THE SUBTLE ART OF MAJOR INSTITUTIONAL REFORM

INTRODUCING PROPERTY RIGHTS IN THE ICELAND FISHERIES

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Introduction

Policy advisers need a reliable operational theory of social systems for successfully employing large-scale institutional change as an instrument for reaching specific economic targets. With a reliable theory lacking, large-scale institutional reform usually involves implicit testing and adjustment of social models as unexpected outcomes and side effects inevitably emerge.¹ When recommending major institutional reform, many economic theorists have until recently paid scant attention to transaction costs, enforcement mechanisms or political economy, and mostly ignored the role of incomplete social models and uncertain feedback in the reform process. In this study I use recent efforts in Iceland to introduce a new form of property rights in the country’s key industry, ocean fisheries, to illustrate how these factors have been relevant for the reform process.²

At the beginning of the 21st century, mismanagement of open-sea fisheries is perhaps the most striking and important example of an all-out institutional failure shared by developed and developing countries alike, except for the problem of industrial pollution. In recent decades, a growing demand for fish products and technical advances on the supply side have put pressures on marine resources worldwide that require new forms of property rights and regulations to avoid serious negative externalities associated with

² This paper, which is still in draft form, is a first step in a wider study of property rights regimes in ocean fisheries.
open access behavior. Yet around the world attempts by governments to meet the challenge and reorganize the industry have, by and large, been singularly unsuccessful.³

At a time of crisis in 1983, the Icelandic legislature initiated a new system of fisheries management by passing a law that introduced individual transferable quotas, ITQs, in the country’s demersal fisheries. A grandfather clause transferred quasi-exclusive property rights to owners of fishing vessels that had been active during the immediate three-year period.⁴ A new legislation in 1990 extended the arrangement. Now some 95% of the volume of fish harvested in Icelandic waters is regulated by ITQs, the general principle for managing fisheries in the 200-mile Icelandic fisheries zone.⁵ The 1983 law allowed quota holders to rent out their quotas on an annual basis, but the 1990 law extended the rights by permitting permanent transfers of quotas (without requiring the owners also to sell their the vessels along with the fishing rights). Yet until 1998 the right to buy or rent individual quotas was severely limited. Legitimate transactions were restricted to owners of licensed vessels that fell under the legislation’s grandfather clauses. Until 1998, an outsider could enter the industry only through buying one of the original (or replacement) vessels and its quotas. These restrictions have now been lifted in response to a court order.⁶

³ Associated Press reports 14 September 2002 that the fisheries authorities on the US West Coast will during the next fishing year forbid harvesting of demersal species within the entire 200 miles zone from the Canadian to the Mexican boarders. The ban will be followed by yet another regulatory scheme. The fisheries policies of the European Union are generally seen as failure, as reflected in precipitous decline of its fish stocks.
⁵ Parliament No. 38/1990
⁶ In 1998, following a ruling by the Supreme Court (SC No. 145/1998), entry conditions in the fisheries were eased. The government will now license any seaworthy vessel and permit its owners to buy ITQs from other vessel owners.
In Iceland the legitimacy of the ITQ-system has been questioned in a vitriolic debate where opponents emphasize that the initial quota recipients illegitimately were given free fishing rights that in local terms have become extremely valuable. The potential rent from well-managed fishing grounds is substantial relative to the country’s GDP. The fisheries sector is responsible for some 40-50% of Iceland’s exports of goods and services (and 60-70% of goods exports). The lack of diversity, which is unusual for a high-income economy, is partly explained by small population size (little less than 300,000 inhabitants).  

Iceland is in an unusual position for a high-income OECD country not to have secure well-established property rights its major industry. The reason, of course, is that open-sea fisheries have characteristics that create exceptional difficulties for governance. Gylfason and Weitzman (2002, 25) list four such features: (1) The high costs of monitoring an industry operating offshore; (2) “the large number of outputs being jointly regulated or managed and the extreme degree of independence among their cost and production functions;” (3) the severe instability of these independent cost and production functions; (4) the “technological inability of fishermen to control exactly the ‘product mix’ of jointly produced species caught...”

