), hereafter AFA or the Act, promises the efficiency benefits of individual transferable quota (ITQ) management without violating the four-year moratorium on new ITQs that Congress imposed in 1996 (Magnuson-Stevens Fishery Conservation and Management Act 1996).[1] AFA extends traditional exemptions from antitrust liability granted to agricultural producers and fishermen by providing an incentive to form voluntary fishery cooperatives. The Act allocates to each vessel that joins a plant-specific cooperative a guaranteed historic share of the total allowable catch, which it may harvest at its own pace. Vessels that join a cooperative must deliver not less than 90% of their quota to their historic processor. This provision that ties cooperating vessels to a specific processor is the most controversial but essential element of AFA. It is this feature that is intended to promote fully compensated, Pareto safe rationalization in both the overcapitalized harvesting and processing sectors.

The purpose of this paper is to examine whether AFA is likely to deliver on its promise. Initially, the political evolution of the Act is reviewed. Then, the distinction between traditional agricultural cooperatives and an AFA-style cooperative is explored. The theory of cooperative price formation is briefly reviewed, followed by the outcome of a Nash bargaining game that captures the win-win bilateral monopoly relationship Congress apparently intended to create between cooperating vessels and their plant. However, the voluntary agreement is shown to alter inter-processor strategic behavior, the likely consequence of which is examined through repeated non-cooperative game theory. Both theoretical and empirical insights (six months after full implementation) are offered into whether the voluntary cooperative agreements promoted by AFA are likely to deliver on the promise of fully compensated, win-win fishery rationalization. Special attention is given to the inevitable changes in market structure.

2. EVOLUTION OF AFA

Senate Bill 1221 was introduced in the United States Senate by Senator Ted Stevens (R-AK) to eliminate a loophole in the Anti-Reflagging Act of 1987 that allowed 18 foreign-rebuilt factory trawlers to operate in the North Pacific pollock fishery. Months later, Senator Slade Gorton (R-WA) redirected the bill toward a voluntary approach to fishery rationalization that avoided ITQs. On August 18, 1998, Senator Gorton held a pollock industry meeting in Seattle (home port and corporate offices for most of the factory trawler fleet, catcher vessels, motherships and onshore processors). Eighteen members/associations of the pollock industry, representing a cross section of all segments, were invited

[1] The basis for the ITQ moratorium centered primarily on distributional concerns first raised in the literature by Matulich et al. (1996). That article demonstrated that in the usual presence of less than perfectly malleable capital, the processing sector (which has never received ITQs) experiences an unintended expropriation of wealth.

to a meeting where Senator Gorton outlined six "Principles for Resolving S. 1221". The two most important elements of these Principles recognized " . . . all present participants in the fishery are in it legally" and that decapitalization " . . . should be done in a manner that recognizes the economic interests of **all** (emphasis added) participants in the onshore and offshore sector" (Gorton, 1998).

Senators Stevens and Gorton sponsored intensive industry negotiations over the next two months. These negotiations included broader representation of the industry and culminated in a compromise agreement that became the American Fisheries Act on October 19, 1998. "The purpose of the legislation was to rationalize, Americanize, and decapitalize the Bering Sea pollock fishery. The [so-called] cooperatives established in the AFA were designed to ensure that both harvesters and processors benefited from the rationalization" (Stevens and Gorton, 1999).

The negotiated agreement addressed the separate and joint needs of the offshore sector and the inshore sector. The offshore sector consists of vertically integrated factory trawlers that catch and process their own catch and also purchase fish for processing from seven catcher vessels. Three motherships that purchase fish at sea from 20 different catcher vessels also participate in the offshore sector. The inshore sector consists of five processing plants located onshore and two floating processors that are moored near shore. Approximately 80 catcher vessels deliver raw fish to these plants. The legislation enabled *vessel owners* who hold limited-entry permits in either sector of the directed pollock fishery to form cooperatives in exchange for a fixed share of the offshore TAC or the inshore TAC. Every vessel in a cooperative would receive a right to harvest its historical share of the respective TAC, analogous to an individual quota. Only that vessel or assignee within its cooperative may harvest that individual quota, except in the case of the seven offshore catcher vessels. Thus, intra-cooperative consolidation through quota trading and season elongation was envisioned as the path toward rationalization in much the same way as gains from trade are the cornerstone of ITQ management.

