Fish Quota Auction
Opportunities for Chile 2010

Expert opinion on open bidding as an allocation method for fishing quotas in an IQ system

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Executive summary

The paper presents the principles for open public auctions as a method for allocation of individual fishing quota shares (IQSs). The auction mechanism is motivating entering and aspiring firms for investment in innovation and value adding growth without sacrificing sustainability which must be secured by independent TAC (total allowable catch) regulations.

A public quota auction is a marketplace for selling rights to catch a certain individual quota share (IQS) of a total allowable quota (TAC) for a period of time to licensed firms against a royalty bid. The quota right may be limited to a period of time like fishing seasons or several years to geographical catching areas according to nautical miles from land or quota regions (as the XV-IX regions).

The number of bidders in royalty auctions may also be constrained according to licenses defined according to vessel ownership, geographical location or past experiences and qualification etc. The sustainability and the efficiency of an IQS auction depend on two important assumptions:

1. Sustainable TAC regulations must rely on independent and reliable scientific advisory service.

Sustainable IQSs are shares of sustainable TACs, which must be determined and managed based on scientific advice from independent marine scientists without influence of short term economic or political interests. Chile may learn from other countries. The report shows that such scientific independence among the advisors is the main organizational principle in the European fisheries TAC management process: The scientists coordinate their research and biological stock assessments and recommendation of biological TACs through the International Council of Exploration of the Seas (ICES) without any political or economic influence. ICES is a scientific meeting place for scientists from all countries interested in the fish stocks under consideration. The biological based TAC may thereafter be adjusted after considering economic and social issues by economist advisors and governmental administrators before the government makes their final decision. All relevant information about the recommendations given in the decision process is publicly open in the Internet. A similar fisheries management decision-making process is also followed in the USA.

The report shows however, that the Chilean TAC management decision-making process does not follow these principles. The Chilean scientists are not in a position to give independent, public TAC advice to the government, but are tied up in an advisory network with industry actors with direct short term economic interests in the TAC regulation. The report shows that this Chilean former TAC management practices have not produced any real limitation of the fishing effort and catches since 2002, which have caused a dramatic

reduction in the Chilean landings in the industrial fisheries the last 8 years. The Chilean TAC management procedures have to be improved significantly, before a fish quota auction can work properly in allocating sustainable individual quota shares. Quota harvest control enforcement is also very important in a reliable TAC management system aimed to counteract the temptation to catch more than the allocated IQS.

2. An auction must assure real competition between bidders without any possibilities for collusion formation, which is counteracting the auction mechanism!

The report shows international experience from Iceland, New Zealand, Estonia and Russia, where quota auctions and trade have been practiced. Iceland and New Zealand introduced open, organized trade between the incumbent IQS holders, while Russia and Estonia introduced public auctions where the government sold individual annual quotas to the fishing companies. All these auctions have failed caused by increasing concentration and collusion among the fishing companies counteracting the auction.

To be efficient, a royalty auction must be open for as many bidders as possible without the possibility of colluding, like in the internet auctions on “Ebay”. Dissemination of information about the public quota prices and characteristics are important to maintain an efficient auction process. If the number of potential bidders is too low for an efficient auction process, an alternative is to call for public IQS tenders from all parties that are interested in bidding. The priority of such tenders may then be decided in administrative-political processes where the total benefits for the society are important decision-making criteria. Such calls for tenders are common practice in public construction or research projects or in allocation of aquaculture licenses. Enforcement of the antitrust law may also be important for avoiding any temptation to collude in these auctions or in more administrative allocation processes.

It is not necessary to auction all quotas shares. The report recommends allocating a share, such as 10% of the quotas, as a starting point in auction and slowly increasing the share. Such a strategy will ease the transition from a grandfathering allocation system to a more market-oriented competitive system. Auctioning only a share of the TAC initially will open opportunities for newcomers and innovative expanding firms without threatening the incumbents, which are given time to restructure their business in order to be competitive with those firms that succeed in the quota auction.

It is also important to create equal opportunities to counteract the incumbents from using their capital power to temporarily pay such high royalty prices that the small entering firms cannot compete. This may happen if the incumbents receive part of the quotas for free after grandfathering principles which are reducing the average royalty paid for their total quota holdings, while the newcomers have to pay the auction royalty on all their quotas which have to be procured in the auction. The report recommends that if a share of the TAC is allocated through a royalty auction, the same royalty paid in the auction may also be

collected for the quotas allocated on grandfathering principles. Such royalty payment principle are counteracting deterring pricing in the auction against the newcomers

The bidding power of some firms with “deep financial pockets” may also be counteracted by offering all bidders the opportunity of royalty payment after the fish is landed and sold. It may also be necessary to establish limits for the maximum share of IQSs on a single firm hand.

In sum, a well-organized quota auction will motivate competition and innovation in the fishing industry. The royalties collected from the auction are the resource rent generated by the biological production and expressed as a super profit above the normal industrial level. This rent will be collected as royalties by the public instead of the incumbents’ private firms that were lucky to receive the fish quotas for free when the individual quotas and licenses regimes were introduced in Chile. The report recommends that plans should be made to invest the royalty income to improve industry competitiveness through research, development, innovation and catch control activities.

The report also comments on some of the incumbent firms’ arguments against introducing fish quota auctions, which they may see as an undesirable competitive pressure putting their resource rent at risk. Their concerns can be addressed with an improved sustainable quotas management system and well-organized auctions. Auctions that motivate real and fair competition among all fish quota seeking firms without opportunities for collusion and also facilitate the entry opportunity for new firms and expanding aspiring incumbent firms will result in innovation and increased value adding to the limited fish quotas, not the contrary, as the incumbent firms argue.

The report also comments Professor Ragnar Arnason from the University of Iceland hired by the incumbents firms to analyze the efficiency benefits of quota allocation directly to the incumbent firms compared through quota auctions. Arnason argues that allocating quotas directly to the incumbents is the most efficient allocation method. His paper, attached to the report, argues that it is possible in the short term to have high cost efficiency in quota allocation in both a grandfathering ITQ (Individual transferable quota between firms) allocation system and in a royalty IQS auction system by applying modern information technologies and methods. However, the history shows that in the long run we may expect that fisheries firms – like all kinds of organizations and individuals that rely on monopoly resource rent collection – will tend to develop management conventions over time making them lazy in market-oriented innovation activities. Without competition in the domestic input market, the incumbents may maintain profitable businesses by collecting the resource rent without improving production and market-oriented efficiency through innovation activities. When such firms are dominating the industry and are in a position to block the entry of new and aspiring firms, there is an increased probability that the industry’s competitive edge and efficiency will decrease over time. On the other hand, a well-organized royalty auction

has the potential to counteract the development of monopoly power and keep the industry open for new expanding firms thereby increasing the total value adding activity from harvesting the nation's fish stocks. The royalty auctions have also the potential to reallocate the resource rent from the incumbent firms to the commons for potential investments in purposes benefitting the entire industry and fishing communities. The long-term efficiency of the auction system may therefore depend of the management and investment of these royalty funds in research and innovative development to improve the industry's market position and contribution to society, encouraging more innovation, not less, as Arnason claims in his report

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Introduction

This paper is a contribution to the current discussion in the Chilean Antitrust Court, where Lota Protein SA has requested the implementation of public auctioning as an allocation method for individual fishing quotas in the industrial fishing sector. The paper presents the author's opinion on open bidding as an allocation method for individual fishing quotas (IQs) written on request from Lota Protein SA. The paper is based on a review of established theories, studies and practical examples from fish quota allocation and fish auctions internationally relevant to the issues under consideration in the Antitrust Court.

Data about the Chilean fisheries referred to in the report were collected on a fact-finding trip in Chile 8th -15th May 2010, assisted by Ferrada Nehme in Santiago and Lota Protein SA in Concepcion.

The paper will be organized in the following way. Firstly, the auction concept will be defined. Secondly, the critical factors in designing the IQ auction will be reviewed. Thirdly, the arguments forwarded in the Chilean debate will be discussed before the paper is concluded.

Why fish quota auctions?

Public auctions are an efficient allocation mechanism especially in markets that involve the allocation of entitlements regarded as common property. Fisheries can benefit from application of the auction principles in the allocation of the limited available catch quotas without sacrificing sustainability secured by independent TAC (total allowable catch) regulations. The main advantage is that auctioning of fishing quotas influences the long term development in the industry as illustrated in Figure 1.

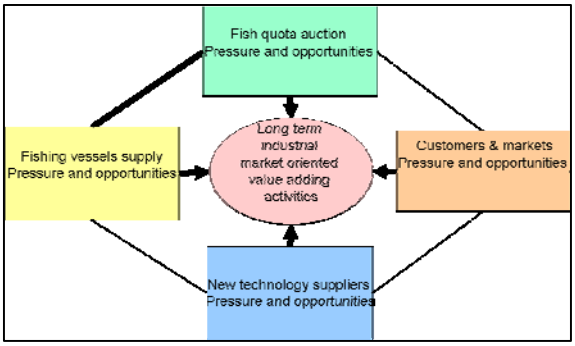

Figure 1: Industrial pressure and opportunities for long term market oriented value adding activities.

The fish auctions strengthen the competitive pressure on the industry interested in fishing quotas at the same time as the auctions are opening opportunities for aspiring bidders. This combination of pressure and opportunities from the fish auction mechanism is increasing the interests among the competing firms for searching after new process, product and marketing opportunities which can enforce their competitive advantages, like new

production technology, new fish species, new fish by-products, better fish qualities or new product concepts oriented towards specific market needs. Without the fish auction pressure and opportunities, the incumbent quota owners have the opportunity to satisfy their profit needs by harvesting the resource rent from fish quota they control rather than innovating in the fish markets. Fish quota auctions are therefore an important mechanism for stimulating changes in the firms' long term business orientation from harvesting of the resource rents to market oriented competition and value adding which will benefit the industry as a whole. In the following these arguments will be elaborated further.

What is an auction?

An auction is here defined as a public sale in which property or items of merchandise are sold to the highest bidder. Auctions can be private or public organized where both public and private actors can exchange property rights like fish quotas against payment. Auctions can be carried out in physical spaces or they can be network-based spaces between traders in specialized business networks that normally require some pre-qualification for participation like licenses, guarantees or qualification.

How auctions are structured is therefore dependent on the supply and demand structure in the specific markets where they operate. Auctions may welcome bids over varying time spans, a possibility that has been improved with the introduction of Internet auctions like eBay.[1] The auctioning time for real estate can for example take place over months from when a property is placed on the market until the buyer accepts or refuses bids. Trading on auctions like equity stock or art exchanges may on the other side require sellers' immediately responding bids.

Fresh fish markets with many connected suppliers and buyers function like private auctions caused by daily supply pressure from the variation in fish landings with a limited shelf life and sales time. The property rights of the fish products are then priced according to daily bids matching the balance of supply and demand for each product quality in the time span where a network of buyers and sellers are connected to conduct business. Communication, a trusted network and logistics limit the number of sellers and buyers operating in such markets. Value chains of seafood moving the property rights of fish products from the fishers to the consumers therefore constitute a chain of marketplaces for fish landings, processed fish, fish exports, fish imports, wholesale and retail where specialized traders in each market are bidding and exchanging delivery contracts daily. The development of technology, logistics and management methods have however made it possible to integrate traditional value chain markets into supply chains with more longer-

[1] http://realestate.shop.ebay.com/

lasting contracts, which include both product mix, qualities, delivery places and time, stable prices and promotion, streamlined according to the customer needs and wishes.

Designing of an efficient and functional fish quota auction

In order to take advantage of the auctioning principle in the allocation of fish quotas, it is important to work out an efficient and functional auction design matching the structure and needs in the specific value chains where allocations of fish quotas take place.

Four issues important for designing individual fish quota (IQ) auctions as an integrated part of a sustainable fisheries management policy will be reviewed:

1. The property right of the fish

   An exchange of property rights takes place in an auction. It is therefore important to clarify who owns and can sell IQs in an auction and ultimately who has the right to benefit from the auctioning of the fish quotas.

2. Fish quotas to be allocated to auction sales

   Allocations of IQs are part of a fisheries stewardship system serving objectives regarding biological and socio-economic sustainability and development. It is important to clarify the structure of the fishery management system that the fish auction will match and support.

3. Entry and exit opportunities

   The principle of free competition according to the applicable antitrust law requires that the IQ auctions must include regulations securing an opening for entering aspiring firms and regulations to prevent firms from being locked in with quotas without exit possibilities. It is therefore important to clarify the design and benefit of entry and exit regulations.

4. Design of an IQ auction in fisheries

   An efficient auction requires trading rule design to secure a fair and independent bidding process without the risk of collusion between key bidders. It is therefore important to clarify how the auction can be designed to counteract the business tendency to create collusions for imposing market control.