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7 The lack of diversity has also been blamed on various other factors, including the Dutch Disease and special interests of the powerful fisheries lobby. In spite of its high share in exports, fishing and processing employs only about 11% of the country’s labor force and contributes about 15% to GDP. The share of fishing and processing in exports fluctuates from one year to another, but there is also downward trend. See the Web page of (the now defunct) National Economic Institute of Iceland: http://www.ths.is/index.htm
With severe problems mounting in commercial fisheries throughout the world, some experts have put their hopes in management systems based on individual transferable quotas. The two most substantial experiments with ITQs have taken place in New Zealand and in Iceland. In the section that follows, I introduce a few propositions concerning major institutional change. Subsequent sections analyze how these propositions fit Iceland’s ITQs experiment.

Some propositions concerning major institutional change

Social equilibrium

New fields such as the New Institutional Economics and Political Economy emphasize rational goal-oriented behavior by actors in all domains, not only in the economic domain. Economic institutions, therefore, belong to a social equilibrium, suggesting severe limits to institutional reforms (Bhagwati et al. 1978). Economic advisers need to pay attention to windows of opportunity if their recommendations are to succeed (Eggertsson forthcoming, chapter 8). The usual preconditions for major institutional reform include unexpected impulses or developments that destabilize the social equilibrium. Shocks create uncertain about prevailing social models and readiness to experiment with new social technologies.

Political economy

Unless external events and unexpected internal developments utterly transform the political structure of a country, its reform path is rooted in the political realities of the
past. Property rights usually are protected by economic and political power but also upheld by historical ideas concerning legitimacy and function. The intended wealth consequences of major changes in economic institutions usually reflect the political power of relevant groups. The famous Demsetz (1960) theory of the evolution of property rights is a special case. According to Demsetz, property rights tend to be efficient (joint wealth is maximized) and communities (somehow) regularly update their system of property rights to make them better (more efficiently) fit new external circumstances.

In practice, governments often do not following a strategy aimed at maximizing joint wealth. Instead they try to accommodate political pressures from various groups that include not only big labor and big government but also small, and sometimes inefficient, businesses. The relative strength of the various lobbies depends on their economic power and electoral significance.  

Transaction costs

Extensive open-access or common property features are rarely found in major industries of modern high-income economies, except for ocean fisheries where high transaction costs limit opportunities to establish exclusive rights under available social technologies.  

Exclusive property involves transaction costs in two domains: exclusion and governance.

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8 Libecap (1989) documents the influence of small, inefficient operators, for instance, on government regulations in the Texas oil fields. Higgs (1982) shows how the influence of small salmon fishers in the US Northwest brought on technical regress and also decimation of the stocks.

9 I use both the terms ‘open access’ and ‘common property’ to signify absence of exclusive rights, and distinguish ‘common property’ from ‘communal property.’ Under communal property, several independent economic actors share exclusive rights to a resource, which they are not allowed to permanently transfer to outsiders. See Eggertsson (2003).
Excluding outsiders gives rise to exclusion cost, whereas monitoring insiders is the source of (internal) governance cost. Internal governance is necessary for efficient operations when two or more independent economic units share the same resource (Scott 1955). For common pool resources, physical features of the resources influence the nature of the governance problem. Ostrom (1990) and others claim that successful control of complex governance problems in common pool resources depends on voluntary cooperation from insiders, which is forthcoming when they have appropriate incentives for cooperating. Primary reliance on third-party enforcement (e.g. central government enforcement) is unlikely to succeed in complex communal environments, according to Ostrom.

**Incomplete social models**

Policymakers and reformers know more about operational aspects of stable social structures than about their underlying social technologies. Typically social models are incomplete. For instance, we have more reliable models of how a well-functioning market operates than how to transfer such market arrangements to a transition economy. The success of new social technologies depends not only on the economic and political interests of key players (such as business and labor) but also indirectly on the players incomplete models and beliefs, which are elements in the social equilibrium.

**Unreliable feedback from social experiments**

The incompleteness of social models are of little consequence, except in the short-run, when large-scale social experiments rapidly send back reliable data that enable effective
learning by doing. In many cases, however, new social technologies remit ambiguous signals. The actors may fail to distinguish random shocks or unexpected values of neglected variables from fundamental system flaws. Uncertainty about new social technologies is likely to lower the quality of the social discourse and create incentives for self-deception and opportunities for strategic falsification of beliefs.

