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Fisheries Management and Market-oriented Value Adding (MOVA)

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Abstract *This paper focuses on fisheries management systems as a motivation factor for market-oriented value adding (MOVA). Analytically, the paper relies on the marketing and industrial economics literature. It shows how established fisheries management systems reduce motivation for market-oriented value adding (MOVA) and thereby waste resource rent. An improved management model is introduced which motivates MOVA, cost-efficiency, sustainability, and fair social allocation. This model combines a Seasonal Quota Auction (SQA) and administrative allocation of licenses and quotas to communities or fisher groups. This model offers the following advantages in comparison with a pure Individual Transferable Quota (ITQ) model: (i) increases resource rent without privatizing the fish resources to a few private holders; (ii) leases seasonal quotas instead of selling permanent quotas as with ITQ; (iii) improves rent generation by motivating the most market-oriented and efficient fishers by leasing quotas on credit; and (iv) offers the choice of collecting resource rent through fisher's cooperatives, regions, ITQ owners, government, or redistribution of rent as a bonus to all fishers.*

Key words Fish auctions, fisheries management, fisheries marketing, institutional economics, market orientation, resource rent, sustainable development, value adding.

Introduction

The resource rent in fisheries is the profit margin between market value and the costs related to catching, processing, and sales of catch. Market value increases with increasing shortage of supply relative to total demand. Total demand, however, is a sum of the demand in market segments with different demand profiles. Individually, fishermen experience that the market values of landings are related to how well the product mixes from catches match demand in the receiving market segments. Therefore, market values and economic rents from fish catches vary significantly between groups of vessels. Product mix from catching derives from the mix of fish species, fish size, product quality, degree of processing, and fish by-product utilization (roe, liver, *etc*.) (Sylvia 1994). Maximizing market values is, according to standard marketing theory, dependent of the fish business' basic ability to strategically manage the product mix from catch and timing of sales to the relative best market segments. Market values can further be improved by marketing activities, such as collection and strategic use of market information and building customer relationships that strengthen the transactions between seller and buyers.

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Generally, the marketing management literature gives strong empirical evidence that both market-oriented management and market orientation have significant positive effects on market performance, which is positively related to financial and business performance (Becker and Homburg 1999; Deshpanté, Farleyand, and Webster 1993; Jaworski and Kohli 1993; Narver and Slater 1990; Ruekert 1992). Market orientation is conceptualized as an organizational behavior which performs "organization-wide generation, dissemination, and responsiveness to market intelligence" (Kohli and Jaworski 1990), and as "an organizational culture (…) that most effectively and efficiently creates the necessary behavior for the creation of superior value for buyers" (Narver and Slater 1990). Capturing added values in the market through differentiation and market orientation is all about long-term business learning (Narver, Slater, and Tietje 1998). The need for organizational learning is a barrier to change because it takes time and energy and is costly (Rogers 1983). So what motivates business and their employers to invest time and money in long-term, market-oriented activities? More specifically, how can motivation be influenced for maximizing market values through long-term market orientation in the fishing business? This question will be discussed using an analytical perspective from industrial organization and the Structure-Conduct-Performance (SCP) model (see figure 1) (Scherer 1980; Porter 1981).

Performance refers to resource rent related to market-oriented value adding and cost efficiency. Conduct refers to the fish industry strategies where objectives, time slack, raw material control, and business capabilities (resources such as expertise, equipment, capital, and vertical control) are the main constraints. Capital and vertical control may accumulate through performance. Structure refers to mobility (entry and exit) barriers in strategic fishery groups (*e.g.*, factory trawlers, longliners, *etc.*) (Barney 1996). Fishery structure is a function of business conduct, but government policy plays an important role in the structure formation (Porter 1990). Fisheries management controls the main raw material source in the seafood value chain and is a main constraint for operating fishing firms and for resource rent generation (Trondsen and Johnston 1998). Over time, the objectives of fisheries management have progressed from maintaining sustainable fish stocks, to allocating fishing rights to preferred fisher groups, and recently, to improving profitability through cost efficiency. So far, less attention had been paid to the objective of maximizing market value of the total catch.

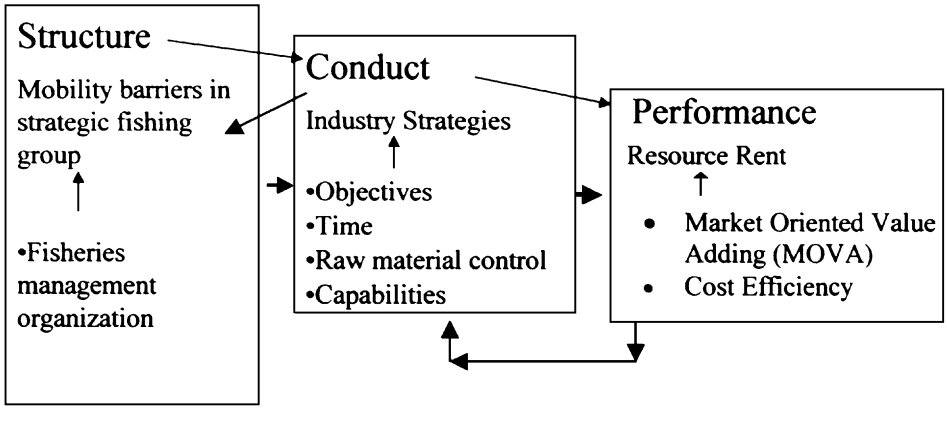

Figure 1. Analytical Perspective

Market Value and Resource Rent

The main focus in academic research and fisheries politics has been on the catching cost side of the resource rent equation. Less attention has been focused on variation in market-oriented value adding. Introduction of ITQs in the New Zealand groundfish fishery and in the US and Canadian halibut fisheries has demonstrated, however, that changes in the fisheries management system also influence market-oriented value adding in the fleet (Dewees 1989; Herrmann 1996; Sjøholdt 1997).