1. The property rights to the fish

The fish resources are resource capital, which in line with Stevens (1980–81) can be defined as “A public trust held by the state on behalf of the people”. Historically, fish were considered *res nullius* (things that do not have an owner) and, as such, were susceptible to legal acquisition through the rule of capture by those who have sufficient ability to capture them. In Chile, according to the Civil Code, fish and other maritime resources are

considered *wild* assets[2] that, while at sea, do not have an owner and only once they have been captured are subjected to the rules of property, entering the fisher's patrimony[3].

However, according to the UN Convention on the Law of the Sea[4] signed by Chile, the States have the duties of managing and protecting fish stocks. These obligations are included in the Chilean *The Fishing and Aquaculture General Act* (FAGA).[5] Protecting fish stocks and promoting sustainability require limitation of the fishing effort. Limitation of the catches creates fishing rights as a scarce good. The value of the right to fish as a scarce good is increasing with increasing interest and competition to acquire this good. It is therefore a classical market situation that creates a value, a resource rent. When the access to fisheries was free, the rents from harvesting the wild resources were a common right for all the people who were willing to catch fish. When the fisheries were closed to new entrants the resource rent as a limited good was also reserved for some but not all Chileans. The question here is therefore how the resource rent from the limited allowable catch will be allocated among the fishers competing to acquire a share of this scarce good and the common people in Chile. The Chilean competition law article 1 gives this guideline: "The objective of this law is to promote and defend free competition in the markets".[6] To gain the benefit from free competition between individual persons and firms is, as already observed by Adam Smith (1759), dependent on governmental regulation and protection against potential monopolistic behaviour in the market.

Free competition in the meaning of freedom to act in fisheries according to sole individual interests is of course impossible without sacrificing the sustainability of the fish resources. The objective of the fisheries law is therefore to direct fisheries' behaviours according to objectives for sustainable biological and socio-economic development managed by the government. It is, however, possible to organize free competition for

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[2] Article 608 of the Civil Code defines wild animals as those that "are naturally free and live independently from men".

[3] Art. 607 of the Civil Code: "Hunting and fishing are a type of possession right through which property over wild animals may be acquired". Art. 617 of the Civil Code: "A hunter or fisherman takes ownership over a wild animal from the moment in which it seriously injures it, thus resulting in the animal's impossibility to escape; or from the moment said animal has been lured into its traps or nets, in the manner that they have been set up in locations where it is legal to hunt or fish. If an injured animal enters territories where it is not legal to hunt without the permission of the owner of the land, the latter may take ownership of the animal."

[4] Article 1 that "The coastal State shall determine the allowable catch of the living resources in its exclusive economic zone ... taking into account the best scientific evidence available" ... "to ensure through proper conservation and management measures that the maintenance of the living resources … is not endangered by over-exploitation. Such measures shall also be designed to maintain or restore population of harvested species at a level which can produce the maximum sustainable yield, as qualified by relevant environmental and economic factors, including the economic need of coastal fishing communities."

[5] Article 1 – "The preservation of hydrobiological resources, and any extractive or research fishing activity, as well as aquaculture activities, carried out in water bodies, internal waters, territorial sea, or in the exclusive economic zone of the Republic of Chile, and in the areas adjacent to the latter, over which there exists or there may exist Chilean jurisdiction in accordance with international laws and treaties, shall be subject to the provisions herein. Fishing activities such as processing and transformation, as well as storage, transportation or sale of hydrobiological resources shall also be subject to this law."

[6] DFL No. 1 of 2005, of the Ministry of Economy, Development and Reconstruction, which sets the revised, coordinated and systemized text of the DL No. 211 of 1973, as amended by Law No. 20,361, published in the Official Gazette on 13 July 2009.

everyone to participate in the bidding for IQs in auctions without sacrificing sustainability in fisheries if the IQ represents a share (IQS) of a biologically responsible total allowable catch (TAC): the design of such organization will be outlined in this paper.

The design will be built on the understanding that the fish resources are owned by the Chilean people with their Government as trustee. The limited fish quotas (TACs) with their corresponding monetary values constitute the Resource Trust to be managed by the Government without scarifying the resource sustainability commitment according to the UN Convention on the Law of the Sea.

The Government, in Chile represented by the Undersecretary of Fishery (Subsecretaria de Pesca), is the sole authority to allocate rights to harvest fishing quotas according to the objectives in the fisheries laws in a non-discriminatory way according to the antitrust law. This means that the Government is the only possible seller of IQSs in the auction.

2. Fish quotas to be allocated to auction sales

Even if the Chilean fisheries law (FAGA) has sustainability of the hydrobiological resources as its main objective, there are also social constraints in the law regarding the regional allocation of quotas on XV-X regions and between the artisanal and industrial fleet (FAGA, article 8) and to medium and small ship-owners (article 27). Such socio-economic considerations are also included in the UN Convention on the Law of the Sea, where relevant environmental and economic factors, including the economic needs of coastal fishing communities, are qualifying factors in the design of the maximum sustainable yield of the harvested species (article 61). Realizing the antitrust law objectives must therefore be constrained by the biological and socio-economic objectives.

Assure sustainable fish stocks

The biological objective is met by a science-based regulation of the catching pattern (effort regulations) for fish size selection through gear regulation, temporary closure of spawning or juvenile areas, total catching effort (vessel licenses according to tonnage, length or engine power) and total limits of allowable catch (TAC) for each fish species.

Marine sciences play a main role in developing sustainable fisheries management. The role and decision process are however different in different countries. While the science is indeed difficult at times, the principle of listening to the scientists is quite unimpeachable (Bromley 2009).There are important differences in the transparencies of the marine biological research and recommendations between Chile and Norway, indicating possible areas for improvement in the Chilean fisheries management conventions.

In Chile there is a tradition for a very close cooperation between the Subsecretaria de Pesca, marine scientists and the fishers' organizations that might increase the fishers' consciousness of the scientific contribution to fisheries management (Schumann 2007). This organization might however decrease the scientists' independence to give biological-based recommendations. The Chilean Subsecretaria de Pesca has the final authority over tuition on all the moneys involved in fisheries science (FAGA, article 91). This was previously also the case in Norway where the Institute of Marine Research (IMR) was part of the Directorate of Fisheries. This has been changed. The IMR is now an independent institute financed directly by the Ministry of Fisheries and the Norwegian Research Council. The IMR has a position at the same administrative level as the Directorate of Fisheries, which, on its side, has the responsibility for coordinating the socio-economic consideration of the TAC regulations. The main reason for this Norwegian change in command lines was to strengthen the independent research and scientific recommendations that also empowered the IMR to challenge the results wanted by the industry.

The Chilean marine scientists have no formal cooperation with marine scientists from other countries as a basis for their biological TAC recommendations. In Europe marine research cooperation is organized internationally through the ICES,[7] which plays an important role in the coordination of the monitoring and recommendations of TACs and other regulations in the member states. The first step in the TAC decision process takes place when scientists from each involved member state present scientific data about the current fish stock situation to their colleagues in other involved countries. The scientific discussion about each fish stock concludes with an analysis of the fish stock situation and TAC recommendations based on solely biological criteria. The Norwegian Institute of Marine Research (IMR) is in cooperation with the ICES in charge of all biological analysis and TAC recommendations.

While the Norwegian research data are published and available for all, the Chilean data and research results is not easily available, making public scrutiny very difficult and like in Norway, be challenged by other scientists.[8]

The published results of the marine biological research in Norway form an important background for the national discussion and recommendation of the TAC where socio- economic and political considerations are also included. In Norway, the industry organization, the international regulation committees like the Norwegian–Russian Fishery

[7] The International Council for the Exploration of the Sea (ICES) coordinates and promotes marine research on oceanography, the marine environment, the marine ecosystem and living marine resources in the North Atlantic. Members of the ICES community now include all coastal states bordering the North Atlantic and the Baltic Sea, with affiliate members in the Mediterranean Sea and southern hemisphere. http://www.ices.dk/indexfla.asp

[8] Source: Lota Protein SA

Commission and the national regulation advisory board participate in the TAC dialogue administered by the Directorate of Fisheries on behalf of the Ministry of Fisheries and Coastal Affairs.

The Ministry, however, decides in principle the final TACs independently of the vote in the advisory board, but mostly follows the recommendations from the advisory board as far as it follows the objectives given by the Ministry. The Ministry can, however, take decisions different from the advisory board recommendations. The advisory board consists of representatives of the fishing industry supplemented with some representatives from other governmental bodies and environmental NGOs. The industry's representatives have a clear agenda to promote their own interests. The power between the different industry groups is balanced by the relative representation on the advisory board, like representatives from coastal vessels, trawlers, purse seiners, long liners and fish processors etc. Conflicts may evolve between the industry's short-term interests and long-term sustainable biological consideration strategies and other socio-economic objectives. The Norwegian Ministry has in such cases the responsibility to correct the TAC advice according to the overall management objectives.

In Chile the Undersecretary of Fishery has, according to the FAGA, articles 21,[9] 26 and 40, an important limitation to its decision making because decisions must rely on majority votes in "The National Fishery Board", a body of some twenty members who are either political appointees, fishing industry members, fishermen or members of fishing industry workers' unions, all of them with a vested interest in maximizing their fish quotas.

These differences in policy management might influence the TAC level. Figure 2 (a-c) and Figure 3 (a-b) show the relationship between the TACs and the total landings of all the pelagic and demersal fisheries in Chile. The figures show that the total landings in the period 2006–2009 have been significantly lower than the TACs. In 2009 the landings were only 62% of the TAC (total TAC 4.1 mill MT and total landings 2.5 mill MT[10]). The low overall TAC utilization is caused by the industrial fleet's low catches relative to its TAC, especially in the pelagic sector. Its total quotas were not taken in any of the recorded years 2003 to 2009, except 2005. Figure 3 shows the same picture in the demersal fisheries, where the average landings 2002-2009 were only 44% of the TAC.

[9] e.g. FAGA, article 21 – "On the initiative of the Undersecretariat and subject to a technical report from this Office, a fishery unit may be declared, by executive decree, in a fully exploited stage, with the approval by absolute majority of the acting members of the National Fisheries Council and the appropriate Zonal Fisheries Council 88."

[10] Sources: Informes Tecnicos de la Subsecretaria de Pesca 2001–2010, Diario Oficial, Anuario Estadistico del Servicio Nacional de Pesca.

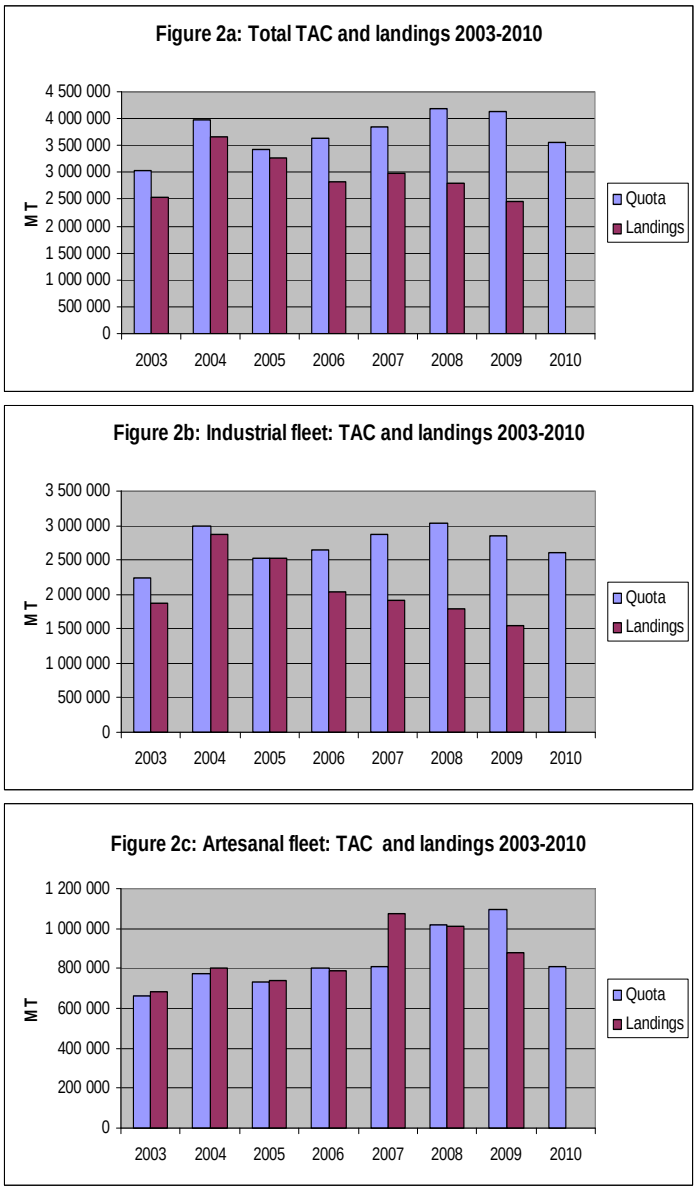
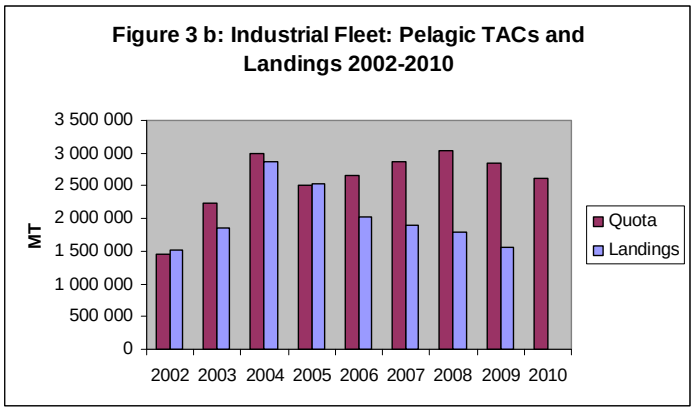