But AFA went a step farther. It recognized that in most of the offshore factory trawl sector, vertical integration assured fleet consolidation benefits both the vessel and plant because they are one and the same. Not so in the inshore sector, where some plants are partially integrated, while others own few or no vessels. Accordingly, AFA implemented cooperatives differentially across sectors. The offshore factory trawl sector was allowed to form two separate cooperatives commencing January 1, 1999. Vertically integrated factory trawlers were allowed to form a single cooperative pursuant to a U. S. Department of Justice Business Review Procedure letter (28 C.F.R. sec. 50.6), despite the potential for collusive pricing behavior among processors. The seven offshore catcher boats were allowed to form a separate cooperative. Formation of inshore and mothership cooperatives was delayed a year and subjected to restrictions that were not imposed upon the seven offshore catcher vessels. These restrictions were intended to assure all vessels and processors share in the rationalization benefits. Because the restrictions are the most controversial aspect of the legislation, they are discussed in the next section. Attention is focussed primarily on the inshore sector.

3. AFA INSHORE COOPERATIVE RULES

AFA section 210 enabled creation of **plant-specific** inshore and mothership fishing cooperatives. These cooperatives may form only if an annual contract is signed by the owners of 80 percent or more of the qualified catcher vessels that delivered the majority of their pollock for processing to an inshore (or mothership) processor in the prior year.[2] Moreover, that plant must agree to process the fish. Binding cooperating vessels to a particular plant, even though the vessels are not member-patrons who own the plant, makes an AFA-style cooperative a hybrid of a traditional agricultural bargaining cooperative and a processing cooperative. In essence, this unique cooperative legislation attempts to create bilateral monopolies in lieu of vertical integration, where the monopolistic bargaining cooperative must negotiate with a monopsonist, thereby, emulating vertical integration.

AFA-style inshore cooperatives are intended to facilitate mutually beneficial bilateral negotiation between the cooperating vessels and their processing plant prior to signing the annual contract. The product of these negotiations should establish: 1) the terms of trade (exvessel price or a rent share agreement) between the plant and the vessel, and 2) the operational rules to achieve mutual cost-reducing throughput consolidation. Both elements of the negotiations are intended to protect vessel and plant interests, while promoting joint profit

[2] Unlike many commercial fisheries, the inshore pollock fishery historically has utilized exclusive delivery contracts between a plant and the fleet delivering to that plant. See Matulich and Sever (1999). This AFA provision affirms that traditional relationship in exchange for a guaranteed share of the TAC and the right to operate in a protected rent-share environment.

maximization that occurs naturally in vertically integrated firms like factory trawlers.[3]

The 80 percent affirmative vote provision is intended to protect countervailing bargaining interests of vessels that must deliver to a monopsonist. If more than 20 percent of the qualified vessels vote not to cooperate (reject the bilaterally negotiated contractual terms), or if the plant rejects the contractual terms, all vessels and the plant must remain in the open access at least one year. Both the plant and its traditional vessels would forego potential efficiency benefits of jointly defined consolidation. However, if sufficient votes are secured to form the cooperative and the agreed upon terms are acceptable to the processor, any vessel that voted "No" must be allowed into the cooperative prior to start of the season. Any vessel that elects not to join its cooperative must operate in the license-limited, open access fishery for at least one year without the benefit of a guaranteed share of the TAC; it must race for fish during that year; and it is free to deliver to any processor. Following this one-year stand down provision, the vessel may withdraw its original quota from the open access pool and join any cooperative that will have it. A vessel will chose not to join its original cooperative if the present value of expected earnings is less than the alternative of switching cooperatives.

In other words, the litmus test of successful AFA-style cooperation is not simply that all parties must recognize that by cooperating they can bake a bigger pie. Both the processor and vessels that participate in a plant-specific cooperative must be better off than under any other arrangement open to them, including the pre-AFA, license-limited open access.