This asymmetric focus is understandable due to the ability of individual companies in the short-run to maximize profits by overexploitation the fish stocks; *i.e.*, harvesting more than a sustainable long-term biological reproduction. Such profit maximizing can, in business terms, be characterized as making profit by using the production machinery as raw material (here the fish stock) rather than relying on maximizing the long-term market value of the annual biological production. This potential for high, short-run profit in open fisheries has given strong incentives for individual entrepreneurs to increase their harvest capacity and catch, even though total catch exceeds the long-term sustainable catch level (MSY), a process described as the "tragedy of the commons" (Gordon 1954; Hardin 1968).

Fishery economists have proposed different cost-oriented solutions to the problem of resource rent depletion. Most solutions prescribe limitation of fishing entry, regulation of effort, or allocation of individual quotas (Clark and Munro 1975; Scott and Neher 1981). Other economists argue for governmental auction of limited number of licenses among the participants (Butlin 1982; De Voretz and Schwindt 1985). Stronger national control over the allocation is also advocated (Neher, Arnarson, and Mollett 1989). More recently, significant support has been given to the idea of privatization of the common resource using ITQs and individual transferable licenses (ITL) (Clark, Major, and Mollett 1988; Hanneson 1990; Helgason 1991; Kennedy 1991; Boyd and Dewees 1991; Grafton 1995). However, academic economists seldom take into account the political constraints and the social costs of the solutions (Copes 1986a; Copes 1986b; McKay and Creed 1990; Lipnowski 1991; Aquilera 1991). Fisheries managers experience these realities when they receive contradictory and heterogeneous demands from specialized advisers and interest groups like biologists, environmentalists, economists, fisher groups, and local fishing communities (Davits 1991; Sissenwine and Mace 1992; Eythorsson 1996; Charles 1998a). For an overview of these issues, see National Research Council (1999).

Fish Industry Strategies and Fisheries Management

The literature about how fisheries management influences the fishers' market-oriented value adding is very slim, except for a growing literature concerning the value-added advantages in utilization of market information for fisheries management (*e.g.*, Larkin and Sylvia 1999; Carpo 2000; Martinez-Garmendia, Anderson, and Carroll 2000).

In contrast, the relationship between business capabilities, as raw material, and business strategies analyses is well documented in the general management literature. The market-orientation literature acknowledges that the levels of existing capabilities may limit the companies' ability to be market-oriented (*e.g.*, Narver and Slater 1990).

The seafood business' ability to satisfy market demand is dependent on its access to the raw fish catch in terms of the right quantity, quality, and time (Anderson 1995; Larkin and Sylvia 1995, 1999; Carroll, Anderson, and Martinez-Garmendia

1999; Trondsen and Johnston 1998). Fish prices are very elastic and vary a lot over the year depending on supply pressure in the available value chains (Trondsen 1994, 1997). Supply management of demanded fish products rather than "catch driven sales" is, therefore, a key factor for maximizing market values.

Still, nature has a significant influence on the supply pressure from fish catch. Fishers traditionally want to catch when the fish is available and when the catching costs are lowest. The fishing companies' access to the fish is, however, controlled by governments. If the natural resource policy governing access to the resource is solely based on conservation, it is expected to limit the ability of the fishing industry to be market-oriented and may lead to market structures that stifle market orientation for these industries (Trondsen and Johnston 1998).

In this paper, the relationship between market value and fisheries management will be discussed in light of the experience of different management systems practiced under different political settings. Information sources include both the literature as well as the author's long-time fisheries experience. The purpose of the study is to generate hypotheses for further discussion and testing. The analysis will be organized as follows. First, I discuss how different fisheries management systems—Olympic style, licenses, and transferable quotas and licenses—influence the motivation of MOVA and, thus, resource rent generation. Based on this analysis, a seasonal quota auction system is outlined as an alternative motivation mechanism for increasing MOVA. The discussion of each management system's impact on MOVA is concluded in general propositions.

Market Orientation and Fisheries Management Systems

Olympic Style

Olympic-style catch management gives the participants (with or without licenses) the right to catch until a specified total fish quota is taken. This has been practiced in such disparate fisheries as the pollock fishery in the North Pacific (until 1999), the offshore Japanese tuna fishery, and part of the Norwegian coastal fishery. The total quota (TAC) or shares of TAC are allocated to all that are interested in catching, or limited to qualified individual applicants among a chosen target fishing group. Examples of such target groups are vessels that are expected to sell their catch in specific regions as in Northern Norway, licensed offshore factory trawlers, or onshore catchers in the US Alaska pollock and Oregon hake fisheries (prior to the introduction of cooperatives in 1999), vessels less than 32 feet in Alaska's Bristol Bay salmon fishery, and licensed coastal vessels or fresh fish trawlers in the Norwegian saithe fisheries.

Olympic-style management without entry limitation controls the total catch, but also encourages competition between the participants in order for them to secure their individual shares of the group's TAC. The competition pattern tends to focus on catching as quickly as possible. When the total quota is less than the vessels' catch capacity, the most efficient vessels will catch the highest share of the total quota and earn the best margins. Over time, the total fishing time available for harvesting quota tends to become shorter and shorter due to entry of new participants and increased individual efficiency.

This was, for example, the case for the US Pacific pollock fisheries, where the season length declined to only a couple of months every year, and for the halibut fishery in Canada and in the US (see figure 2) (Casey *et al.* 1995). An extreme case was the Alaska halibut fishery, in which the season length declined to just two, 24-hour openings during the 1980s when it was managed under an Olympic system (Sjøholt 1997).

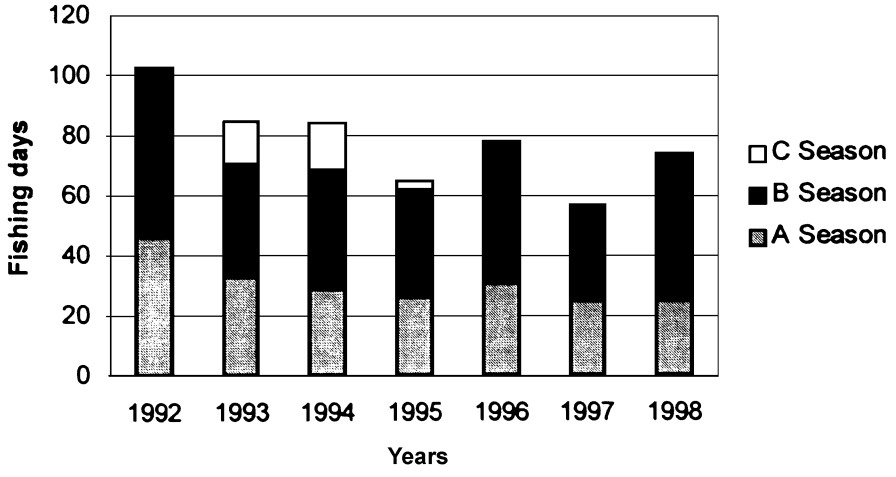

Figure 2. Season Length of Olympic Fisheries after Alaskan Pollock 1993–1998. US Offshore fleet in the Bering Sea