Figure 2: Chilean TAC for all species and landings 2003–2010. (Sources: Informes Tecnicos de la Subsecretaria de Pesca 2001–2010, Diario Oficial & Anuario Estadistico del Servicio Nacional de Pesca)



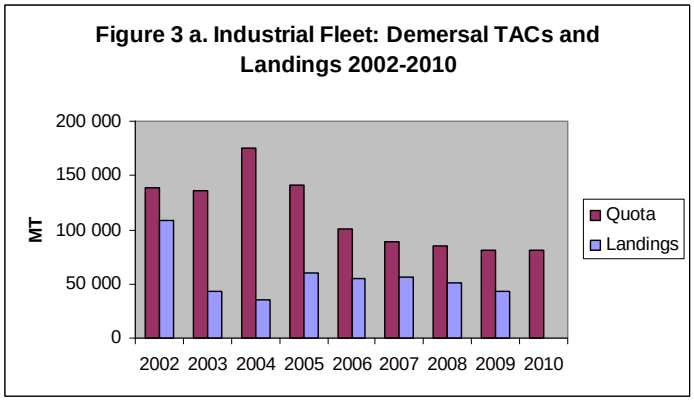


Figure 3 (a-b): Chilean Industrial Fleet TAC and landings 2002–2010 divided on demersal fish and pelagic fish. (Sources: Informes Tecnicos de la Subsecretaria de Pesca 2001–2010, Diario Oficial & Anuario Estadistico del Servicio Nacional de Pesca).

These figures indicating that the TACs have not been a limiting factor for the total industrial catches in neither the pelagic nor in the demersal fisheries, which rather are limited by the total vessel permits (effort regulation).

The closure of the fisheries for new licenses is, however, justified by a decision that the referred fisheries are in a fully exploited stage according to FAGA, article 19.[11] If the TACs reflect the allowable sustainable catch level of fully exploited stock fisheries, the catch capacity can be increased. Foreign vessels can, according to the UN Law of the Sea, article 62, require that the coastal states give other states access to harvest the surplus of the allowable catch the coastal state does not have the capacity to harvest. Such foreign interests might be actualized according to the strong international interests in for example the jack mackerel fisheries (Peña-Torres *et al* 2000). If the differences between the TAC and the landings do not reflect the TAC surplus, the TAC is not biologically well justified according to the allowable sustainable catch level of a fully exploited stock fishery.

[11] Because the species or more than one species requested are fishery units declared to be in a fully exploited stage and their access is temporarily closed, as indicated in the second paragraph of this section.

Such differences between landings and TACs can never be seen in the Norwegian case. Norwegian vessels are harvesting the TACs every year, which are really limiting the total fishing effort. If Norway does not harvest the TAC, other countries like Russia and the EU will request quota rights in the Norwegian zone.

It can be summarized that the foundations of the IQSs to be auctioned are managed by the governments independently of how the TAC is divided into IQSs and allocated to vessel groups, areas or individual firms. An efficient and sustainable stewardship of the fish stocks relies on transparent procedures securing the input of independent information and analyses where biological and socio-economic considerations are balanced in a public dialogue open to all stakeholders.

Allocating the total allowable catch according to socio-economic considerations

The second objective of allocating the total allowable catch to each species according to socio-economic considerations is met by sharing the TAC among the favoured regions and vessel groups. It is a well-established practice to allocate the catches inside five nautical miles to the artisanal vessels and outside five nautical miles to the industrial fleet (FAGA, article 47) (Bernal *et al* 1999). Table 1 and table 2 show examples of how the total quotas of pelagic[12] and demersal[13] fish species are allocated to fleets and research.

Total Pelagic TACs							
	Total	Industrial Fleet		Artisanal Fleet		Research	
2002	2 052 000	1 463 387	71%	310 113	15%	278 500	14%
2003	3 026 098	2 230 702	74%	664 792	22%	102 944	3%
2004	3 970 260	2 999 460	76%	772 400	19%	173 740	4%
2005	3 418 500	2 513 359	74%	732 484	21%	159 157	5%
2006	3 637 000	2 652 849	73%	801 301	22%	181 850	5%
2007	3 844 000	2 877 972	75%	806 028	21%	156 000	4%
2008	4 197 200	3 030 058	72%	1 021 162	24%	141 980	3%
2009	4 129 947	2 852 626	69%	1 094 344	26%	178 977	4%
2010	3 564 055	2 613 149	73%	807 046	23%	132 707	4%
Average 2002–2010	3 537 673	2 581 507	73%	778 852	22%	167 317	5%

Table 1: TAC 2001–2010 for all pelagic species in all regions allocated to industrial and artisanal fleets and research. (Sources: Informes Tecnicos de la Subsecretaria de Pesca & Diario Oficial)

On average in 2002–2010, 73% of the pelagic quotas were allocated to the industrial fleet, 22% to the artisanal fleet and 5% to research. The similar demersal fish figures are 36% to the industrial fleet and 14% to the artisanal fleet.

[12] Anchovy, sardine and jack mackerel (jurel).

[13] Chilean hake (Merluza Comun), Chilean hoki (Merluza de Cola), Southern blue whiting (Merluza tres aletas) and Southern hake (Merluza del sur)

Total Demersal TACs					
	Total	Industrial Fleet		Artisanal Fleet	
2002	326 246	137 968	42 %	47 746	15 %
2003	382 840	136 035	36 %	62 891	16 %
2004	413 589	175 048	42 %	55 381	13 %
2005	358 609	141 548	39 %	65 831	18 %
2006	291 250	100 697	35 %	41 768	14 %
2007	278 800	89 491	32 %	37 838	14 %
2008	270 700	84 725	31 %	34 863	13 %
2009	267 700	81 699	31 %	33 718	13 %
2010	265 700	80 463	30 %	33 092	12 %
Average 2002-2010	317 270	114 186	36 %	45 903	14 %

Table 2: TAC 2001–2010 for all demersal species in all regions allocated to industrial and artisanal fleets and research. (Sources: Informes Tecnicos de la Subsecretaria de Pesca & Diario Oficial)

The total quota of each pelagic species (TAC) is in the next step divided into regional fishery units[14] according to IQ law article 2.[15] Jack mackerel (jurel – *Trachurus murphyi*) is divided into four regions (XV-II), (III-IV), (V-IX) and (XIV-X), anchovy (*Engraulis ringens*) into three regions (XV-II), (III-IV) and (V-X) and sardine (*Sardinops sagax*) into two regions (XV-II) and (III-IV). It is expected here that each species is one biological unit (TAC) to be allocated to fishery units (called a global quota[16]).

Each demersal species is however located to one fishing unit. Chilean hake can be harvested in region IV-X, Chilean hoki in region V-XII, while both Southern blue whiting and southern hake can be harvested in region X-XII.

	Total Anchovy	Anchovy XV-II		Anchovy III-IV		Anchovy V-X	
2003	1 184 451	721 160	61%	70 000	6%	393 291	33%
2004	2 100 760	1 616 160	77%	100 600	5%	384 000	18%
2005	1 574 000	1 040 000	66%	102 000	6%	432 000	27%
2006	1 764 000	1 270 000	72%	106 000	6%	388 000	22%
2007	1 816 000	1 270 000	70%	106 000	6%	440 000	24%
2008	1 807 200	1 270 000	70%	106 000	6%	431 200	24%
2009	1 811 000	1 270 000	70%	106 000	6%	435 000	24%
2010	1 659 055	1 270 000	77%	106 000	6%	283 055	17%
Average 2003-10	1 714 558	1 215 915	71%	100 325	6%	398 318	23%

Table 3: TAC 2001–2010 for anchovy to industrial fleet allocated on regions. (Sources: Informes Tecnicos de la Subsecretaria de Pesca & Diario Oficial)

[14] A fishery unit is in the IQ law defined in article 2 as defined regions.

[15] Law 19,713

[16] The global quota is in the IQ law defined as the total allowable catch (TAC) in a fishery unit. The TAC for each species is the sum of the global quotas in each fishery unit (Bernal *et al* 1999).

The allocation criteria for dividing the total quota for a species into different fishing units are not published by the Subsecretaria de Pesca. Table 3 shows an example of how the TAC of anchovy allocated to the industrial fleet is divided into fisheries units. The table shows no fixed percentage of the total quota between the regions. Region V-X has for example been allocated from 33% (2003) to 17% (2010) of the total industrial quota of anchovy.

The variation in the TAC shares between the vessel groups and regions might partly be explained by biological variations according to the fish stocks' geographical availability and age composition, but the variation in the TAC shares can also indicate the room for political assessment of TAC allocations. The high TAC share of pelagic fish allocated to research purposes, which mainly goes to the ordinary commercial vessels and not to research vessels,[17] is also an indication of maneuvering room for political allocations of TAC shares.

The regional fishery unit quota for the industrial fleet shall according to the law of the maximum catch limit per ship-owner (IQ law), article 2,[18] be further divided into individual vessels as a global quota share coefficient (IQS) of the regional fishery unit quota.

Table 4 shows an example of such quota coefficients allocated to vessel owner firms for jack mackerel in 2010 in the Region III-IV. All the company coefficients add up to 1 for each fishery unit, which means that when a global quota for the regional fishery unit (TAC) is set, each vessel and company obtains its share by multiplying the global quota by the quota coefficient, here named IQS – individual quota share. The quota coefficient varies between companies and vessels. The variation between companies is dependent on the number of vessels each company controls and the size of the coefficient for each vessel. The model for defining the size of the coefficient per vessel is defined in the IQ law, article 4.

[17] According to Albert Arias Arthur, Lota Protein SA.

[18] Law 19,713

Quota Coefficients 2010 Jurel (Jack Mackerel) Region III-IV	
Company	**Coefficients**
SAN JOSE S.A. PESQ.	0.3777358
ITATA S.A. PESQ.	0.1856409
CORPESCA S.A.	0.108963
ALIMENTOS MARINOS S.A.	0.0836123
EL GOLFO S.A. PESQ.	0.0821692
BIO BIO S.A. PESQ.	0.0642348
CAMANCHACA S.A. CIA. PESQ.	0.0381211
SOUTHPACIFIC KORP S.A.	0.0260921
INVERSIONES PESQUERAS S.A.	0.0114144
LANDES S.A. SOC. PESQ.	0.0077849
FOODCORP S.A.	0.0068075
BAHIA CALDERA S.A. PESQ.	0.0044306
ISLADAMAS S.A. PESQ.	0.0011236
AQUAFISH S.A.	0.0007486
LOTA PROTEIN S.A.	0.0005056
SEPULVEDA C. LUIS	0.0003116
ARICA SEAFOOD PRODUCER S.A.	0.000304
Total	**1**

Table 4: Quota coefficients 2010 for jack mackerel region III-IV. (Source: Diario Oficial).

The relative share coefficient of the global quota (TAC) per ship-owner for each of the fishery units is measured from the sum corresponding to 50% of the vessel's historic catch share in 1997–2000 and 50% of the vessel's share of the total storage capacity (in cubic metres M^3) corrected by the length of the region's coastline (IQ law, article 2). These fishing rights earned by vessels measured as coefficients (IQS) of a global quota (TAC) are allowed to be merged for fewer vessels through cooperating associations or companies (IQ law, articles 7–9).

The allocation of the TAC to Fishery units according to the current laws means that the IQ auctions fit best at the Fishery unit level and should be designed as IQS auctions. The sizes in metric tonnage of the IQSs are dependent on both the biological TAC recommendations and the socio-economic considerations regarding allocating the TACs between artisanal and industry fleets and fishery units.

3. Opportunities for aspiring firms according to the antitrust law

The current quota allocation model prescribes that all the fishing rights allocated to the industry fleet are defined by the fishing firms' historic presence in the industry in 1997–2000, independent of their later performance. The actual size in metric tonnage of the annual individual quotas (IQSs) can vary according to the decisions of the Undersecretary for Fisheries regarding the size of TAC share for each species for regional fishing units, vessel groups and research.

The Undersecretary's decisions rely on the majority vote from the National Fishery Board, strongly influenced by the most powerful groups in the industry. The criteria for both the allocation of the actual annual quota (TAC) and the quota coefficients support these incumbent firms with a power basis in quota control initially allocated for free on the historic records.