4. COOPERATIVE PRICE FORMATION THEORY

Staatz (1989) and Torgerson, Reynolds, and Gray (1998) note that the concept of producer cooperatives as a form of vertically integrated firm has a long tradition beginning with Emelianof (1942). However, it wasn't until Sexton (1986) and Staatz (1987) applied cooperative game theory to model cooperative price formation that a more complete behavioral model of price emerged. Both argued that a cooperative coalition can form if the members can agree to share the gains so that each member benefits, i.e., cannot be made worse off relative to available alternatives. The conditions to achieve a core, win-win, solution are few. Individual members must behave rationally, i.e., they must benefit from cooperation. Collective action must maximize joint benefits. No player or group of players has the incentive or ability to undermine the core.

These three conditions seem to conform reasonably well to the various checks and balances designed into the AFA cooperative legislation. Cooperating vessels must bargain with a particular plant in order for either to participate in the rationalization efficiency gains that stem from a guaranteed share of the TAC. Providing a contract is negotiated between at least 80 percent of the vessels and the plant, each party should work independently to maximize its contribution to joint welfare. The result is analogous to bilateral monopoly and functionally similar to vertical integration.

Both views of a cooperative (bilateral monopoly and vertical integration) are, for all practical purposes, different manifestations of the same market structure in which profits are partitioned between the upstream monopolistic bargaining association and the downstream monopsonist. Providing " . . . the two sides bargain in a rational manner . . . de facto integration of the two sectors would occur" (Munro 1982). A similar conclusion was reached by Blair and Kaserman (1987) who provided a theoretical framework for modeling price formation under bilateral monopoly as a formula price contract that relies only on knowledge of final product price and average input costs. The monopolist and monopsonist simply have to agree to the formula that partitions the joint rents. Matulich et al. (1995) extended the Blair and Kaserman-type formula price contract in the presence of uncertainty by utilizing common expectations of final output price, input costs, even quantity.[4]

The notion that a cooperative, particularly a hybrid, AFA-style cooperative, is analogous to a bilateral

[3] Price discovery is permitted by allowing every vessel to deliver up to10% of its catch to a different processor.

[4] Interestingly, empirical implementation of this model involved all but one of the inshore AFA processors, though a different species. The empirical model was specified in terms of costs and revenue proxies that are evident to all parties. These proxies captured general changes in costs and revenues over time, and emulated incentives that induced adjustments to joint profit maximizing behavior. Model goodness of fit was excellent. Thus, asymmetric knowledge of finished product prices or of processing and fishing costs does not impede successful cooperative behavior providing both parties share a common view of expected joint profit and agree to split the rents such that fishers earn β-share and processors earn $(1-\beta)$-share. Ex post audits can be used to confirm actual prices, costs and thus, total rent. Such audits can involve bonded neutral third parties to protect proprietary information. In this regard, there should be no informational impediment to negotiating a mutually beneficial formula price contract that maximizes joint profit, thereby emulating a vertically integrated firm.

monopoly is further supported by Sexton (1994a,b) who surveyed non-cooperative game theory as it pertains to agricultural markets and cooperative bargaining. He noted that

> *In most cases in the U.S., the* [cooperative bargaining] *association often controls in excess of 50 per cent of production in the market, but does not have exclusive control. Associations usually interact with multiple processors, but the bargaining environment is often structured so that the association bargains with a single handler, often the dominant firm in the industry, and agreements with other handlers closely parallel the initial agreement. This structure, thus, is roughly bilateral in nature and also conforms to the framework of bargaining theory (p. 197, 1994b).*

Sexton concludes

> *The market structure in which bargaining emerges is generally oligopsony, not monopsony (Iskow and Sexton 1991), but the advent of bargaining often converts the environment to one approximating bilateral monopoly (p198, 1994b).*

5. AN AFA COOPERATIVE GAME

A two-person Nash (1953) bargaining game can be used to characterize the solution to the bilateral monopoly, cooperative game intended by AFA. Providing the cooperating vessels (the monopolist) and the plant (the monopsonist) negotiate in a rational manner, a unique price exits that is a core solution. The axiomatic solution to a Nash bargaining game is found by maximizing the product $(x - x_0)(y - y_0)$, where the terms x and y denote the payoffs to the parties, and x_0 and y_0 are the threat points that arise from failure to negotiate. This equation is maximized subject to the constraint that $x + y = z$, where z is the total payoff available.