In order to maximize the individual vessel quota share under the Olympic management system, the participants are motivated to invest in capacity-increasing equipment, rather than in market value-adding activities. The chosen fish processing lines are those that generate the best daily total margins, even if other processing lines would have given higher margins per ton if time weren't a limiting factor. For example, the pollock factory trawlers under the Olympic system tended to process more surimi than fillets even in market situations where margins per ton of catch were higher in processing fillets compared to surimi. The reason was that a greater quantity of raw fish could be turned into surimi per day. A comparison of Alaska pollock offshore; onboard processing between the Japanese factory vessels, which operated in Alaska waters until the 1980's, and US factory vessels in the 1980s and 90s shows this difference in behavior. The Japanese had enough quotas for most of the year and could focus more on surimi quality and marketing. In contrast, when the US factory trawlers were managed under an Olympic-style system, they were invested heavily to improve daily output in each vessel. The US trawlers had to compete for a limited total quota during a short time period and had to focus on daily processing efficiency to maximize their share of the total quota (Arnarson and Trondsen 1989).

Profitable market-oriented value adding meets significant barriers under an Olympic management system where vessels operate for only a few months under fierce time constraints. Processing for the higher-valued fresh fish markets requires a more continuous raw fish supply and time limits on fishing trips to secure fish quality, due to the limited shelflife for fresh, iced fish. Some traditional fresh fish consumer markets are seasonal and adapted to seasonal catch, but the growth in fresh fish sales is increasingly related to supermarkets and restaurant chains demanding stable supply every week over the year (as demonstrated by the exceptional market growth of fresh, farmed salmon). In practice, storing fresh fish is only possible in live condition to maintain the freshness preferred by consumers. Prices are driven downward in cases where the quantity of catches and landings of fresh fish under Olympic-style management exceeds the weekly capacity and premium quality demand in the fresh fish distribution system. In such cases, lower-priced frozen,

salted, canned, or other quality-preserved products become more profitable.[1] When the total quota for a species is caught, the supply of the fresh product declines and the fresh fish price may increase again—but fishers are not allowed to catch fish to meet this demand. This is why the total resource rent may increase when individual vessels are free to choose when to catch limited individual vessel quotas to take advantage of market conditions, as demonstrated in the Pacific halibut fisheries (Hermann 1996).

It is also much more time consuming to produce value-added products on board the vessels (as fillets/steaks, *etc.*) or to utilize byproducts from fish (roe, liver, head, enzymes, amino acids, fish meal, Omega-3 oil, *etc.*). This means that even if it is possible to increase the market value of the catch through value-adding production, the time constraint under the Olympic quota system will hinder such practice.

The conclusion is that Olympic-style fisheries management of TAC, or a share of TAC, allocated to a group of vessels will waste resource rent on both the income and the cost sides, even if it is successful in securing a sustainable fish stock. The utilization of possible market values from a limited total quota will be reduced if the time constraint reduces the industry's motivation to be market oriented. While entry restrictions may reduce resource rent waste on the cost side, they will not motivate market orientation. Thus, a generalization of this proposition is:

GENERAL PROPOSITION 1: *Fisheries managed after an Olympic-style catching reduces the time available for market-oriented value adding and, thus, reduces potential resource rent.*

License Management

Introducing licenses for entry into specific fisheries is another method of regulating the total catch capacity by limiting the number of participants in a fishery.[2] When quotas are allocated to license owners, license allocation indirectly becomes an allocation of future harvest and resource rent between the participants.

If the license system reduces entry of new vessels and stimulates exit of existing vessels, the resource rent increases, according to economic theory, by reducing catching costs until the number of vessels has an optimum catch capacity for the total available quota.

Norway is an example where the fishing effort in many coastal fisheries has been regulated through a combination of TAC, entry licenses, and individual vessel quotas. The combination of these regulatory tools may vary from fishery to fishery. Fishing vessels may, for example, have both a general license to a specific fishery (*e.g.*, groundfish or herring) and an individual quota of specific species, such as cod haddock, herring, mackerel, *etc.* Fisheries requiring special licenses represented more than half of all Norwegian catch, by value, in the late 1980s. Licenses were required for 90% of the herring sector (herring, mackerel, capelin, and blue whiting) and 35% of the groundfish sector (Trondsen and Angel 1992).

Since individual quota limitation was introduced in 1990 on smaller coastal vessels with conventional gears (net, longline, *etc.*), the coastal sector has been gradually closing for new entrants. Today, fisheries managed under licenses and/or individual quotas account for almost the entire value of the Norwegian fishing industry (Holm, Rånes, and Hersoug 1998).

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[1] In some cases, processed fish receive a higher price than fresh fish. This is often the case for big salted cod for Bacalao products demanded by Catholics in southern Europe and Brazil.

[2] Licenses can be non-transferable or transferable between vessels.

Introduction of licenses when the capacity is already too high may hinder new entry, and also reduction of capacity. It may even increase capacity because vessels may enter the fishery in anticipation of the introduction of licenses because of the license's potential market value.

The fishers' incomes are decided by the vessels' share of the total resource rent in each fishery, which varies from species to species due to substantial fluctuations in catch and commodity prices. For example, the resource rent can be high for herring in some years and low for prawns and cod. While for other years, the situation may be reversed.

Fishers learn fast that to secure a high-income under changing price and catch conditions in different seasons and fisheries, they have to secure all necessary rights (licenses) in order to have the option to choose the most profitable combination of fishing seasons each year. When licenses were first introduced, the Norwegian government required that vessels already have a catch record to be eligible for one. Similar methods were used when licenses were introduced in the US Alaska pollock and Icelandic cod fisheries. To keep the license over time, the Norwegian government also requires that catching activity be continuously documented.