Social disequilibrium in Iceland’s fishing sector

The willingness of those yielding political and economic power in Iceland to experiment with a little-known new social technology for organizing the country’s key industry occurred at the time of deep economic crises that threatened the economic future of the country. Individual quotas were first introduced in the herring fisheries in 1975, and quota trading was allowed in 1979, in response to a startling collapse of herring stocks in the late 1960s, which reduced per capita GDP by 4.5% in 1967 and by 6.2% in 1968. When the herring fishing was resumed in 1976, after being discontinued in 1972, the boats were issued individual quotas.

The all-important demersal fisheries were also in trouble. In 1975 the country’s Institute of Marine Biology issued an alarming report on the immanent collapse of the crucial cod stock and possibly other demersal species in Icelandic waters. The authorities responded in two fronts: by claiming national exclusive rights over the Iceland fisheries, and by
introducing a complex regulatory regime.\textsuperscript{10} The country acquired a exclusive 200-mile fisheries zone in 1976, following a difficult struggle (‘cod war’) with Great Britain, but was much less successful in managing insider users through various direct restrictions— involving types of fishing gear, days at sea, number of vessels, permitted fishing areas, and total allowable catch, TAC.

Why did the regime of so-called direct restrictions fail to halt the decline in fish stocks? Critics of direct restrictions usually explain the failure in terms of technical problems with enforcement and ample opportunities for evasion by the fishers. Direct restrictions have also created incentives for perverse competition that raises rather than lowers costs. Yet, the story is clearly more complicated. For apparent political reasons, the government did not fully enforce its own measures. Expansion of the country’s fishing fleet continued unabated in spite of a moratorium on new vessels (except for replacements). When politicians favored one district with a trawler, the representatives of other districts follow suit. As for total allowable catch, the authorities authorized a larger catch than government scientists recommended, and then did not even enforce their own inflated targets.\textsuperscript{11} An evaluation of fisheries management systems, therefore, cannot ignore the politics of enforcing alternative regimes, which can be of equal or greater importance than the microeconomic property of the regimes. For instance, do governments that lack the political will to limit excessive utilization of fish stocks, but don’t want to give such impression, favor particular types of regulations? Alternatively, do certain governance

\textsuperscript{10} Prior to 1975 the catch by foreign trawlers, mostly British and German, in Icelandic waters was about equal to that of Icelandic vessels.

\textsuperscript{11} Currently the EU relies mostly on direct restrictions in its fisheries policy but appears to lacks the political will to set and enforce effective measures.
systems minimize the political pressures on leaders who seek efficient utilization of fishing grounds? These are issues that deserve a closer look.

The failure of direct restrictions in the 1970s and early 1980s was compounded by a large decline in export prices at the beginning of the 1980s, leading again to falling per capita GDP and severe losses in the industry. For their part, the country’s marine biologists published gloomy reports on the state of fish stocks, Memories of the herring disaster were still fresh in the early 1980s, and a collapse of the cod fisheries was a frightening prospect. The government, the industry, and the public were ready to experiment with a new system.

An ITQ system for codfish and other demersal species was activated in 1984 but immediately modified in 1985 to allow ships to choose between two arrangements: ITQs and limits on fishing days per year. In 1990 the government made the decisive move to make individual, exclusive and transferable quotas the general system of fisheries management for Iceland. Almost as an afterthought, the 1984 law contains a clause, which the 1990 legislation picks up, stating that the fishing grounds around Iceland are the property of the people—a national commune. The 1990 law states further that individual fishing quotas are not inviolable exclusive property but temporary rights.

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12 It was problems with implementing grandfather clauses that slowed down the move toward ITQs. The 1985 law permitted vessel owners to choose between effort control and ITQs, and about half of them preferred direct restrictions. Those who opted for ITQs were given shares in TAC in based on their fishing history in 1981-83. The 1985 amendment gave vessels that had been relatively inactive during the 1981-83 period an opportunity to collect future ITQ points while operating under a fishing-day system. The 1990 law eliminated this dichotomy.
granted by the state that can be withdrawn without compensation. A schizoid system of property rights was born.