Bargaining agents are assumed to act so as to leave no member of a plant-specific cooperative worse off relative to *status quo ante* open access. Thus, the threat points can be substituted with open access quasi rents associated with minimum and maximum exvessel prices $\underline{P}_k$ and $\overline{P}_k$ for the fishers in the k^{th} cooperative and the associated processor, respectively. The solution to the Nash bargaining game can be solved by maximizing $(\pi^c_{fk}(P) - \pi^c_{fk}(\underline{P}_k))(\pi^c_{pk}(P) - \pi^c_{pk}(\overline{P}_k))$, where $\pi^c_{fk}(P)$ and $\pi^c_{pk}(P)$ are cooperative quasi rents for fishers and processor; $\pi^c_{fk}(\underline{P}_k)$ and $\pi^c_{pk}(\overline{P}_k)$ are the threat points that assure neither the fishers nor the processor in the k^{th} cooperative is worse off. This equation is maximized subject to the constraint that $\pi^c_{fk}(P) + \pi^c_{pk}(P) = \pi^c_{total}$, where π^c_{total} denotes the total potential cooperative quasi-rents. The unique solution to this bargaining game, assuming all parties possess symmetric bargaining power and agree to equally share cooperatively generated rents, is given by the value of P that satisfies: $\pi_f(P) = [\pi^c_{total} - \pi^c_p(\overline{P}_k) + \pi^c_f(\underline{P}_k)]/2$ and $\pi_p(P) = [\pi^c_{total} - \pi^c_f(\underline{P}_k) + \pi^c_p(\overline{P}_k)]/2$. This solution implies that fishers and processors each earn sufficient quasi-rents to make **all** members no worse off, and that rents due to cooperative rationalization are split equally between them. Of course, the specific split characterized in this game should not be construed as a predictive outcome of cooperative bargaining under AFA. Rather, it characterizes only that some Pareto safe rent share agreement exists that is dependent upon relative bargaining power.

6. DISCUSSION

The preceding bilateral monopoly, cooperative bargaining framework provides insight into how a single, plant-specific cooperative is likely to divide the surplus from rationalization efficiency gains. However, two elements of hybrid AFA-style fishery cooperatives render the Nash bargaining game incomplete in its depiction of cooperative price formation. First, not all AFA inshore cooperatives are comprised of vertically integrated member-patrons who own the plant (as in an agricultural producer cooperative). Second, processors will possess excess capacity when cooperating vessels consolidate to slow the race for fish (Matulich et al. 1996, and Matulich and Sever 1999). Both make strategic inter-processor relationships/competition and cross-cooperative collective bargaining behavior potentially important elements that are absent from the bilateral monopoly model.

Insights from repeated game theory help refine our understanding of plausible, if not likely outcomes, even though one should not expect industry behavior to involve repeated play of the same game.[5] Repeated non-cooperative game theory tells us strategic relationships among inshore processors are likely to change as

[5] "The main virtue of repeated games lies not in their value as realistic modeling paradigms, but, rather, in suggesting through the stark results they generate that richer and more realistic specifications of the game environment are called for" (Sexton 1994a).

processors respond to AFA-induced incentives to reduce processing over-capitalization. And the *folk theorem*, which states that almost any outcome can be a Nash equilibrium to a repeated non-cooperative game, tells us that processors face a continuum of rational strategies and outcomes as they strive to shed costly excess capacity.[6] This continuum is bounded by two polar cases, which are labeled *market sharing* and *market realignment*.

The market-sharing strategy is one in which processors act like an implicit cartel to maintain *status quo* market shares. They do so by reducing exvessel price to the equilibrium vessel minimax payoff that still maximizes season elongation and, thus, fleet rationalization. Excess processing capacity is internally abandoned (*sic* written off). This market-sharing strategy is individually rational to the extent that any attempt to acquire greater market share by offering a higher price provokes retaliatory price increases from rivals. Deviation from this cartel-like behavior leads to destructive price competition and foregone present value profit for processors. The market-sharing strategy is collectively rational only if price competition is destructive for every processor, i.e., when processors are relatively homogenous and present value benefits from excess capacity utilization are less than the expected cost of price competition. Farsighted firms would not attempt to capture short-run gains in market share because they anticipate long-run retaliatory costs that deviations precipitate. Vessels would not participate in AFA policy-created rents under this variant of a market-sharing strategy; processors would capture all rents.