It is an established theory that there is a conflict between the concentration of power and the long term industrial innovation and development, also reflected in the Chilean competition law. Most business people, who can choose, pursue the most easily available profit first. In fisheries huge profits in term of resource rent can be harvested from the resources by controlling fish quotas. From a business point of view it is rational to give priority to controlling the resource capital before other business activities. Adam Smith already observed in his famous book in 1759 that when businessmen meet they are always discussing how to suspend and protect themselves from the market forces. There is also a general tendency among firms to develop the lazy monopoly syndrome, the more powerful they become. When satisfactory profit is secured by controlling the market and supply chain, the motivation to innovate to be competitive is also reduced. The Nobel Prize winner for economics Herbert Simon's main finding was that when firms are satisfied with their profitability, they tend to reduce the effort to improve and maximize the business outcome (Simon 1958). This is the main reason for the importance of bringing in new aspiring firms that can increase the industrial value adding by utilizing the opportunities established firms do not pick up.

This insight is an important theoretical background for the competition laws and the modern theories about the relationship between market organization, innovation and industrial development. Michel Porter has in the latest years been the most influential theorist through his books about competitive strategies in industries, showing that innovation and performance in industries are dependent on positive rivalry between firms in their industry sectors (Porter 1980).

Figure 4: Competitive forces

The rivalry between firms is in the long term driven by four main competitive forces in the industry's environment (see Figure 4): pressure from the customers and markets, pressure from the suppliers and raw material market, pressure from substituting products and industries and pressure from entering firms competing for the same industrial resources and markets.

Public regulation and allocation of common resources like fish quotas are also recognized as drivers in the long term industrial development as illustrated in Figure 1. Porter observed that increasing pressure also spurs the rivalry over time between the firms in the industry releasing entrepreneurial effort for more competitive improved industrial solutions in the market, in which the industry as a whole and the regions where they are located take advantage of (Porter 1990). The industrial opening for new firms is especially seen as important for motivating industrial innovation by adapting new technologies. New ideas and technology have in the long term a tendency to enter faster into industries through new entrepreneurially driven firms, especially when it comes to technologies that change the direction of the industrial development, while firms with sunk costs place more focus on maintaining the efficiencies of the investments in supply and production lines where they have sunk cost advantages (Trondsen 1985).

The industrial development in the Chilean fisheries has to a high degree been driven by entrepreneurial firms with foreign entrepreneurs bringing to Chile new technologies in pelagic fishing, fish meal production and aquaculture. This industrial development took place in a time period without limitations to fish quotas. The industrial orientation was focused on harvesting the resource rent by building catching and processing capacity in order to utilize the resource potential. When there are no more expansion possibilities to increase the total catches, increasing value adding and development must to a much higher degree in the long term focus on maximizing the value of each tonnage of catch. Also, in the development of value-adding strategies, Chilean entrepreneurs can find new technologies and market opportunities by learning from the development in other advanced fishing nations like Japan, the US, Iceland and Norway, which might lead the industrial development in different market-oriented seafood technology sectors.

One strategy is to increase the share of the landings for human consumption markets where premium prices are paid compared with feed production. Such development requires improving the fish qualities through all the steps in the supply chain from the harvest to the final consumer. For example, in Iceland and Norway more and more companies are adapting the use of slurry ice on board the vessels, chilling the fish quickly to -2/-3 °C directly after the catch, which improves the shelf life of a good quality fish for processing and sales by about 4 days. Another new emerging Japanese technology offers fresh fish quality to markets far away from the fish landing places by deep freezing in magnetic fields right after the catch to -35/-40 °C followed by controlled fast thawing in the marketplace. There is also an interesting development in value adding from high-quality water-soluble

fish meal for the market for human consumption. Fish meal has a high health value that might be very important for human health prevention in the future, which requires standardization of high-quality tastes attractive to consumers as for example a food additive. These are technology examples that over time might be adapted faster among firms in Chile in an industrial competitive climate motivating rivalry in gaining advantages through adding the highest long term value per tonnage of landed fish.

The market, the substitutive product and the technology pressure are all outside the Chilean Government's control due to the seafood industry's international characteristics. The Government's choice of methods for the allocation of IQSs has however a direct influence on the direction of the competitive pressure on the industry and the level of short and long term profit satisfaction that is an important driver for the industry's long term investment strategies: It is expected that the higher the generation of short term profit satisfaction from catching fish quotas allocated for free, the less interests are generated in the industry for long term investments toward market oriented innovation activities. The governmental challenge is therefore to choose methods for quota allocation that are directing the competitive pressure towards a positive rivalry between the firms in improving the industry's long term market oriented competitive development. This is the challenge for a well-functioning fish auction exchanging IQSs against a royalty fee between the governmental trusted manager and the fishing firms (Bromley 2009, Trondsen 2004).

4. Design of an IQ fish auction

Article 27 in FAGA (1991) opens for the auctioning of 5% IQSs of the global quota in each fishery unit every year to a maximum of 50% of the total annual global quota. The auction system can be implemented over a 10-year period of time, as shown in Table 5.

Year	Historic IQS	Auction IQS	New Auction IQS
1	95%	5%	5%
2	90%	10%	5%
3	85%	15%	5%
4	80%	20%	5%
5	75%	25%	5%
6	70%	30%	5%
7	65%	35%	5%
8	60%	40%	5%
9	55%	45%	5%
10	50%	50%	5%

Table 5: Allocation of IQSs of a fishing unit global quota to incumbent firms and auction bidders over 10 years

Technically two kinds of IQS can be constructed, one historic IQS and one auction IQS. The historic IQS is similar to the present quota coefficients and represents a share of the global TAC in the fishing unit allocated on historic records, while the new auction IQS is purchased in auctions after royalty bidding as a new share of the global TAC. The share

of the total global TAC in each fishing unit allocated to historic IQSs will be reduced to 50% after 10 years. The actual IQ in metric tons calculated from each firm's incumbent quota coefficient (historic IQS) will also be reduced equivalently.

The share of the global TAC to be auctioned will increase from 5% to 50% in the same period. Article 27 limits auctioning quota shares to 10 years. This means that the maximum user rights of an auctioned IQS are 10 years decreasing to 1 year at the end of the period.

The royalty paid for time-limited quota coefficients in an efficient auction market can be seen as a rent of the resource capital, the resource rent (Trondsen 2001). The next question here is how an efficient auction market can be designed in Chile.

Economic theory prescribes some characteristics necessary for an efficient market that may apply to a fish quota market, where one major seller aims to maximize the long-term rent of the resource capital. Specific characteristics of the fish quota auction may include

- equal opportunities for all fishing vessel owners
- minimum entry/exit barriers – making it relatively easy to enter or exit the business
- independent buyers without collusion opportunities
- transparent dissemination of price and quality information to all interested bidders.

Equal opportunities

If the incumbent quota owners obtain a big share of their IQSs from historical allocation for free, they also gain strong competitive advantages when purchasing IQSs in the auction because the royalty paid in the auction can be divided by the firms' total holdings of IQSs. The average cost per IQS will thus be much lower compared with that of newcomers, who have to purchase all the IQSs they need at the auction. The incumbent firms with bigger historical-based IQSs will also have an advantage over those incumbents with smaller IQSs. Such discriminating pricing creates temptation for the big incumbent firms with a high share of historic IQSs to pay very high deterring prices in the auction to keep newcomers out of the market and reduce the competitive pressure from expanding firms.

Such discrimination can be levelled out by requiring royalty payment for all the allocated IQSs. The incumbent quota owners should be requested to pay a royalty fee for the historic IQSs equivalent to the royalty fee paid for the IQSs traded in the auction. Such a regulation will create equivalent quota costs for all vessel owners, but where the auction fees define the market-based royalty price, which may vary over time according to the market situation.

Similar regulation can be found for example in Iceland, where about 20% of all fish landings are sold through auctions, but where all the processors purchasing catches directly from the vessels have to pay a price for the landed fish equivalent to 76% of the daily price set in the auction. This regulation has emerged because fishers onboard the industrial trawlers have their salary calculated from the landed value, which now can be decided from the daily auction prices. The advantage of such a market regulation is that a small share of the property rights sold through the auction market becomes the reference price for all the contracts in the market. Such links between auction markets and long-term contract markets are quite normal in most commodity markets like fish meal, grains, oils etc. where the prices in the auctions and spot markets become reference prices for the more long-term contracts. The adoption of such rules in the IQS auction market will reduce the temptation for the incumbent firms to practice deterring pricing against competitors and newcomers.

A licensed vessel limited by a maximum holding capacity and a history in catching in the fishing unit region was required when the historic IQS was allocated to the incumbent firms. The question here is what kind of qualification should be required to participate in a quota auction. The historic IQSs are allocated to firms rather than to vessels. After the merging of fishing rights into fewer vessels in the last years, the firms are now allowed to use the same vessel in different regions, like Lota Proteins has fishing rights with the vessel “Santa Maria” in several regions. The same rules can be adapted in an IQS auction, where all firms with a technical licensed vessel registered in the fishing unit region are free to purchase quotas in the local fish auctions. An alternative is to limit the participation in auctions by requiring that the bidding firm must be located or obliged to land the catches in the region where the auction takes place.

Minimum entry/exit barriers

The introduction of the same royalty fee on all allocated IQSs will minimize the entry barriers to newcomers. However, the big companies may still have an advantage from their “deep financial pockets” compared with smaller entering firms if they are required to pay royalty fees up front. These differences can be levelled out by delaying the requirement for royalty fee payment until the fish has been landed and sold, which will open the quota market to newcomers and others with low capital capability.

Payment after the fish has been sold will however create new problems to be solved: the bidders can be tempted to purchase more IQSs equivalent to a catch quantity they are not able to harvest. This will create too high a royalty fee level and the uncaught quotas from many vessels may create an unbalance between catches and the TAC. To prevent this, the bidder having a royalty bid accepted should at the end of the quota year be legally obliged to pay the accepted bids for the IQSs purchased even if he did not catch the quota. Such a measure will make the buyers careful about bidding for more quota shares than they can be sure of harvesting.

It may, however, be difficult to decide with certainty the catching possibilities several years ahead, which is also illustrated by the facts that no industrial quotas in Chile have been fully caught in the last years. It is therefore necessary to allow transferability of quotas between vessels, either between vessels in each company or between vessels in associations, but also by running auctions more often. Flexibility in the IQS market can be improved by allowing vessel owners to purchase available IQSs for a different period of time than the 10 years referred to in the FAGA, article 27, like IQSs for seasons, a year, fewer than 10 years or even longer period of time. If the auction has an objective to maximize the royalty income, it might be rational to offer a mix of IQSs of different lasting lengths meeting the demand for flexibility in the IQS transactions under uncertain harvesting conditions and varying IQ needs. Running an auction often may also open a possibility for those who have purchased more quotas than they are able to catch to return the quota back to the auction for resale in the market.

A combination of IQSs allocated by auctions and historical IQSs gives the fishing industry time to adapt to a gradually more competitive environment in quota allocation. The opening of the quota market to firms with a higher than average value-adding margin will stimulate the rivalry between the firms in developing market-oriented innovations for more efficient and value-adding products, which should benefit the whole industry, without monopolizing the industry or sacrificing the sustainability.

Independent buyers without collusion opportunities

An efficient auction requires independent buyers without possibilities for making collusions to coordinate bidding. In the present industrial fishing sector in control of 11 firms there is of course a real risk of collusions among the involved firms, as pointed out by Peña-Torres (2002). It is, however, possible to work against such behaviour with several means.

Firstly, it is possible to arrange anonymous bidding through electronic Internet auctions (like eBay) where the industry actors are motivated to compete with each other without the risk of being sanctioned by competing firms, as may happen if the bidding process takes place in the same public room.

Secondly, stronger regulations can also be established. Collusions are already in the Chilean Antitrust law subject to fines, where corporations and involved individuals and even to the dissolution of the companies involved[19]. Additional rules might be included within the bidding regulations.

This means that the industry players are not allowed to form rings for the coordination of bidding. Any pattern indicating such behaviour must be sanctioned strongly, for example by exclusion from the auction for a period of time.

[19] Source: Ferrada Nehme

Thirdly, the auction always has the possibility to set a minimum opening bid, with which the bidders have to comply.

Fourth, even if some of the incumbent firms try to coordinate the bidding, the auction will always be open to aspiring firms of newcomers and entrepreneurial firms among the incumbents seeing value-adding opportunities to increase their fish IQS through auction bidding. The borderlines between artisanal and industrial vessels of 18-metre vessel length and 50 GRT are very low compared with for example Norway, where the limit between coastal and ocean-going vessel groups is 28 metres. A large potential pool of newcomers might be knowledgeable artisanal fishing boat owners who want to expand into the industrial sector. This can also be the case when some of the industrial quota can be harvested most efficiently inside the five nautical mile border, making it attractive for the artisanal vessels to purchase a seasonal IQS.