When catch records for each seasonal fishery are a condition for maintaining license rights, the fishers are motivated to keep a fleet consisting of all-round vessels which are suitable for using many different gears and for processing and storing different species onboard. These vessels that combine many short seasonal fisheries are motivated to maximize their yearly income by catching as much as possible in seasons under Olympic time constraints and catching as fast as possible in seasons under individual limited quota constraints. The time to take care of and process the catch will, in both cases, be reduced. Market-oriented activities, such as quality management, value-adding packing, sorting, processing, and just-in-time delivery suffer.

In the Norwegian case, the size of the individual vessel quota has also been a function of the vessel size. Under such regulation, the fishers are motivated to increase the size of the vessel in order to increase the present and future shares of the total quotas. To avoid increasing vessel sizes and fleet capacity, governments usually put vessel size constraints on the catch licenses. When quota is a main asset in the fisheries, boat owners are motivated to build or purchase second-hand vessels according to these license and quota requirements rather than to maximize the market value of the catch through better handling and processing onboard.

This means that under such license qualifying activity and technical license constraints, fishing effort is expected to increase without increasing the catch value, while market value-adding activities decrease. A generalization of this proposition is:

General Proposition II: *Fisheries managed by limited-entry licenses may reduce the resource rent if: (i) Catch records are required to maintain licenses, which motivates catching to maintain fishing rights in temporarily less-profitable fisheries and reduces the available time for market-oriented value adding; and (ii) Vessel size constraints are imposed, which reduce the optimal mix of products processed from catch.*

Individual Transferable Quotas (ITQs) and Individual Transferable Licenses (ITLs)

Most economists consider ITQs as the most economically efficient system in fisheries management. This system has been adopted in Iceland, New Zealand, Australia, Canada, and the US (halibut and sablefish fisheries), among other places. Experi-

ence has shown that the system basically works according to theory when it comes to improve cost efficiency and more market-oriented value adding based on traditional production methods (National Research Council 1999). The capacity used in the fisheries adapts to the income from the available ITQs. The most efficient and financially strong entrepreneurs and vessel owners buy quotas from the less efficient quota owners (Arnarson 1991; Lindner, Campbell, and Bevin 1992). Iceland, for example, has no specific size or gear regulation on vessels, except biologically motivated mesh size in trawl nets, and quota allocation to smaller coastal vessels. The fleet structure has, therefore, adapted to vessel sizes and catching technology that the fishers perceive as most efficient for their business, without interference from the government. Ownership constraints may reduce this effect. Matthiasson (1997) has shown that local government ownership and employment interests in the Icelandic fresh fish trawler fleet have hindered the capacity reduction favored by fisheries managers.

In Iceland, all quota transactions are handled by the Icelandic Directorate of Fisheries to assure that the quota transactions occur at a real fish market price between anonymous partners. Earlier quotas were traded between business partners and priced accordingly to broader business interests, which tended to increase the quota price far beyond its fish market value.[3]

Norway has a system with transferable licenses connected to vessel transactions controlled by the government. Each licensed vessel has the right to catch a share of a total quota either through competition in Olympic-regulated fisheries or as a government allocated individual share of a TAC. The Norwegian government had programs during the 1990s to reduce capacity and effort through decommissioning schemes, support for selling vessels abroad, support for establishing international fishing, and offers of increased vessel quotas when two or more licenses were used by one vessel.

The first three programs failed because the compensation was too low compared to the loss of permanent license rights. Most vessel owners gave priority to maintaining future fishing rights instead of selling the license back to the government.

When the government introduced quota incentives for adding more than one license to each vessel, the market started to work. Under this scheme, fishers who owned two or more licensed vessels, which had individual quota rights, were allowed to transfer a certain percentage of the quota from one vessel to another vessel if the latter vessel was withdrawn from the fisheries. The prices of vessels with licenses and quota rights went up to a very profitable level, which motivated the owners to sell vessels with the license to another vessel owner that wanted to catch more on his/her present vessel. Through this process, first introduced in the Norwegian pelagic sector and in the groundfish fisheries in the late 1990s, capacity and total catching costs have been substantially reduced. Norway did, in practice, introduce an ITL controlled by the government. This is indirectly a transferable quota system because quotas are allocated to licensed vessels. The government denies that buying and selling licenses and quotas is allowed, and claims that there is no automatic license transfer between buyers and sellers of vessels. The government has to issue the license, which follows the exchange of a vessel title. However, when such a

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[3] In Iceland, it has been common practice that the quota owners exchange quotas in barter trades. However, both partners are interested in pricing their quota units as high as possible in order to show high asset values in their books for financing and equity purposes. Quota assets have also been subject to depreciation. Depreciation of high quota values is, therefore, an efficient way to eliminate high taxable income while the quota prices increased far above any reasonable economic level. It is anticipated that the quota prices will decline to a reasonable level when companies are forced to complete the quota transactions with anonymous cash buyers.

transaction is very seldom denied, and there is always more than one buyer per licensed vessels, the seller can always choose among those who are approved by the government. Therefore, both the value of the vessel, plus the value of the license and related future quota rights, are reflected in the traded vessel price (Flaaten, Heen, and Salvanes 1995).

The Norwegian experience shows that such a transferable license system related to a market price is an effective system for adjusting capacity in the fleet. The license becomes a valued equity asset. Fishers with licenses are protected from competitive pressure from entering competitors (Barney 1996). This means that they have secured their equity asset by performing their traditional catch- and production-oriented behavior. Only fishers with historical records in the industry get a license in the Norwegian case. The core capabilities in the industry are then limited to the traditional fishing knowledge, ideas, and behavior. Introduction of new market-oriented ideas, initiatives, and technologies is often related to the entry of new and motivated entrepreneurs with alternative core competencies (Porter 1990). Without available new licenses for more market-oriented entrepreneurs, the license system may hinder market-oriented value adding in the industry as a whole.