Of course, catcher vessels would not complacently accept their minimax payoff and allow all policy-created rents to flow to processors. Vessels would invoke traditional exemptions from antitrust liability granted to fishermen and form a countervailing monopolistic bargaining association. The resultant market structure closely approximates bilateral monopoly. Thus, the market-sharing strategy reverts from a processor-take-all game to a win-win sharing of AFA rents, analogous to that portrayed in the prior Nash bargaining game. This bargaining strategy is precisely what occurred during the first half-year of inshore cooperatives, as players began to adapt to the hybrid AFA-cooperative environment. The same Bering Sea Marketing Association that negotiated price contracts for vessels prior to AFA continued to negotiate with processors, despite the formation of AFA cooperatives.

The alternative polar case is a market-realignment strategy in which processors seek to utilize existing capacity more fully by acquiring additional raw fish from non-member vessels. The strategy involves raising exvessel price to the least efficient rival processor's minimax payoff. Such an acquisitive strategy captures economies of size that reduce non-fish average variable costs but incurs higher raw fish costs. Heterogeneity among processors makes this strategy individually rational for the low-cost firm if its present value profitability net of higher raw fish variable costs increases. Less efficient processors who lose market share may be forced to exit, while the more efficient firms who gain market share will eliminate excess capacity by increasing throughput and lowering unit processing costs. Vessels maximize rents; some processors incur uncompensated losses; surviving processors participate in policy-created rents, though the vessels capture a greater share of policy-created rents.

Schmidt (1993) developed the theoretical underpinnings of the market-realignment outcome. In particular, he studied games of conflicting interest, in which one of the players (e.g., the efficient firm) can hold a rival down to its minimax payoff by playing a so-called *commitment strategy*. A player's commitment strategy guarantees the highest payoff to a stage game in which rivals behave in their own best interest. Schmidt's main theorem states that in games with conflicting interests, the committed player will get at least its commitment payoff in any Nash equilibrium of a repeated game.[7] In our context, the commitment strategy is the market-realignment strategy. A firm will not hesitate to pursue a market-realignment strategy if increases in quantity and savings in non-fish average costs more than compensate raising exvessel prices.

Since these starkly different polar strategies/outcomes are supported by the folk theorem, ". . . considerable suspicion is called for if anyone puts too much emphasis on a particular equilibrium for an infinitely repeated game" (Sexton 1994a, p. 19.) without carefully addressing the institutional details of the fishery. Thus, any tendency toward one polar case or the other is dependent on the specific market structure and institutional circumstances of the fishery, which are now considered.

Two notable features of the North Pacific pollock fishery point toward the market realignment

[6] A strategy is individually rational if it equals or exceeds the smallest payoff to which rivals can hold a player—the *minimax* payoff. Those strategies that maximize the respective player's payoff, given the strategies of rival players, are Nash equilibria.

[7] Schmidt's main theorem holds when the following two conditions are met: 1) with positive probability, the committed player will always play his commitment strategy in every repetition of the game and 2) the committed player doesn't discount the future too much.

strategy as the more plausible tendency. First, processors and vessels are heterogeneous in the sense of unequal non-fish variable costs. Second, some processors are largely vertically integrated, owning/controlling upwards of 80% of their fleet (measured in terms of percentage of throughput originating from plant-owned/controlled vessels). One plant, in contrast, owns/controls no vessels. Both features point toward the possible existence of a sufficiently dominant processor who could pursue a commitment strategy, though differential vertical integration makes a commitment or market-realignment strategy likely. For purposes of illustrating the strategic implications of differential vertical integration, assume, without loss of generality, that one processor is 100% vertically integrated (IP) and there is one non-integrated processor (NP). Furthermore, note that the cost of raw fish is the principal variable cost of processing pollock, accounting for upward of 75% of all variable costs.