It is also important to avoid putting too much pressure on the bidding process, for example to complete the auction process in a few hours. The auctioning process should run over some time to give the potential bidders a good chance to consider the right priced royalty bids. The auction should also be held regularly, making it easier for the eventual reselling of quotas, which also releases the pressure on the auctioning process.

It may also be an option to develop a regulation to avoid a too high concentration of the traded quotas on single firms. Such a limit of concentration is not unusual in other auctions. In Iceland, for example, a maximum limit is set of 12–35% of the TACs (dependent on species) that a single firm can own of the total allocated IQs.

If the specific circumstances make it impossible to run an efficient auction, it is also an alternative to introduce open application competitions with administrative decisions on the leasing of fixed term quota shares (Brownley & Macinko 2007) based on performance criteria like former quota utilization and documented value adding per IQ (Trondsen 2010) or simply according to the industrial plans practiced in the allocation of new oil drilling and aquaculture permits in Norway.

Dissemination of information to all the interested bidders

Information processing and the presentation of trading data are very important tasks for the auction. The auction should publish updated statistic information through the Internet about current royalty pricing and trading volumes. If collusion is a threat, protecting information about individual firms' bids might however be considered.

Information about royalty pricing may over time also influence the TAC level of each species and the global quotas. The royalty price will decrease with increasing TACs relative to buying interests, while the royalty price will increase the lower TACs relative to the buying interest. Royalty pricing therefore improves the TAC managers' information

background to optimize the TAC levels, which maximize the long-term royalty income calculated as the long-term TAC multiplied by the average royalty price.

Royalty management

The main purpose of royalty auctioning is to open the IQ market to aspiring firms with higher than average value-adding margins, which generates a market-based royalty price (resource rent) of the resource property value.[20] Collecting this resource rent is among the main motives for private investment in the harvesting of natural resources. In other industries like oil, it is quite normal for firms to give royalty bids to harvest the resources in specific geographical areas. In fisheries this rent has mostly been harvested by the many fishers and fishing communities that traditionally have lived from catching fish, like the artisanal sector in Chile and other countries. A new situation has emerged, however, in the development of the industrial fishing controlled by a very few companies and investors. It is therefore a reasonable wish to redistribute the resource rent to the common society as the owner of this resource trust. The resource rent royalty also gives a good financial basis for the stewardship of the fish resources, which may reduce other taxpayer spending on fisheries management. Improving the value adding of the resources through investment in better marine, technology and marketing research and development and in control might be important measures.

The idea of IQS auctions including a plan for the use of the royalty income might however improve the industrial support to such a project. Experiences from international quota auctions and resource rent collections in countries like Russia, Estonia and Iceland have shown that collecting the royalty fees mainly motivated by collecting taxes for the Treasury have met growing industrial and political resistance that ultimately has undermined the quota auction and resource rent collection systems.

Examples from public fish quota auctions

Fish quota auctions have been practised in the Russian Far East in 2001–2003, in Estonia in 2001–2003 and in the US in Washington State (Geoduck auction) (Anferova *et al* 2005, Ero *et al* 2005, Trondsen 2004, Vetemaa *et al* 2005).

It can be observed that private auction markets are emerging in countries where the fish quota rights are distributed from the government to the fishing firms on historical records: this is the case in Iceland and New Zealand where the quota rights (ITQ – individual transferable quotas) can be auctioned directly between firms while such transactions in Norway go through private auctions of vessels with IQs attached (IVQ –

[20] Indications of the economic benefits from the introduction of the ITQ reform were estimated from 1997–2002 catch data as between 6 and 19% of the exported value by Lobo *et al* (2007).

individual vessel quotas) (Arnason 2002, Hersoug 2002 & 2005). As in Chile, the trading of IQs has in all these countries increased the concentration of the ownership in the industry driven by the firms with the deepest financial pockets followed by an increasing total capital effort and consequently higher debt in the industry due to the buy-out costs (Arnarson 2009).

In New Zealand the actual trading was initially planned to take place through a Quota Trading Exchange (QTE), set up as a separate company owned by the operators together with the crown. However, the QTE was only in operation for the first two years after the Quota Management System was introduced in the early 1980s. With the increasing concentration of quotas it was felt that the exchange was unnecessary. The quota holders also claimed that the QTE revealed too much information to the Ministry of Fisheries, later to be used to adjust resource rentals. Consequently, the QTE was abandoned and trading was left to the informal market and to a number of quota dealers, today operating on the Internet (Hersoug 2002:33). Iceland has been through the same process; nowadays the concentration of quota owners is so high that the private IQ traders are also more and less out of business.

When the concentration of the ownership increases to a certain level where the dominating firms are controlling the quota markets, the private auctions of ITQs seems to be gradually drying up.

These bigger firms controlling the long-term fishing rights are also involved in the auctioning of ITQ leasing contracts to other firms in need of IQs. Such leasing contracts are typically annual. This means that the government has moved the right to manage the allocation of fish quotas to the private firms that received the quota rights for free on historical records. These firms controlling fish quotas gradually become quota leasing firms rather than fishing firms (Trondsen 2004).

On the level of first-hand sales of fish (from the vessel to the first buyer), almost all the fish landed in the EU and Iceland and a large part of the Norwegian landings are directly or indirectly sold through fish auctions. These auctions are protected by law regulation as a mechanism to keep this market open for smaller firms because the bigger firms both in fishing and in processing tend to prefer direct exchange without any third-party interference (Trondsen *et al* 2003).

In the fish quota market, the direct industrial political power tends to increase, the more concentrated and organized it is. Typically, the trials of IQ auctions in both Russia and Estonia were terminated by politicians after political pressure from industrial interest groups avoiding paying any royalty fees (Anferova *et al*. 2005, Ero *et al* 2005, Vetemaa *et al* 2005). We see the same obstacle to collecting resource rent from the firms' allocated quotas on historical rights, like in Iceland and New Zealand. In both cases payments of

royalty fees were a precondition of the firms' exclusive quota rights. However, in the political process these fees disappeared (Arnarson 2009, Hersoug 2002).

In order to build support for royalty payment as part of an auction mechanism, the international experience underscores the importance of recirculation the royalty fees back to common benefits for the industrial development rather than going directly to the Treasury. Royalty fees' management must make sense for the industry.

Quota control

Implementing efficient quota control systems is very important to counteract the potential pressure from fishing firms attempting to cover the royalty fee expenses by overfishing the allocated quota. The act of catching more than the allocated quota must be defined as a criminal offence and sanctioned very hard to have a deterring effect. Chile already has a quota control system in place. It might be improved with independent weighing and control systems like the landings control in for example Norway and Iceland. In Iceland all catches must go through a weighing procedure managed by independent inspectors reporting directly to a central quota control register. In Norway all weights are controlled by inspectors and the landings paper must be signed by both the fisher and the first-hand buyers. The accumulated landing figures are in addition cross-checked with storage and sales control by the fishers' sales organization empowered to manage the quota control in cooperation with the Norwegian Directorate of Fisheries.

To prevent overfishing the IQ, it is most important to enforce very strong overfishing penalties, like a loss of quota rights for a period of time. In Norway, the law also gives the possibility to bring quota overfishing to court where many fishers have been convicted by penalty and some also jailed for quota fraud.

Discussion of the arguments in the Chilean debate on quota allocation

In the following the arguments in the Chilean public debate about the prospective impact of the introduction of quota auctions in Chile will be presented and commented on.

Arguments presented by Lota Protein SA (LP)

1. ***Auctions ensure better efficiency, competition and greater transparency (LP).***

Law No. 19,713, which created and allocated individual catch quotas in certain commercial fisheries (the most important ones), was introduced in the middle of a state of emergency caused by a crisis due to overexploitation of resources. That context promoted the allocation of quotas to certain specific companies, based upon their historical catches and a "corrected" storage capacity of the vessels. This allocation system benefited the main

incumbents, who received these quotas for free. This gave them a double advantage: it limited the entry of potential competitors and ensured their market position by acquiring at no cost high-value assets, therefore increasing their financial capacity.

Meanwhile, to date, the special auction system of article 27 of Law No. 18,092 (Fisheries Act), still formally in force, has had no application. The Undersecretariat of Fisheries has not issued the regulation to implement it, nor has it proposed its implementation at the Fisheries Councils. Therefore, in this scenario, the quota system promoted a serious foreclosure of the market.

The public auction is an allocation mechanism that is used especially in markets that involve the allocation of entitlements regarded as common property. Thus, the aim is to allocate an essential input to the best proposal in terms of efficiency, therefore promoting an effective competition in the auction procedure.

Auctions ensure greater transparency than other allocation mechanisms.

Comments: Efficiency, competition and transparency are dependent on the design of the auctions ensuring equal opportunities to participate in the auction, minimum entry/exit barriers, the prevention of collusion formation and transparent Internet-based information open to all containing detailed updated trade statistics.

2. ***Auctions may promote an efficient initial allocation of fishing quotas, considering the presence of significant transaction costs in this market that hinder the creation of a secondary "quota market", thus impeding the entry of new competitors (LP) .***

Comments: Very few potential bidders in each fishery are subject to auction, caused by a very strong concentration in the industrial fisheries since 2001. To carry out an efficient auction process, it might be necessary to run transparent auction processes on individual time-limited quota shares (IQSs) for seasons, years or multiple years shorter than 10 years. It might be necessary to improve the efficiency of the auction by anonymous bidding in Internet-based auctions over a certain period of time, where the bidders' names are kept secret (like bidding for a real estate property).

3. ***Auctions promote innovation in the industrial fish market, through a more dynamic competition (LP).***

Comments: To promote innovation it is a precondition that the auctions are kept open for newcomers and innovative efficient firms competitive in growing value chains and markets. Innovation can be motivated if the auction is organized to prevent monopolizing high bids by buyers with deep financial pockets. Such monopolizing behaviour can be counteracted by issuing the same

royalty fee for all quotas according to the closing prices in the auction and by requesting payment for the bids after the fish have been landed and sold.

4. ***Auctions may produce positive externalities in the adjacent market of artisanal fishing, by levelling the power of negotiation with the demand side (industrial processors). This may be the case when the auctions are designed to enhance the number of competitors on the industrial market (LP).***

Comments: The auction gives expansion opportunities for fishers with a background in the artisanal fleet to enter the industrial quota market. More competition for the industrial IQSs will also spill over to the demand for the fish caught by the artisanal fleet as an alternative to bidding in the auction.

5. ***Auctions should be designed in a pro-competitive way, considering criteria other than direct monetary payments (LP).***

Comments: Limiting single firms' permitted share of the global quota (TAC) is an efficient and frequently used measure to hinder the monopolization of the fish quota market. In Iceland such limitation is between 12 and 35% of the TACs depending on the fish species.

6. ***Implementing auctions of quotas should allow the entry of new players into the market (LP).*** The quota system produces rents; the auctions transfer part of those rents to the Treasury. The Fisheries Councils allow a high degree of coordination between incumbents. It also gives them an effective tool to maintain the status quo through a right of veto. The institutional design confuses the regulator and the regulated, allowing the incumbents to influence public policy in their own interests.

Comment: An efficient barrier against entering newcomers is the present organization where the incumbent firms in practice can block potential decisions taken by the Undersecretary that threaten their allocation of the fish quota. The Undersecretary of Fishery as a representative of all Chilean people should be free to take the necessary decisions independent of organized industry groups.

Arguments presented by the incumbents and public authorities (I & PA)[21]

7. ***We don't know an auction system would give us more resources (I & PA)***.

The license ("patente de pesca") paid by the industry for the right to fish is about US$30 million per year, and we don't know if an auction system would give us more resources.

[21] According to Ferrada Nehme's summary of arguments presented in the press

Comments: A dynamic royalty auction system will give economic incentives for better-managed fish stocks and as a result more sustainable resources and income. The royalty payment comes in addition to the license payments, which are compensation for the historic fishing rights. It should be considered reimbursement of the license costs from the royalty payment of the historic-based IQS. Well-managed fish stocks should give a higher rent than the license fee. The royalty fee gives more financial resources for research, innovation and control aimed to improve the fish resource utilization. Royalty bidding has in addition an important function as a quota allocation mechanism.

8. The implementation of an auction system of allocation will tend to higher levels of concentration (I & PA).

Comments: Concentration in the auction market can be prevented by three measures:

- *Payment of the same royalties for all allocated IQSs according to the price level traded at the auction. This request prevents companies with big IQSs based on historic criteria from practising deterring royalty bidding against newcomers and competitors in the auction market, because increasing royalty prices in the auction also increase the royalty of the historic-allocated IQS. The royalty prices will then reflect the real value-adding opportunity every company sees for all IQSs independent of the allocation method.*

- *The payment of IQS royalties when the fish have been landed and sold reduces the concentrated market power from deep financial pockets and opens up for entrepreneurial companies with less financial strength.*

- *Opening the IQ market to market-oriented companies in high niche markets with value-adding margins above the average in the industry. These groups currently have limited marketing possibilities because of a lack of stable access to IQSs.*

The industrial fleet has already reached a high degree on concentration motivated by the present historic based IQ regulations.