However, those in the ITQ and ITL systems, who received the quota right for free (based on historical records) when the systems were established, receive all the resource rent when they sell the quota to the first buyer (Eythorsson 1996). These rents, which are windfall profits, are then capitalized through high markups on vessels or quota sales. Quota or license values fluctuate due to changes in catch quantities and fish prices. Such fluctuations provide opportunities for profitable speculation in buying and selling vessels with license rights. It is expected that the objective and motivation of the business is profit satisfaction rather than profit maximization (Simon 1958). Business practices change slowly, constrained by their capabilities and motivation. Industry leaders typically search for solutions for business problems in the neighborhood of established business practices, where marginal profit satisfaction may be reached with the lowest resource effort (Cyert and March 1963). The possibility for resource rent capitalization in the form of windfall profit is, therefore, expected to reduce the motivation for investment in technology and structures focusing more on long-term value adding. The latter may require changes in the fish business' market-oriented practice beyond better market utilization of traditional technology and practice. A disadvantage of both the ITL and ITQ systems is the reduced entrepreneurial motivation for increased market-oriented value adding. Both systems can secure a high resource rent from harvesting, regardless of the contribution from market-oriented value adding.

There is a lot of evidence that new business orientation, in general, comes from entering new ventures and from entrepreneurs driven by external knowledge, ideas, and social forces (Drucker 1986; Porter 1990; Trondsen 1985).

Openness for new entrepreneurs is an advantage of the open transferable license or quota systems. When the resource rent is fully capitalized through traditional products, capital-controlling entrepreneurs may still purchase or rent quotas and licenses and introduce market-oriented ideas (Barney 1986). However, the cost of entry is much higher than for the fishers that initially got the fishing right for free. The need for capital becomes a new entry barrier and favors companies that control or have access to enough capital, and excludes those entrepreneurs who don't. Market-oriented value adding in the long term is motivated and improved by low barriers for entering entrepreneurs (Drucker 1986; Porter 1990; Trondsen 1985). Barriers in the form of non-transferable licenses or high-capitalized licenses and quotas hinder such entering entrepreneurial pressure in the fishing industry.

Introducing exit mechanisms through transferable quotas and licenses reduces capacity costs per unit catch and increases resource rent. However, accumulation of

assets in private hands increases the monopoly power and economic satisfaction among the present participants without being market oriented. This reduces the motivation for more market-oriented value adding if entry of new entrepreneurs is also restricted by licenses requiring historic participation or high capital costs.

GENERAL PROPOSITION III: *Fisheries that require licenses and individual quotas are motivated to reduce market-oriented value adding if: (i) Historical catch records and increasing capital are required from the participants; (ii) Entry barriers for new fishers increase; and (iii) The size of the quota-shares satisfies the existing participants profit expectation without market-oriented value adding.*

Market Orientation Through Fish Auctions

Fish auctions have a great potential to allocate and exchange values where the demand and supply are very diversified (Kearny 1997). Fish auctions have been utilized as the main instrument to exchange multi-species landings of fresh fish between fishers and firsthand buyers in most European countries. The experiences from these auctions show that fishers gain higher prices compared to all other exchange systems if the catch attributes and/or purchase preferences are heterogeneous (Arnarson and Trondsen 1998). Auctions that offer catch from many vessels give heterogeneous buyers the opportunity to purchase their preferred part of the landings (for example one species of a specific size and quality) from several catching vessels. The buyers then have the opportunity to specialize in products and markets. Using such strategic, specialized expertise may improve the market-oriented margin (Porter 1985).

An alternative to auctions is contracts (short or long term) directly between individual vessels and the first-hand buyer, as is practiced in the Norwegian cod fishery. Buyers under such contracts are obliged to purchase the entire catch containing a broad range of heterogeneous product attributes. The product attributes in the catch that do not fit the purchasers' specialization profile will, in such cases, be in less demand compared to product attributes which do. Such contracts between sellers of catch containing heterogeneous product attributes and specialized buyers reduce the possibility for product specialization and market-oriented value adding in this transaction, compared with exchange through auctions where heterogeneous buyers are present. This hypothesis is confirmed by findings from Icelandic fish auctions, which indicate that the average prices paid for catches under contracts are significantly lower than prices for fish traded through auctions (Arnarson and Trondsen 1998). It is also a trend in Iceland that buyers who control catchers under long-term contracts sell parts of the catch that do not fit their own specialized production in the auction. This means that the first-hand buyer collects the margin that the fishers would otherwise collect if they sold directly through the auction (*ibid*).

Fish auctions, to date, have not been utilized to exchange fish quotas because the owners (governments) allocate quotas according to non-monetary rules. Fish quotas have heterogeneous product attributes, which have different values (product prices and cost of catching), for different fishing groups. The values vary with quota attributes, such as species, quantity, fish size, season, catching area, catch gear, days at sea, allowed bycatch, closed fishing area, spawning ground regulations, *etc.* The fishers will have different preferences and will put different values on quota attributes depending of their capability with respect to vessel type, fishing gear, home location, season combinations, catching, processing, and marketing. If the quota's attributes are exchanged through auctions, the fisher's possible number of attribute choices may increase, which increases the possibility of bundling attributes that best fit

the fisher's preferences and the vessel's capabilities. Such increased choices may improve the opportunity window for specialization of catch, processing, and market orientation. Without governmental constraints on what type of vessels the fishers are allowed to use, they are motivated to chose the mix of products, markets, species, processing technology, and capacity that satisfies their rent expectation from a given quota.

Exchange of quotas in auctions will create a price—actually a resource rent—that fishers are willing to pay the owner and still be able to run a profitable catching and processing operation for themselves. Competition for quotas among fishers also gives an incentive to increase operation margins between costs and market values. This will motivate all participants to improve the value added of the limited total quota, which, in turn, may increase the resource rent. The resource rent might be collected by the owner through these kinds of auction sales (government) or by the fishing community itself.

Auction of quotas is not a new idea. Butlin (1982) and DeVoretz and Schwindt (1985) argued that auctioning of licenses, combined with free quota rights, is, in fact, the same as auctioning of quotas. Morgan (1995) and Brubaker (1995) also argued for quota auctions as a means to solve the problems of current practices of allocation by administrative decisions, which has been a source of great discontent in the introduction of ITQ management systems. The only known example of fish quota auctions is for geoduck in Washington state in the US (Brubaker 1995). Practical experiences have been gained in other industries, such as communication, airline, financial, forest, and mineral, which face the same allocation problems. Auctions that have evolved in other industries have led to the achievement of a wide range of public policy objectives in an economically efficient manner (Brubaker 1995; Gulley and McGill 1984).