The IP has incentive to pursue a commitment or market-realignment strategy by virtue of its vertical integration. All additional fish it acquires through price competition are marginal fish. Thus, it has a variable cost pricing incentive in which it raises raw fish price offers until the NP can no longer cover variable costs and must exit. As long as the IP covers its fish and non-fish variable costs--after unit processing costs decline due to greater size economies--any residual is pure economic profit. The IP faces no increase in raw fish costs on its original AFA cooperative quota because it pays that increase to itself. The NP, in contrast, must internalize the exvessel price increase across its entire original AFA cooperative quota just to avoid vessel defection. Such a price increase threatens NP viability; average variable costs (fish plus non-fish variable costs) rise and average total costs rise with every defection.

This commitment strategy is precisely what occurred in the offshore factory trawl sector during 1999, as factory trawlers bid for quota from the seven catcher vessels. All factory trawlers possessed excess capacity, which they desired to utilize. Acquisitive factory trawlers more than doubled exvessel price offers for the quota from the seven offshore catcher vessels relative to the inshore sector, which by law, still operated under open access rules.[8] These factory trawlers increased profitability despite doubling raw fish prices because they more than covered fish and non-fish variable costs. Non-acquisitive factory trawlers were unaffected by the dramatic price increase for marginal fish because all factory trawlers received transferable base quota that allowed them to operate in a protected rent share environment. This transferable base quota is analogous to a *two-pie allocation* of separate fishing and processing quota shown to be efficient and Pareto safe by Matulich and Sever.

The message of Schmidt's theorem for the inshore IP-NP game with conflicting interests is clear. An IP can leverage its integrated structure to price aggressively and bid away independent catcher vessels from a NP cooperative, conceivably even from other cooperatives that are integrated but to a lesser extent than the IP. In so doing, the IP corners an increasing share of the raw fish market and forces the weaker NP to exit the processing sector without compensation. Thus, variable cost pricing in the inshore sector will have a quite different impact on processors who are unable to match high price offers, than what occurred in the factory trawl sector. Inshore processors were not given quota that guarantees they can operate either in a protected rent share environment or exit fully compensated.

Up to now, the cost of switching processors has been ignored. Catchers who desire to change processors must forego the benefits of cooperative rationalization for one year, taking their quota into open access, where they must race for fish without the assurance of catching their historic quota. This one-year stand down provision of AFA may increase the expected cost of defection, potentially lessening the extent to which vessels would respond to an IP's commitment strategy. Independent catcher vessels will weigh any expected one-year loss in base catch (at the increased exvessel price) against the present value of expected gains over their entire repatriated base quota in years two and beyond. Three factors suggest this stand down provision is not an impediment to defection. First, expected exvessel price increases paid to independent catcher vessels in the inshore sector ought to approximate that paid by acquisitive offshore factory trawlers, assuming the acquisitive inshore plant is 100% integrated like a factory trawler. A doubling of exvessel price (before variable harvesting costs) analogous to the offshore sector would fully mitigate up to a 50% one-year expected harvest loss while in open access, not to mention the increased present value stream of rents earned in subsequent years. It seems unlikely vessels should expect to lose half of their catch in open access. Second, vessels are unlikely to defect without first securing a long-run contract with an acquisitive processor. Third, acquisitive processors may be willing to bear the potential one-year risk confronting defecting vessels by including a guaranteed minimum gross earnings provision in the contract.

7. CONCLUSION

The American Fisheries Act takes an innovative, voluntary approach to internalize the efficiency robbing

[8] All catcher vessel rights were acquired under long-term contracts or outright vessel purchase.

open access externality that persists in commercial fisheries. It does so recognizing this externality extends through initial product stabilization and thus, internalization should benefit both vessels and processors. Unfortunately, it does not appear that AFA is likely to deliver on its promise of fully compensated rationalization. The hybrid cooperatives created by AFA were intended to utilize a bilateral monopoly bargaining structure to emulate vertical integration characteristic of the offshore factory trawl sector and of cooperative bargaining found in agricultural cooperatives. But the creation of excess processing capacity as cooperating vessels consolidate to slow both the race to fish and the corresponding race to process provides an incentive for strategic inter-processor behavior not found in cooperative bargaining. If plants were relatively homogeneous in both cost structure and degree of vertical integration, one might expect to see cartel-like behavior of forward-looking processors, to which vessels would react by forming a countervailing bargaining cartel. This bilateral monopoly character of a market-sharing strategy would reflect the win-win intent of the Act. However, the heterogeneous firm structure in the North Pacific pollock fishery (particularly differential vertical integration) points to a commitment or market-realignment strategy as more likely than a market-sharing strategy.