- *The main differences between the Chilean and Norwegian pelagic industrial fisheries, which in 2009 landed about 1.5 million MT and 1.8 million MT, respectively, are the higher speed of the concentration process and the stronger degree of concentration in Chile. The number of vessels in the pelagic industrial fleet in Chile (vessels larger than 18 m and 50 MT fishing anchoveta, jack mackerel and sardine) has been reduced by 40% (from 192 to 136) and the number of owners*

has reduced by 69% (27 to 16) in the period 2001–2009[22]. In the similar Norwegian pelagic fleet the number of vessels larger than 27.4 m has been reduced by 50% (160-79) in the period 1985-2009. The number of Norwegian owners of this fleet was 49 in 2009[23]. The average Norwegian owner of these pelagic vessels controlled 1.6 vessels compared to 8.5 vessels per Chilean owner in 2009. The comparative figures indicate much lesser constraints in merging the Chilean individual vessel quotas compared with those of Norway without the public auction mechanism.

9. ***Risk of delayed investments needed to reconstruct the infrastructure (I & PA)***.

Both the expiration of Law No. 19,713 in 2012 and the destruction caused by the recent earthquake, even though the companies were insured, made the Undersecretary say that there is a risk that the incumbents will delay the investments needed to reconstruct the infrastructure. This is said in the context of 12,500 direct and 35,000 indirect jobs that depend on the industry. In the same line, the incumbents expressly conditioned those investments to the extension of the actual quota allocation criteria beyond 2012.

- *Comments: With a transition period of 10 years until the auction market comes into full effect, delays in current investments do not make any business sense. The current high market prices on fish products combined with a slowly increasing competitive pressure from an IQS auction strongly motivate value-adding investments among the companies with ambitions to take strong competitive positions in the years to come. The IQS auctions give motivation for more market-oriented investment in emerging value-adding niche markets and business structures that should make the entire industrial structure more competitive in the future.*

10. ***Auctions influence the biomass negatively (I & PA)***.

There are negative effects caused by auctions. This would be the case for four species, whose biomass would be reduced after using this mechanism.

Comments: There are no logical interactions between the auctioning of IQSs and the development of the biomass in the fishery except criminal offences in overfishing the allocated IQSs (Peña-Torres (2002). *The IQSs represent a certain share of the TAC set by the Subsecretaria de Pesca reflecting a sustainable catch level. If the biomass in a fishery is reduced under its sustainable level, the TAC is set too high. The willingness to give bids in the IQS royalty auction will reflect each bidder's CPU (catch value per unit effort). The CPU and royalty bids should therefore motivate increasing the biomass. The Subsecretaria*

[22] Source: Diario Oficial

[23] Source: The Norwegian Directorate of Fisheries.

de Pesca will therefore through the auction system be motivated to set a TAC decision solely from long-term sustainable criteria and not from the industry short-term needs. Vessels that catch more fish than the allocated IQSs in order to pay the royalty commit on the other side a criminal offence, which must be controlled and punished.

Table 2 shows also decreasing pelagic landings from the industrial fleet indicating a decreasing catch value per unit effort and biomass also in these fisheries independent of method of quota allocation.

11. New entrants do not want to invest in processing plants (I & PA).

Potential entrants to the industrial fishing market have not considered the necessary investments in processing plants that are needed to develop this activity. If newcomers have taken this into consideration, they will not be willing to participate or to bid high prices in an auction.

Comments:

- *If potential entrants are not willing to give competitive royalty bids they can not enter the quota market and are not a problem for any of the incumbents.*
- *It is possible to enter the industry without making an investment in processing plants, but rather making delivery contracts/partnerships with already-established processing plants.*
- *Already today there are differences in the present processing plants' previous investments that generate differences in value adding and capability to give bids in IQS royalty auctions. Even if the established firms have a strong competitive advantage in sunk costs from investment in traditional processing and markets, experiences from other industrial sectors show there are always niches in the market that the big companies with sunk costs in traditional technology investments can not exploit due to the structure constraints developed through the past investments. All industry sectors can therefore benefit from opening the market to aspiring niche-oriented companies pioneering new products and markets. In order to offer many high-quality consumer-oriented fish products to the market, integrated quality control of the product flow is often required throughout the entire supply chain from the harvest to the final product and markets (Trondsen & Johnston 1998). The production of high-quality Omega 3, fish meal and frozen products for human consumption are product examples that require access to fresh raw materials and strict quality control along the supply chain. There may also be potential for improved strategies in the fishing operations in quality handling that increase the harvested values. In Norway and Iceland there is for example a very*

profitable movement of the whitefish quotas from demersal trawling to long-line fishing that improves the landed fish quality. We have also seen that improvement in chilling and freezing/thawing technologies increases the quality of the fish and as a result the market prices. Storage methods that extend the fresh shelf life also open up possibilities for extended fish trips without damaging the fish quality, and therefore reduce the average catching cost per tonnage of catch. The extension of the shelf life might be especially important in the jack mackerel fishery where the fleet delivering fresh fish for land processing moves to the international waters beyond the 200 nm zone (Peña-Torres & Valderrama 2008). Altogether such value-adding improvement will strengthen the entrepreneurial companies' capability to give higher than average royalty bids in the IQS auction. Introducing and pioneering new technologies and new market niches are conditioned on entrepreneurial access and control over the supply chain influencing the fish fresh quality. Sometimes such entrepreneurships grow out of established firms, but industry concentration structured in an oligopoly tends to be more conservative in its orientation to ongoing business based on previous investments at the expense of the entrepreneurial pioneering of new ventures. Opening the quota market for innovative entrepreneurship is therefore as important in fishing and fish-processing industries as in other industries to grow and prosper. Also, the established incumbent firms may take advantages from learning from the aspiring and entering firms' examples.

12. Quota reallocation leads to less industrial stability and investment uncertainty (I & PA).

The short duration of the law leads to extensive regulatory uncertainty, affecting the incumbents' investment decisions and the stability of the sector.

Comments: Many different individual strategic adaptations can be competitive in the same fishery. Some firms may prefer to give bids for seasonal IQSs while others wish to give bids on longer term IQSs. Most firms might wish a mix of short term and long term IQSs. Increasing the flexibility in IQS terms offered through the auctions, ranging IQS terms from seasonal to for example 20-30 years[24], will increase the trade-offs for the adaptation of individual firms and by this reduce the industry's investment uncertainties.

All industries face uncertainties and competitive pressure from their supply and demand markets and from competitors, including newcomers and suppliers of substitute products and solutions (Porter 1980). The prospering firms and industries are those with a competitive edge toward profitable

24 In Norway the administrative allocated quota term is 23 years.

markets able to deal with and take advantage of such competitive uncertainty (Barney 1996). Monopoly or oligopoly firms, independent of their governmental or private ownership, tend to fall behind in international competition without such competitive pressure. All business pursues the easiest money first. In fisheries where the fish quota capital is taken over by industries for free, which can also for many years strengthen their book balance with the value of the fish quotas, the resource capital, without improving their efficiency or market position. This resource capital can be mortgaged and the resource rent can be pulled out, especially when the firms' ownership changes hands. The stockholders who received the quota for free can add the market value of the quota's resource capital to the equity value, while those who take over the firms e.g. in the next generation increase the mortgage to finance the takeover (Orebech 2005). At the end of such development, all the resource rent in fish quotas becomes monopolized and capitalized and such fishing sectors becomes similar to other sectors emptied of resource rents. There are important differences between fisheries with IQS royalty auctions without resource rent privatization and fully private monopolized fisheries. There is more common working capital in the IQS auction, making space for more participants and common resources for more research, development and control. In the monopolized fisheries the resource rent is channeled into very few private pockets with the risk that the next generation taking over an industry will be in deep debt (Orebech 2005).

13. Amendments should be limited to improving the quota transference mechanisms (I & PA).

Should an amendment to the Fishery Regulation be discussed, it should be limited to improving the quotas' transference mechanisms. If the quota transference mechanism is efficient, the original form of assignation of the quotas (i.e., auctions, historical catching criteria) is irrelevant.

Comments: Auction and historical catching criteria are both transference mechanisms of IQSs from the commons to the fishing firms. An amendment to the Fishery Regulation limited to the improvement of the quota transference mechanisms means introduction of ITQ trading between the fishing firms where the initial allocation from the commons to the fishing firms is already completed. The main question to be answered is in other words: Who should benefit from utilizing the common fish resources: the common people in Chile or the incumbents who have the IQSs allocated for free? If the amendment is limited to improving the quota transfer mechanism, it means handing over resource rents to the incumbents. An amendment to the Fishery Regulation including auctioning IQSs as a transference mechanism, will on the other hand

spur competition and innovation as well as collecting the resource rents from the different fisheries for the commons.

14. The introduction of an auction mechanism is a very risky innovation (I & PA).

Auction mechanisms are exceptional in the rest of the world. Implementing auctions in Chile would be a very risky innovation. It would also introduce a relevant degree of incertitude regarding investments.

Comments:

- *The introduction of auctions gradually over a 10-year period starting with only 5% of the TACs gives time to develop a well-functioning auction system gradually.*

- *Auction mechanisms are not exceptional in the rest of the world. Transferability in ITQ systems based on auctioning tools is adapted between firms where IQSs are exchanged against payment or bartered against other IQSs. In the private market such auctioning is rather normal, regulated by the government. In Iceland all IQS transactions including prices are registered in an official register. All transactions of IQS shares in Norway are attached to vessels' transactions (IVQ), and registered in the official registers but without IQ prices. In Iceland and New Zealand minor royalties (resource rent taxation) were charged for the IQSs for some years, but were removed after pressure from the vessel owner organizations (Arnarson 2009, Hersoug 2002). In Norway such royalties have been discussed, but not implemented. Instead, social costs are imposed on the industry through structural limitations to meet the Government's objectives regarding employment and settlement along the coast. The governments in these two countries have in other words handed over the title of the IQSs for free to incumbent fishing firms, which on their side have been free to exchange the IQSs in private auction markets under regulatory constraints limiting the ownership concentration.*

- *The auction mechanism in Chile has mainly worked in the trading of licenses with IQ rights attached. Such concentration in fewer hands increases the entry barriers to newcomers and aspiring market-oriented companies in the industry. The main difference in moving the IQ from private to public auction on behalf of the Chilean commons is that the resource rent will be channelled from the accounts of the firms to the accounts of the common trust. These funds can then be used for common purposes for the industry and the society. There should not be any more risk involved besides the resource accounts in some of the firms being slimmer, while the opportunity from the expanding firms would be to the better advantage of the industry and Chile as a whole. Increasing the degree of incertitude is quite normal in all competitive industries in the world of increasing globalization. The increased degree of incertitude for the incumbent companies is also an*

incentive always to improve the competitiveness towards entering and other expanding firms to maintain a strong position in the industry.

15. ***Bidding mechanisms would damage the small-scale fishery sector (artisanal), by cutting the small-scale fishery quotas (I & PA)***.

Comments: There are no links between auction bidding mechanisms and the allocation of TAC shares to each region or vessel group. The quota (TAC) on each fish stock should be decided upon biological considerations of long-term socio-economic sustainable harvesting. The TACs are thereafter divided into TAC shares between the artisanal and industrial vessel groups in fishing units related to the different regions VX-X. It is such regional TAC shares (global quotas) for the industrial fleet that are subject to separate auctions. There are no proposals to introduce auctions of the TAC shares allocated to the artisanal fleet. However, an auction of IQSs in the industry sector may also be opened to vessel owners in the artisanal fleet. Some of the industrial quota can only be taken in the fishing zone belonging to the artisanal fleet. Giving the artisanal vessel owners the opportunity to enter the industrial quota might improve the flexibility in the fishery and give clever skippers in the artisanal fleet the opportunity to grow into bigger vessel operations.

Conclusion

This paper has presented the authors opinion on open bidding through auctions as an allocation method for individual fishing quotas owned by the Chilean commons. The main conclusion is that gradually implementing the auctioning of individual quota shares (IQSs) to the industrial fleet over a 10-year period can be recommended as a low-risk strategy that should strengthen the long term competitiveness of the Chilean fisheries without sacrificing the common ownership or sustainability of the fish resources. Biological and socio-economic sustainability are maintained through management processes ending up in the recommendation of a TAC for each species independent of IQS allocation through the fish auction. The industry's long term competitiveness is stimulated by the auction markets which are favoring market oriented investments aiming for gaining competitive strength in the value chain as well as in the fish quota market.

Based on Norwegian experiences, possible areas for improvement of the TAC management process are also shown. The IQS auctions can best be implemented in allocation of the TAC shares for each species allocated to the regional Fishing units.

It is also recommended to improve the flexibility in the transferability of IQSs between firms by running auctions for time-limited seasonal, annual and multi-year IQSs according to demand. Such a measure will reduce the bidders' risk from varying catch opportunities and is expected to improve the value adding and the royalty fee income.