However, if the auction mechanism is utilized without constraints, the sum of social costs soon may be higher than that which is politically accepted (Charles 1998b). A main disadvantage of the free-market auction solution is that relative monopoly control of capital, processing, and distribution chains tends to be more important for the allocation of quotas than a firm's ability to maximize market-oriented values from the limited TAC. The market role of governments, as Smith (1993) argued, is to set rules which hinder monopoly power and increase competition to gain the advantages of the free-market mechanism. Most governments also have social objectives for the allocation of fishing rights. The question is, therefore, to what degree can the auction mechanism be integrated into a broader allocation management decision model that satisfies both the objectives of market orientation and social allocation, as well as the objective of economic efficiency. A generalization of this proposition is:

GENERAL PROPOSITION IV: *Fisheries are motivated to maximize market-oriented value adding through fish auctions where heterogeneous product attributes are exchanged with heterogeneous buyers' preferences. The social costs may increase and market values may be reduced if increased capital requirement and vertical control in the value chain restrict entry into the business.*

Seasonal Quota Auctions (SQAs)

Auction of seasonal quotas offers an institutional solution for the problem of concentration of market power in free market solutions (Proposition IV). Seasonal quota units (SQUs) are assets that can be traded through a seasonal quota auction (SQA). Such quota units may be for a limited time period and constrained by catch attributes according to management objectives as illustrated in table 1.

Table 1
Example of a Seasonal Quota Unit (SQU) with Catch Constraint Attributes

Attributes	Example of Constraints
Fish species	Cod
Period	Jan. 1 – March 31
Quantity	800 tons
Fish sizes	> 2 kg
Bycatch	Maximum 100 tons haddock and 50 tons redfish
Catching area	N 65° – N 70°, outside 4 nautical miles
Gear	Longline
Landings places	Northern Norway
License	Home address northern Norway (2A)

The better the SQUs are designed to meet the fishers' preferences, the higher the values of the SQUs as reflected in auction prices. The concept of seasonal quota units may fit into the fishers' planning horizons. High uncertainties characterize fisheries and make the fishing industry a high-risk business. Fishers' planning horizons, therefore, tend to be short term. A seasonal SQA system will, in the same way as an ITQ system, give fishing enterprises the necessary motivation to be competitive within this regulatory framework. To be competitive bidders in the quota auction, fishers must keep the margin between operational costs and sales income as high as possible. It is in the fishers' interest to minimize their economic overcapacity, adapt to changing business cycles in different fisheries, be market oriented, and maximize market value.

Three types of problems must be addressed before the auction can work according to these objectives: (1) avoid concentration of buying power; (2) allocate quota to meet demand from different target groups and between seasons; and (3) manage an efficient exchange process.

Concentration of Buying Power

A seasonal quota auction may, as with tradable ITQ systems, be an arena for powerful buyers with "deep pockets" (Porter 1980). These buyers, who control capital, may be willing to pay a high quota price without making profit for a shorter period in order to get rid of competitors and reduce future competition. Such strategic conduct and structure may also, as suggested in Proposition IV, reduce the probability for maximization of market-oriented value gain, especially in small auctions with a limited number of bidders. If the fishers are given credit for the payment of the SQUs until after the quota is actually caught and sold, such market behavior might be minimized. Those who are not able to catch the purchased quota may pay only for the quota they have actually caught, while the rest of the quota may go back to the auction for resale. However, this mechanism could motivate fishers to buy more quotas than they need in order to make sure that they have enough if the catch rates are high. The management task is to make sure that actual total catches match the available quotas. This can be secured by establishing a mechanism where the fishers must pay for some part of the quota when the quota is purchased on the auction and some part after the fish is caught. This will motivate the fishers to sell back to the auction the part of the quota they have bought but are not able to catch. By running the quota auction regularly and offering to buy back unused quota units for resale in

the current season, it is expected that the total catch will match the total quota. All quota units will be allocated to fishers at all times. How to adapt the catch to the quota will be up to fishers, and may vary based on the catch experience during the season. In this kind of system, the fisher faces a risk of loss if he buys more quota units than he can catch and realizes this fact too late for selling the surplus quota back to the auction for resale to other fishers for the same season.

Target Groups and Seasons

If fishery management has a policy of allocating quotas between seasons and target fishing groups, an alternative is to follow the international practice of allocating the total yearly TAC into SGQs. These SGQs may then be divided into SQUs and sold by auction, as illustrated in table 2.

For example, shares of the TAC in both the US and EU are first allocated to regions, before being shared and allocated to individual vessels. In the US, quotas are allocated by regional fishery management councils, which set the rules for distribution of quotas to individual vessels. For example, in the pollock fishery the TAC is first allocated between offshore factory trawlers, catchers/motherships and catchers/land processors, and regions in Alaska. Secondly, the TAC shares are divided between seasons before the individual vessels can compete for their individual shares of these seasonal group quotas through an Olympic race for fish or through fixed individual quotas, which were introduced for factory trawlers through a cooperative system in 1999. In the EU, each country constitutes one TAC region. The TAC for each EU country is further partly allocated to vessels through Producer Organizations, or POs (Salz 1992; Hatcher 1997; Young, Smith, and Muir 1996).

In other countries, such as Norway, quotas are allocated to target vessel groups with similar catch and processing technology; *e.g.*, coastal fleet, purse-seiners, fresh fish trawlers, factory trawlers, *etc.* Sometimes regions and vessel groups are combined in one target group.

Regional constraints can also be included in SQAs. The target group may be geographical regions or groups of vessels, fishers, or processors. For example, cod vessels with passive gears (longline, net, jigging, *etc.*) north of 62˚N in northern Norway are managed as a separate target group for quota allocation and received 69% of the Norwegian Norwegian-Arctic cod quota in 1999 (Fiskets Gang 1999).

Dividing the TAC quotas into SGQs may also satisfy the governments' allocation objectives.