In its attempt to eliminate one market failure, AFA redistributes wealth and possibly introduces a new market failure by effectively creating differential raw fish prices. Non-integrated processors will base all market decisions on efficient market prices, while vertically integrated processors will base market decisions on price signals that are internal accounting artifacts. Integrated processors can segment their market such that raw fish is free from all plant-owned vessels, while the efficient market price prevails on all fish purchased from vessels not owned by the plant. This potential for market segmentation encourages vertically integrated processors to impose higher average raw fish costs on non-integrated or less-integrated processors. Integrated plants seeking to utilize policy-induced excess capacity are advantaged by lower average raw fish prices relative to plants that own few or no vessels. The result is a market-realignment strategy that assures vessels earn maximum rents; some processors incur uncompensated losses; surviving processors would participate in policy-created rents, though vessels would capture a greater **share** of the policy-created rents.

Market failure arises whenever this market realignment strategy promotes rationalization in the processing sector that is not based on processing efficiency. Vertical integration rather than processing efficiency will dictate rationalization among processors. Suppose, for example, the one pollock processor that owns no vessels is most efficient in the sense of lowest non-fish variable processing costs. This processor will confront higher average costs than a vertically integrated processor who pursues a commitment strategy. The efficient non-integrated processor would be forced to exit, though cooperating vessels could acquire the plant.[9]

Apart from failing to assure win-win rationalization, the American Fisheries Act may be the death knell of the independent fisherman. Surviving processors will have a strong incentive to equilibrate the degree of integration across plants, which, in the limit, is 100% vertical integration. Independent catcher vessels will be more than fully compensated to sell out to acquisitive processors. This social consequence of AFA-style cooperatives, with its potentially far-reaching impact on fishery-dependent coastal communities, is worthy of careful consideration, especially if AFA is extended to other fisheries in which coastal community dependence on vessels/crews is more pronounced.

The qualitative insights presented in this paper were drawn from the theory of repeated games and should not be construed as predictive. Few real-world applications involve repeated play of the same game because what happens today usually affects future games to be played. Repeated play of the same game, however, is not essential to obtain a similar outcome when changing parameters are embedded into a single game with multiple stages, as is done in “war of attrition games” and “exit games,” (Fudenberg and Tirole 1991). Regardless, the win-win bilateral monopoly relationship Congress and industry envisioned with AFA is unlikely and efficiency cannot be guaranteed.

The pathology of overcapitalization in both harvesting and processing sectors is clear: ill-defined property rights. The pathology of wealth redistribution and potential market failure introduced by AFA is equally apparent. Only vessels were assured compensatory protection of quota. Processors did not receive a similar direct compensation mechanism. Instead, protection of processing interests relied on an institutional framework to promote cooperative bargaining. Yet, excess processing capacity combined with heterogeneity among processors may promote strategic inter-processor competition that undermines legislative intent and fails to assure efficiency. In the absence of near perfect homogeneity, the only viable property-based mechanism to assure efficient, win-win rationalization appears to be a two-pie allocation of individual transferable fishing and processing quotas (Matulich and Sever). Alternatively, it

[9] Downstream vertical integration should enable this "true" cooperative to dominate the market-realignment strategy, especially in the transition period as less integrated processors attempt to fully integrate.

is necessary to avoid giving away rationalization benefits and associated market power in the first place. It is conceivable some form of truth-revealing auction could be constructed such that the most efficient auction winners only pay the policy-induced increase in quasi rents, and these payments are subsequently used to compensate losers. Win-win rationalization would follow.

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