To take advantage of the long term benefits of open bidding for IQSs, it is important to structure the auction and the bidding process to prevent deterring bidding and collusion forming from the big incumbent firms. Measures to counteract such behaviour can be made by

- collecting royalty fees on all IQSs, included those allocated on historic criteria, according to the royalty fee paid in the auction;
- collection of payment of royalty fees “as you fish”;
- running Internet auctions over time where the bidders are kept anonymous;
- strengthening the regulations making it a criminal offence to create bidding rings influencing the bidding process.

It is also recommended to develop plans for the royalty fee management that might be an important financial common resource to strengthen the fishing industry’s long term competitiveness through research, development, innovation and control activities.

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References

Anferova E., M. Vetemaa & R. Hannesson (2005): Fish quota auctions in the Russian Far East: A failed experiment, *Marine Policy* 2947–56.

Arnarson I. (2009): Det islandske kvotesystemet. *FiskeribladetFiskaren* 9. January.2009.

Arnason R. (2002): A review of international experiences with ITQs. *Report* 58. *Cemare* , Porthmouth, UK.

Barney J.A. (1996): *Gaining and sustaining competitive advantage*. Addison-Westley Publ. N.Y

Bernal P.A., F. Oliva, B. Aliaga & C. Morales (1999): New regulation in Chilean fisheries and aquaculture: ITQs and territoral user rights. *Ocean and Coastal Management* 42, 119–142.

Bromley D.W. (2009): Abdicating responsibility: The deceits of fisheries policy. *Fisheries* 34.

Brownley D.W. & S. Macinko (2007): *Rethinking fisheries policy in Alaska; options for the future.* Report prepared for the Alaska Department of Fish and Game, Juneau, Oct. 31.

Eero M., M. Vetemaa & R. Hanneson (2005): The quota auctions in Estonia and their effect on the trawler fleet. *Marine Resource Economics* 20, 101–112.

Hersoug B. (2002): *New Zealand's experience with right-based fisheries management. Unfinished business*. Eburon Academic Publ., Delft, The Netherlands.

Hersoug B. (2005): *Closing the commons. The Norwegian fisheries from open access to private property.* Eburon Academic Publ., Delft, The Netherlands.

Lobo A.G., J. Peña-Torres & P. Barría (2007): *ITQs in Chile: Measuring the economic benefits of reform.* Department of Economics, University of Chile, Santiago, Chile.

Orebech P. (2005): What restoration schemes can do? Or, getting it right without fisheries transferable quotas. *Ocean Development & International Law* 36, 159–178.

Peña-Torres J., R. Serra & M. Basch (2000): Who can fish what and where: Chile's tradeoffs in high seas fishing of straddling stocks. *Marine Resource Economics* 14, 245–262.

Peña-Torres J. (2002): *Individual transferrable fishing quotas in Chile: Recent history and current debates*. Economics and Business Administration Department, Jesuit University Alberto Hurtado/ILADES, Erasmo Excala 1835, Santiago, Chile. May 26.

Peña-Torres J. & M.V. Valderrama (2008): *Fishing location decisions in the Chilean-Transzonal jack mackerel fishery.* Facultad de Economía y Negocios, Universidad Alberto Hurtado/ILADES, Erasmo Escala 1835, Santiago, Chile.

Porter M. (1980): *Competitive strategies*. The Free Press, N.Y

Porter M. (1990): *Competitive advantage for nations*. The Macmillan Press Ltd., London

Schumann S. (2007): Co-management and consciousness: Fishers' assimilation of management principles in Chile. *Marine Policy* 31, 101–111.

Simon H. (1958): *Administrative behaviors*. The Free Press.

Smith A. (1759): *The theory of moral sentiments*. Cosimo Inc.

Stevens J.S. (1980–81): The public trust: A sovereign's ancient prerogative becomes the people's environment right. *The University of California Davis Law Review* 195, 210.

Trondsen T. (1985): *Industrial innovation.* PhD dissertation. Institute of Fisheries, University of Tromso.

Trondsen T. & R.S. Johnston (1998): Market orientation and raw material control. *Journal of Market Focused Management* 34(6), 193–210.

Trondsen T. (2001): Fisheries management and market oriented value adding (MOVA). *Marine Resource Economics* 16(17-37).

Trondsen T., K. Helstad & J.A. Young (2003): Market-oriented fisheries management – An analysis of four fisheries regions in the North Atlantic. *Ocean and Coastal Management* 46, 917–941.

Trondsen T. (2004): Toward market orientation: The role of auctioning individual seasonal quotas (ISQ). *Marine Policy* 28, 375–382.

Trondsen T. (2010): *A "football league" model for opening access into closed common fisheries without compromising sustainability.* Working paper, Norwegian College of Fishery Science, University of Tromso.

Vetemaa M., M. Eero & R. Hannesson (2005): Fishing rights auctions in the fisheries of Lake Peipsi-Pihkva, Estonia. *Fisheries Management and Ecology* 12, 3009–313.

Appendix

Review Assigning ITQs: An economic Analysis. A report prepared by Ragnar Arnason for Claro y Cia law firm June 21, 2010.

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9.08.2010

The a priori premises

Ragnar Arnason from University of Iceland belongs to an international group of fisheries economists promoting privatization of fishing rights and free trade of individual transferrable quotas (ITQs). His report has in addition a priori premise that the fishing rights belong to the grandfathering (incumbents) fishing companies, that received their individual quota shares (IQSs) for free reflecting their historic catch shares during three years in the late 1990s (Chapter 9). He wants to limit governmental involvement to guaranteeing the IQS rights to the incumbents firms. All other governmental involvement in reallocation of quotas is described as expropriation (pp 24, 38, 39, 58, 82). Based on this a priori premise, the report argues and concludes logically that public auctions are not in the interest of the present incumbent firms in control of the quota shares, which are his contractors.

The ITQ system he promotes has been practiced in his homeland Iceland for 20 years. According to new information from Iceland[25], it is an interesting point that 70 percent of his fellow citizens in Iceland in the polls do not express support of the ITQ system promoted by Ragnar Arnason, which has given the leading fishing companies oligopoly power over the main fish quotas. The ITQs in Iceland have contributed heavily as collateral for the build up of economic debt in fishing companies which became a significant contribution to the national economic crisis that in 2009 ended in the fall of the ruling party and government. The new Government in Iceland is currently responding to the popular dissatisfaction by stepwise dismantling the ITQ system. Ragnar Arnason and his fisheries economist colleagues who had a strong influence on the introduction of the ITQ system in Island have ultimately lost much of their public influence over these issues in their homeland.

Even if the report intends to argue logically for the interests for the incumbents firms, there are several weaknesses in the arguments and direct mistakes in some places, as well as misunderstandings and unclear use of analytical concepts, which I will describe in the following.

The theoretical and empirical background

The report is highly theoretical with weak support of independent empirical evidence. The reference list is built on articles from his own academic network mainly based on standard neoclassical fishery economic theories and models. These analytical models select data according to sets of presumptions which are: (i) The economic agents have rational preferences, (ii) they are only maximizing profit, (iii) they act individually without social influence and (iv) they are fully informed about all relevant strategic possibilities in markets.[26] The scientific proofs delivered in the report about the ITQ systems success are therefore highly theoretically based on mathematical

[25] Information from newspapers and personal communication collected by dr. scient Ingolfur Arnarson, fisheries consultant, Reykjavik, Iceland

[26] http://en.wikipedia.org/wiki/Neoclassical_economics

reasoning providing preferences and behaviour of the economic agents according to the economic models' assumptions. The models presented in the appendices (1-6) are examples of such modelling and reasoning. The problem is that societies, people or economic agents are not acting according to the assumptions in the economic models. The firms are not only acting economically rationally according to the economic models: They may have social preferences. They are not necessarily maximizing profit, but rather seeking profit satisfaction. They do not act individually but are a part of social systems, each of which is dominated by conventions based on values, including beliefs, social and legal rules and practice built up in the past. Finally, they are not fully informed of all possible choices, but rather embedded in information networks filtered by the convention structure in which they belong. Scientific proofs of the success or failure of any management system may only be valid from empirical analysis of the economic actors' preferences, behaviour and performance according to actual fisheries management objectives and not according to analyses where data are selected based on presumed objectives and behaviour that are defined in neoclassical economic models. The economic analysis does not present any facts, but rather economic opinions that depend on the premises and model specification.

The individual quota concept: ITQ or IQS?

ITQ is a key concept promoted in the report for solving "the fisheries problem". An ITQ is defined as "Individual Transferrable Quota," which constitutes property rights of harvesting shares of a total allowable catch (TAC) (p6). The concept is promoted in the report by claiming that "ITQs have been adopted in hundreds (probably well over a thousand) of fisheries around the world and at an increasing fast rate. Currently over 15 major nations use variants of ITQ or an integral part of their fisheries management system and close to 25% of the global catch is currently taken under ITQs" (p16). Table 1 (p19) shows a list of nations using ITQs in their fisheries. This table includes also Norway. The problem is that there are no ITQ systems in Norway. Norway has an individual quota share (IQS) system. The Norwegian Supreme Court made a ruling in 2009 making it clear that trading fish quotas is not allowed according

to the Norwegian fisheries laws[27]. Transfer of IQSs between fishing firms can only be carried out by explicit permits issued by the Directorate of fisheries in Norway. The permits are allocated according to a broad set of objectives like fleet structure, geography allocation, employment and industry profitability. The Norwegian Directorate of Fisheries only allows transferring long term IQSs when they are attached to the sale of fishing vessels. The Directorate of fisheries is also, in come cases, authorized to allow the transfer of seasonal or annual IQSs (leasing) between vessels in the same vessel group, which is defined according to size and fishing gears. It seems that Ragnar Arnason includes all such kinds of transfer methods into his ITQ concept without differentiating the various institutional and regulatory environments where transfers take place in different countries. It is confusing though, because in the report he writes that the contribution in Trondsen (2004) has "nothing to do with the usual ITQ fisheries" (p42). An interpretation of his position is that "usual ITQ fisheries" according to his definition do not include institutional management levels like auctions or other administrative allocation mechanisms designed to match the society's many objectives other than maximizing profit in the vessel owning firms. The problem with his ITQ claims is that similar transferability constraints like those in Norway may also occur in other countries managing fisheries with IQS. Transferability (The T in ITQ) does not mean exchange of quotas in a free market system between sellers and buyers as in a theoretical ITQ system, but rather exchanges that are carried out through different kinds of transaction systems, which include extensive transaction costs involving negotiation between the fishing firms and direct governmental involvement or regulation of the permit transfers. The transaction costs are significantly higher than the figures presented in the report (page 47) which are indicating transaction costs similar to a 1-3% broker fee. The fact is that the concentration of IQSs in both Iceland and New Zealand are so high that the markets for quota brokers' services are almost dried up. Instead a barter trade of quotas has evolved between the big companies. In such barter trade, the parties may decide the transaction price of IQSs without cash transfers. In

[27] According to Associate professor in fisheries law Peter Ørebech, Norwegian College of Fishery Science University of Tromsø, Norway

such barter trade, both partners may benefit from increasing the traded IQS price, which also becomes a reference price for valuation of the collateral of all their previous total quota assets. This economic motive has clearly been a main driver for the economic bubble in the Icelandic economy. The increasing collateral value of the fish quotas was one of the sources for the Icelandic economic debt bubble before it burst in 2008. Therefore, such monopolistic barter trade transactions may not contribute to a sustainable efficient market.

Arnason's reported success of the ITQ system is in reality a reported success of IQS systems. Most fisheries experts in academia and business will probably agree that the allocation of IQSs to vessels or companies is an important success factor for limiting the total catches to TACs, which reflect a presumed sustainable harvesting level. However, such IQS catch limits are always combined with entry and effort regulations, such as issuing permits for the maximum number of vessels, engine sizes, vessel lengths, area closing, days at sea, etc.

The advantages of IQSs are the same for all allocation methods including: (i) ITQ systems where grandfathering firms have the IQS allocated for free and are able to trade the IQSs in open quota markets without royalty payment, (ii) administrative systems where the government allocates IQSs based on sets of defined rules or (iv) government-organized royalty auctions where the IQSs are allocated according to competitive bidding.

The question to be answered in Chile is what IQS property right allocation system is most efficient to meet the society's fisheries management objectives; it is not about the cost efficiency of the IQS allocation methods.

The assumptions regarding allocation of property rights and economic prosperity

In chapter 2.5, Arnason underpins his position that property right belong to the grandfathering incumbents by referring to John Locke's philosophical publication from 1689 "*Two Treaties of Government,*" which states in an example that " he who picks an

apple of a tree has doing so mixed his labor with the apple and has thus become owner of that apple " (p12). With the assumption that the tree was growing on wild common land, the statement is in line with the old Roman law where the fishermen acquired property rights to the fish they caught in the common sea. The problem with Arnason's reasoning is that he extends the argument to state that those who have acquired property rights by picking apples or by catching fish also should acquire a harvesting right of a share of the common apple garden or the fishing stock in all future similar to their harvest in random chosen three specific years. The application of this argument should clearly imply that the indigenous people in Chile and other countries should have the property rights over all the land where they previous have harvested their food from the common land and sea! Indigenous people both in Alaska (US) and New Zealand have succeeded in getting rights to big IQS shares based on such historic rights which are based on thousands of years harvesting practice, not three random chosen years which was practice when Chile last allocated the grandfather incumbents fisheries rights. If Chile opens ups for legalizing grandfathering rights, the country must also be prepared to deal with legal demand for such rights from its indigenous people.