Throughout the auction process, management will receive information about target groups' willingness to pay for the SQUs in different seasons. This market information from the auction, including the fishers' judgement of the value-adding op-

Table 2
Example of Quota Allocation (1,000 tons) to Season and Vessel Target Groups

Target Group/ Season	Year/SGQ	Jan. 1 – March 31	April 1 – Aug. 31	Sept. 1 – Dec. 31
Year/SGQ	400'	150'	125'	125'
Vessel < 10 m from Northern Norway	140'	50'	50'	40'
Longliners 10–30 m	100'	40'	30'	30'
Danish seine vessels 10–30 m	20'	10'	5'	5'
Trawlers	140'	50'	40'	50'

portunities, may satisfy the need for market information in future design of quota units and allocation decisions as discussed by Sylvia (1994). Auction statistics will show the impact of the TAC allocation profile on market prices and resource rent generation. For example, how does the total sales value of a TAC vary if a certain share of a TAC is allocated to the winter season compared with the summer and autumn seasons? See examples of such judgements in Martinez-Garmendia, Anderson, and Carroll (2000). Without such market information, the political allocation process will be based on estimates of the relative need for quotas among the different participants in the fishery based on the relative number of fishers, political influence, regional impact, *etc.* Market considerations are seldom a part of the decision background in, for example, the Norwegian quota allocations. Lack of such market orientation in fisheries management tends to be a main barrier for value adding in the fishing industry (Trondsen 1997).

Allocating TAC shares for one year or longer as proposed by Morgan (1995) and Brubaker (1995), makes it difficult to integrate other measures with the total quota. Such allocation of yearly TAC shares also allows for, as in ordinary ITQ systems, short-term seasonal quota trading and redistribution of the resource rent directly between the fish companies outside the auction when fishing conditions change. This effect may be avoided if the quota units are related to fishing seasons and other biological constraints, which fit better into both the fishers' and managers' planning horizons and objectives.

Licensing is an established method of discriminating between individuals, and may be an efficient tool, especially for securing governmental objectives other than capturing the resource rent.

To get rid of the technical inefficiency problem, where licenses are connected to specific vessels (as in Norway), the license rights may be separated from the vessels and allocated to persons or enterprises (as in Iceland). A license is a right based on a legal contract between the user and the owner (all citizens) represented by the government. The anticipated behavior of the license holder may be regulated in such contracts regarding limitation of quotas, bycatch, exchanges of quotas with other users, *etc.* In order to maintain real bidding competition in the quota auction, the license system should not limit the number of licenses in each target group. Government may, however, impose constraints on licenses, such as ownership of specific vessels, residence in specific areas, nationality, *etc.*

All who satisfy a set of generic rules should be given a license, but to get a quota, the license holder must go to the auction and purchase quota in competition with other licensed fishers. A license should, therefore, be a right to buy seasonal quota units in the auction, rather than a right to get a quota allocated.

The Auction

To be efficient, markets need many competing and independent buyers and sellers. In this case, the government is the only seller. To create a real market situation, the role of the powerful seller of quota units should not be mixed with the role of the political allocation institution influenced by interest groups. The separation of the two roles is secured by auctions of the same type, as the European raw fish auctions between fishers as sellers and the first buyers (Kearny 1997). Transferred to quota exchange, this type of seasonal quota auction might be an independent institution with the sole purpose of managing the exchange process of SQUs between buyers (licensed fishers) and the seller (the government's representative). By accepting only anonymous, simultaneous bidding, the auction exchange process will also hinder collusion of bidders and tactical sequential bidding (Morgan 1995).

SQUs may be auctioned separately, where only licensed buyers belonging to the same group are allowed to bid.

The auction institution, in addition to managing the technical part of the auction, may also serve as an information database, by supplying various sales reports and other information for any time period since implementation of the systems.

Experience from Iceland shows that fish auctions technically can be operated as computerized systems that are based on remote bidding. This will increase the number of buyers and increase the efficiency of the market (Arnarson and Trondsen 1998).

Compared with established systems, there shouldn't be any significant increases in management costs. Each auction can be run by a few people and may be much more efficient than traditional quota allocations systems, which keeps the Norwegian Directorate of Fisheries busy. Increases in resource rent can be a source of funding for management and research. For fishers who must continually buy shares, transactions costs may be somewhat higher compared to administrative allocations or one-time purchase of an ITQ. Fishers' success in getting licenses and administrative allocated quotas may, however, rely on heavy involvement in the political and organizational levels influencing quota allocation. Political allocations also are risky—they must constantly be defended; whereas the proposed seasonal allocations allow more long-run certainty about access to fish. Purchase of an ITQ, on the other hand, would demand much more capital and consequently much higher capital costs.

Technically, the auctions may be open for hundreds or thousands of fishers. The experience from Iceland shows that computer technology makes this very easy. It is possible for a fisher to sit in his/her boat and be connected to the auction. For those who do not have the necessary technical equipment, it is possible to arrange auctions in every landing place along the coast. A great advantage for a quota auction is that the buyer does not have to see the product he is buying, as farmers do when they are buying live cattle, or when a fish buyer purchases iced fish at a land-based fish auction. It means that the auction process can be done entirely by using computers and the Internet. Quota auctions may also be combined with fresh fish auctions, where the fishers change roles from buyer to seller and receive market signals from farther along the value chain.

Based on learning curve theory, we also suggest that the valuable market information gathered from the auction over time will improve the knowledge basis and the communication between regulators and their more business-oriented clients (see Sylvia 1994).

Costs and Benefits of an SQA

Governmental restrictions may, as shown by Matthiasson (1997), reduce the theoretical economic gain from an ITQ system without restrictions. The difference may be seen as a compensation for the social cost. The resource rent collected by society through the auction may be a source for financing resource management, research, and development of more value-adding activities.

Market-orientated innovation may also be motivated and improved through lower entry barriers than those of the ITQ system. Without links between quota and vessels, all quota-holding companies may buy and sell vessels without any significant interference from the government. The vessel prices will adapt to an international price level and will only reflect the present value of the ship as a catching and processing machine and not the quota values. This will reduce entry costs for young fishers and thereby motivate entrepreneurship and innovation, which normally fol-

low newcomers. Allocation of specific quotas to recruit new fishing entrepreneurs, as practiced in Norway, can also ease entry costs for young fishers.