Grandfathering of common property rights is however, not the case in modern market-based economies, where property rights rely on each individual's (person or firm) competitiveness to pay for the property rights over land, processing plants, market channels, patents etc. The competition about the control of the most valuable property rights is in fact the key factor for economic growth and prosperity. An economy purely based on harvesting valuable but limited natural resources tends to fall behind in the international industrial competition, where advantages are gained from investments in technology and product development. This was Spain's fate after it based its economy on emptying South America for gold and silver in the 1500s[28].

It is quite normal that all competitive market-oriented value adding activities in firms aiming to improve prices or sales volume, products quality and convenience or

[28] See for example Reinert S. Eric (2007). How Rich Countries Got Rich.. and Why Poor Countries Stray Poor. Constable. London

the cost structure in harvesting and processing, have to rely on contracted input factors like raw materials, labour, energy, technology etc. Property rights over raw materials input in the form of IQS or fish landings for the addition of further value can be acquired through contracts in the same way as property rights of other input factors like labour, capital, energy etc. are acquired. Such contracts may specify the obligations of buyers and sellers with respect to product qualities and prices over a certain period of time. This is a normal world fact for example in the wine industry, where the grape supply to the wineries relies on contractual relationships. This is also the same in the agriculture industry, where the dairies have contractual relationships with their supplying cow farmers and the sheep processing companies have contractual relationships with sheep farmers. If they haven't purchased land, the farmers of grapes, cows and sheep often have contractual relationships with the land owners through leasing arrangements. Industrial practices give no evidence that permanent property rights over input resources are a precondition for competitive and sustainable economic value adding and performance as Arnason argues. On the contrary, permanent legally protected property rights over limited input resources like fish quotas create monopoly positions, weakening the interest in investing in long term industrial development. The reason for this is that collecting the resource rent from nationally protected fish harvesting might give a higher risk-free profitability compared to a more risky investment in value adding activities that are exposed to international competition. Such economic behaviour can currently be observed in the Norwegian[29] and New Zealand[30] fishing industries, which are based on protected IQS property rights. The most competitive and successful market-oriented value adding firms are those which have to compete for production resources in the input markets where all bidders have equal opportunities. Therefore, the concentration of property rights is closely related to the phenomenon of "lazy monopolies," which describes firms controlling resources in high

[29] Trondsen T (2009): Har strukturpolitikken gitt en mer lønnsom fiskeflåte? En empirisk analyse av rederienes regnskaper (Have the structural policy developed a more profitable fishing fleet? An empirical analysis of the fishing companies' accounts) 2005-2007. Working paper, The Norwegian College of Fishery Science, University of Tromsø

[30] Stringer S & G. Simmons (2010): Changing trends in offshore processing, implication for the New Zealand seafood industry. Paper presented for the International Institute for fisheries economics and trade. Montpellier, France, July 2010

demand, thereby satisfying their preferences by tapping the resource rent (cash cow), without engaging in E & I (Exploration and Innovation), which Arnason underscores as an important success factor for sustainable growth (p 31). In fact, markets characterized by high E&I activities are those which are open for entrepreneurship most often coming from smaller expanding firms. If the fishing rights are monopolized by a few incumbent firms, these firms are in a position to block the possibility of innovative expanding firms. These expanding firms need a way to acquire more quota to increase their share without contracting the incumbent firms with monopoly industry power based on their grandfathering property rights. A royalty auction keeps the quota market open for these expanding firms, while firms in the monopolized ITQ markets that Arnason promotes can block entering firms perceived as a threat against their monopoly position in the value chain. The problems with monopoly property power are in other words on the fishing industry's input side. Arnason does not seem to be worried about the monopoly power of the ITQ as an industrial input resource. Instead, he justifies that the problem is the same in all rationalization of the fishing activity (p24). This assumption is not correct. In an ITQ system where a few companies control all quotas, the incumbents can block competitors that want to expand their quota shares. This is not the case in an open royalty auction organized in a transparent and non discriminating way, where monopoly power can be counteracted.

Arnason is discussing the effect of monopoly power in the industry's output market (page 20-24). Here he rightly points out that even if the concentration of fishing rights in a fishery is high it might be difficult to gain monopoly power and influence prices in the product market. Most products produced in Chile are competing in global markets where the Chilean firms are price takers with limited influence on market prices by their relative resource control. The only way to gain monopoly power in the value chain is to control property rights to unique harvesting, processing or marketing practice of unique products and services in high demand. In all innovative strategic practice, there are however also first mover advantages, business secrets and patented property rights, which also are protecting against competition. It is not like what Arnason claims on page 14, that the government through an auction system "will step in and seizes the resource in order to auction it off or tax it in other ways." Individuals,

who have created value from previously unknown natural resources, can protect this knowledge independently of whether the IQSs are auctioned or not.

The quality of the property rights acquired in royalty auctions

An IQS auction can satisfy all the characteristics of property rights according to Scott (1996, 2000), which are referred to in Arnasons report pages 7-10: Security, Exclusivity, Performance and Transferability. The quality of the IQS property rights may be defined based on the same principles Arnason uses to define the quality of ordinary ITQs (p10). The main difference between a royalty auction solution and the free ITQ solution promoted by Arnason is that the property rights are time limited IQSs purchased in a royalty auction in line with all other input factors needed for profitable fisheries and processing operations. Trading of time limited IQS (leasing) contracts will also take place in free ITQ systems, but will take place directly between sellers and buyers without an auction as broker. Experience from Iceland and New Zealand shows that the big fishing companies make significant profit by leasing IQSs to smaller fishing companies lacking property rights to permanent ITQs. The big grandfathering incumbents are therefore filling the same managing role of IQSs as the proposed public royalty auction. The difference is that the resource rent in the ITQ case is channelled into the pockets of the grandfathering incumbent firms according to the their catch shares three specific years random chosen qualifying years, while the royalty auction solution channel the resource rent into the common pockets.

The arguments for assigning of IQS rights to the incumbents

Arnason argues that the IQS/ITQs should be assigned to the existing operators in the industry because they have invested time and money in this business (p 16). Such constraints can be introduced both in a pure ITQ system and in a system with IQS auctioning. It is possible to require some qualification tests for entering an auction trade, such as documentation of previous investment and practice in the industry. However, it is difficult to understand Arnason's economic justification of the promotion of the "once and for all" allocation of fish quotas to what the firms just happen to catch as their share of the TAC in three randomly chosen qualifying years. The business

cycles between firms may vary over time. Each firm has a different time period for investment and time period for growth depending on each entrepreneur's background and market opportunities. Fishing firms having their business cycle's growing phase after the randomly chosen qualifying years are at a disadvantage compared to those incumbent firms which have an earlier growth phase. It is not reasonable that the firms with a later growth phase, which also may represent new growth strength for the industry as a whole, should be dependent on purchasing quota shares obtained for free from firms in an earlier growth phase. This favouring of the grandfathering incumbent firms at the expense of other growing prospering firms may represent a Pareto reduction according to Arnason's definition (p17). On the contrary, Pareto improvement for the entire industry may happen in an open auction market where all firms have the same possibility to purchase IQSs in a non-discriminatory way and to take advantage over time of the newcomers' entrepreneurial and innovative spirit. In all competitive markets there will be winners and losers in the short term, but such competition is in reality a source of learning for long term improvement of the competitive business practises for both the winner and the losers.

The importance of auction design and efficiency

Arnason admits that auctions can be efficient for allocation of scarce resources if they are designed correctly (p30). In the conclusion of his discussion of the effectiveness of auctions (p59) he refers to the limited research into the relative efficiency of different allocation mechanisms. "The general result is that both grandfathering and allocation by auction may be efficient." Then he adds his a priori assumption in line with his contractor's interests: "Much, however, depends on whether the rights exist or not. When rights have already been established by prior participation there are strong arguments for grandfathering. Auctions are more attractive when there is no prior participation and rights have not been established."

It is therefore surprising that he writes without any further documentation in the main conclusion (p83), "Auctioning ITQ rights do not seem to be a good idea from virtually all major perspectives. They will almost certainly lead to a reduction in the

economic efficiency of the fishery and, by their impact on many other industries as well not to mention the exploration and discovery (E&D) activity" and "ITQ- auction are very unlikely to have any noticeable effect on possible monopoly power and monopolistic behaviour in the fishing industry."

He does, however, mix the concepts of IQS and ITQ by writing about ITQ auctions (p45). I have not seen any proposal about ITQ auctions, which should imply two auction markets; one private ITQ market directly between the incumbent firms and one public market where the government is auctioning IQS or ITQs. This combination motivates fishing firms to do business by quota trading at the expense of market-oriented efficient production business. Firm-to-firm trading of ITQs may undermine the public royalty auction by creating competition between these two markets and reduce the traded volume in the royalty auction. By channelling all IQS transactions through the royalty auctions, it should be possible to gain high cost efficiency and counteract the temptation of developing monopoly power through collusive behaviour.

Arnason exaggerates the possible disadvantages of auctions a lot, eg. the cost of preparing and conducting auctions (p31). The more complicated fresh fish auctions in Iceland and in EU, which also are managing physical product logistics, do not cost more than 3-4% of the trading price. An IQS auction run over the Internet like an Ebay auction may be operated very cheaply, for approximately 1-2% of the trading price. Like in the fresh fish auction, the traders who follow the market learn fast the price driven factors very well. It does neither take much time and transaction costs to operate a computer-based royalty auction.

In Arnason's outline of the economic implications of auctions, he is most concerned about the "expropriation of any pre-existing rights" (pp 34, 35). He seems not to be aware that the present fishing rights in Chile expire in 2011. He also claims that the auction weakens the quality of the property rights embedded in the ITQs. He also claims that the auction represents close to 100% taxation of future profits (pp 36, 37, 39). It is surprising that an economist does not take into account that in all market places there are at least two parties, sellers and buyers. If the Government issues 100%

taxation of all profits, there will be no production and markets. The royalty price set in the auction will reflect the bidders' opportunity value. In theory, the bidding price will not exceed the possible alternative rent to be gained from alternative investments of the same amount of money. It is also incorrect to define the royalty price as a tax. The basic fact is that the fish resources belong to the commons where harvesting is leased to private operators, like farmers who are renting lands from a landowner. The royalty can, of course, be taxed by the Treasury. But, the part of the royalty used to fund management, research, development and education for the fishing sector may not be defined as taxation but as a benefit for all in the industry and the fishing communities along the coast. The Government may also make the auction attractive, by deciding that all royalty gained by the auction should be invested in industry and fishing community development.

Arnason also expects that the royalty auction price will push the most efficient firms out of the industry, leaving only the least efficient (p35). It is a strange claim. It is more reasonable, according to economic theory, to believe that the opposite may happen. The least efficient firms will pull out of the industry, leaving the most efficient with the highest value adding margins in the industry, which gives a net contribution of value adding to the industry as a whole.

Arnason is also afraid that the most successful bidders will not be the ones most qualified for fishing, they could even be speculative! It is also a strange claim from an economist. Of course there are some degrees of speculation in all markets. But, if the buyers of IQS do not have the right to sell their rights to others (like in ITQ), the only speculations which can be performed are into risky innovations projects where the entrepreneurs believe in higher value adding. This kind of risk, and what some will call "speculative investment," should be encouraged in an innovative and prospering industry.

Conclusion

Arnason's paper does not give any new evidence that weakens the arguments for the introduction of royalty auction of IQSs. It is however reasonable to believe that in

the short term it is possible to have high cost efficiency in management of both a grandfathering ITQ allocation system and in a royalty IQS auction system. In the long run fisheries firms like all kind of organizations and individuals relying of rent collection are over time developing a monopoly power and conventions making them lazy in market oriented innovation activities. Without competition in the domestic input market the incumbents are in position of develop a profitable business in collecting the resource rent without improving production and market-oriented efficiency through innovation activities. When such firms are dominating the industry and are in a position to block the entry of new and prospering firms, the probability will increase for reducing the competitive edge and efficiency in the entire fishing industry over time. A well organized royalty auction has on the other side a potential for counteracting the development of monopoly power and keeping the industry open for new expanding firms and by this increasing the total value adding from harvesting the nations fish stocks.

On the other side: The royalty auction will reallocate resource rent from the grandfathering incumbent firms to the commons for potential investments in purposes benefitting the entire industry and fishing communities. The long term efficiency of the auction system will therefore also be dependent on the management and investment of these royalty funds in common research and innovative development to improve the industry's market position and social contribution to society, encouraging more innovation, not less, as Arnason claims in page 36.