The purchase prices and capital barriers for seasonal group quotas will be much lower compared with purchasing permanent quota shares in an ITQ system. Payment credit until after the fish is sold (similar to pay-as-you-fish royalties), will also favor entrepreneurs without much capital (Morgan 1995; Brubaker 1995). The system should also hinder outcomes such as we have seen in Iceland, where freely traded ITQs tend to be concentrated in the hands of a few specialized quota owners. These quota barons, as they are called in Iceland, make profits by further renting out the quotas to the actual fishers (Eythorsson 1996; Arnarson and Trondsen 1998).

SQAs lower mobility barriers between different fisheries and seasons and may also level out profit differences due to movement of vessels between fisheries. More flexibility in moving vessels between different fisheries may also reduce the political pressure for increased TAC driven by overcapacity. The advantages of an ITQ system are kept and most disadvantages removed.

General Proposition V: *Fisheries that auction seasonal group quotas may: (i) secure allocation objectives; and (ii) motivate market-oriented value adding and cost efficiency in the value chain, by lowering capital requirements and license barriers for entering fishers.*

Resource Rent Collection

What about the collected resource rent? Does it go directly to the treasury? This uncertainty is a major factor explaining the lack of interest in collecting resource rent from the fisheries. As Cunningham (1993) has observed, fisheries management essentially is a choice about how to spend the resource rent. However, there is also a relationship between resource rent generation and choice of fisheries management systems. Norway has a system where all governmental income belongs to the treasury before it can be redistributed. This connection doesn't give the industry motivation to promote systems for resource rent collection. A better incentive would be to allocate part of the resource rents to funds that may be utilized for fisheries management, coastal management, research, and development to increase value adding in the resource-based regions. Such regional funds based on resource rent from natural resources exist for oil (Alaska) and electricity (Norway) (Amundsen, Andersen, and Sannarnes 1992). Development of comanagement, where fishing cooperatives manage their own allocation tasks under government guidelines as practiced in Japan, is another possibility (Okada and Yamamoto 1994; Lim, Matsua, and Shigema 1995). Such comanagement is also practiced in Norway (Lofoten), in the US Pacific whiting fishery, and was introduced in the Alaska pollock fisheries in 1999 by the American Fisheries Act S 1222. How the user group should be incorporated in the management process is a question of institutional design (Jentoft 1989; Jentoft and McCay 1995).

One alternative is that the government allocates quota ownership to regions, fishing groups, or other entities. These entities may manage auctions as described above, collect the rental payments, and redistribute the resource rent back to the participants as a bonus at the end of the year per ton catch or in collective development funds.

Competition for resource rent in itself is a driving force in the development of fishery management systems. Most countries develop management systems step by step. It is, therefore, interesting to note the political/legal process in Iceland, which

in the late 1980's introduced a system of limited licenses and the ITQ system. This change resulted in the development of a small group of private quota owners. In the fall of 1998, the Icelandic Supreme Court ruled that the system of limited licenses was unconstitutional. The government, therefore, had to introduce a new license system, which was open for all, but kept the ITQ system for all fish stocks where TAC regulations were in force. This means that the Icelandic system, in fact, has developed into a system with open-access licenses and SQAs, as proposed in this paper. The difference from the proposed SQA system is that the private ITQ owners collect the resource rent in the Icelandic system by auctioning/selling seasonal quotas to licensed vessel owners. This means that the resource rent generation effects should be the same if the private ITQ owners, instead of governments, organized share quota auctions as proposed in this paper.

Conclusion

In this paper, we have analyzed how fisheries management systems motivate market-orientated value adding in the fishing industry, which together with cost efficiency constitutes the sources for the resource rent.

We have found that both the Olympic and license systems motivate catch orientation rather than market orientation. Both systems waste potential resource rent by tying up capital in overcapacity and reducing potential market values from the limited total quota due to the reduced time available for market orientation.

Introduction of licenses may reduce catching costs in Olympic-style management, but may have the opposite effect if activity catch records are required to qualify and maintain license rights. The activity requirement may also limit the available time for market-oriented value adding by fishers.

Transferable license and quota systems are the only recognized systems that effectively create exit strategies in the industry where the participants themselves adjust catch and processing costs to the potential income from the available quota. This allows the cost side of the resource rent to be maximized through many individual judgements and decisions. These systems, however, may increase monetary and legal entry barriers for new entrants into the industry. Those who have control over the quotas may generate monopoly profit without market-oriented value adding. Under these conditions, new entrepreneurs with new, market-oriented ideas may be hindered from entering the industry, and the industry may not fully realize the potential market-oriented values.

We have found that fish auctions are an efficient mechanism to motivate maximization of values between many buyers with heterogeneous preferences and sellers of products with heterogeneous attributes. However, the presence of a few, powerful buyers with vertical control in the value chain may increase entry barriers and reduce the extent to which auctions contribute to market orientation.

In this paper, we have introduced the concept of SQAs. These, combined with an open-license system and quota allocation to target fisher groups, will lower entry barriers for new entrants, thereby stimulating market orientation and cost efficiency. SQAs may also make it possible to collect resource rent for redistribution to society or back to the fishing community.

SQAs differ from ITQs in the sense that permanent quota ownership is not transferred, but fishers are offered a right to lease a natural resource on a temporary basis. SQAs offer a management solution to improve market orientation and cost efficiency without first privatizing the fish resources in a few, private hands, as in the ITQ system. The potential political attraction for such an idea is derived from the

potential it creates for coastal and fishing communities to collect and take ownership of the resource rent through comanagement.

SQAs may also be complementary to an ITQ system, if private ITQ owners sell seasonal quotas to fishers through auctions.

This seasonal fishing allocation model is similar to other leasing arrangements practiced in recreational fishing. Recreational fishers can get rights to fish for specific times of year in specific rivers or parts of rivers, while long-term rights are still held by the landowners. Sometimes we also observe that such seasonal fishing rights are auctioned among users who are willing to pay the highest price.

Leasing, rather than ownership, is not a new idea in economic theory. Seasonal quota auctions for commercial fisheries, as suggested in this paper, should be analyzed further in light of experience from similar management schemes for recreational fishing and other natural resources and in the light of economic leasing theory.

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