**Iceland’s ITQs and property rights**

The main distinction between ITQs and direct restrictions, it is often argued, is that ITQs eliminate the open access element in the fisheries by introducing exclusive property rights. The Icelandic system of ITQs, however, is a hybrid: a mixture of state property and private property with a dash of people’s property (or a national commune) thrown in for good measure, thus creating considerable uncertainty about who owns what. As would be expected, those possessing users rights have exceedingly weak incentives to maintain and protect the resource, except to avoid third-party punishment. Finally, public opposition to private ownership in Iceland’s fisheries has kindled an interest in people’s property and national communes for other natural resources. In 2000 a prestigious government committee suggested that the Icelanders put ownership of the wind (wind energy) in the ‘custody of the people’ (the next step before people’s property) to ensure its availability if the country decides to employ windmills for generating electricity.\(^{13}\)

\(^{13}\) In 1998 the Icelandic Parliament appointed a committee of high-level experts to study the utilization of natural resources that already are owned by the people or may soon be owned by the people. In particular the committee was asked to recommend ways of charging for user rights to these resources. In 2000 the committee delivered an informative and exhaustive report, including commissioned studies by various experts, especial in economics and law. The idea (social model) of national communes was unmistakably popular in Iceland at the end of the 20\(^{th}\) century, and not strictly a left-right political issue. The main feature of a traditional communal property is that rights to the resource cannot be permanently transferred to new owners. In its report, the committee recommended that natural resources that currently are not strictly under exclusive ownership in the conventional sense (including much of the highlands in central Iceland or the ocean) be declared people’s property. The report recommends further that the government put non-owned and currently abundant natural resources in the custody of the people to prevent surprise appropriation by private actors. It is recommended that the country’s constitution be changed to explicitly recognize these two new forms of property. Perhaps the report’s only humorous feature is its recommendation that wind
The division of rights and duties in the Icelandic system of ITQs is as follows. The fisheries’ minister determines annually total allowable catch, TAC, after receiving recommendations from government scientists. The right to share in TAC is restricted to vessels that possess individual quotas, which are expressed as a percentage of TAC for each species. Those who hold ITQs are allowed to rent their quotas on an annual basis or alternatively (from 1990) sell them outright to the owners of other authorized vessels. Supporters of the new system make two key efficiency arguments. According Coase (1960), allowing free trade in ITQs will transfer the rights to their most efficient uses, unless the trade is hampered by high transaction costs. Second, the introduction of ITQs will terminate wasteful competition characteristic of both open access and direct restrictions.

Prior to the ITQ system, the structure and location of Iceland’s fishing industry bore the mark of regional politics and political favoritism rather cost minimization. In the intervening years, vigorous trade in quota rights has pushed the industry in the direction of Coasean efficiency but also brought dislocation to small fishing communities in various parts of the country. As I discuss the paper’s last section, other important factors than ITQs have contributed to these developments. The initially low market value of quotas has risen to create huge windfall gains, sometimes millions of dollars, for the

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energy, notoriously abundant and bothersome in Iceland, be put in the custody of the people. The reason being that the wind may eventually be in short supply, particularly as a source of power for windmills. The report identifies three types of public property: state property (such as banks) that can be sold; national communal property, and resources in public custody that cannot be sold (Auðlindaneðnd. Álitsgerð 2000). The government so far has not sought to change the constitution.
original recipients of free quotas. These windfalls have angered many individuals, including inhabitants of fishing towns who have suffered serious economic losses because the local fishing rights have been sold to other communities. Others are angry because they did not share in the bonanza either directly or through lower taxes and better government services.

The introduction of ITQs in ocean fisheries can be seen as a new social technology effective for overcoming the high costs of introducing exclusive private property rights to common pool resources. Yet ITQs, at least in their present form in Iceland, are an incomplete substitute for exclusive property rights. One of the key efficiency characteristics of exclusive ownership is that proprietors have a strong incentive to maintain and augment their assets. In Iceland the national government itself has assumed the owner’s traditional maintenance and monitoring role. The authorities, for instance, try to ensure that vessels do not exceed their quotas (by weighing the catch at the time of landing) or go fishing without quotas, as well as setting and enforcing rules that govern fishing gear, protection of nurseries, minimum fish size, temporary closures of fishing banks, and dumping fish at sea.

The question, whether any possible adjustments in the ITQ-system might make the system self-enforcing by involving the industry in protecting the resource, holds little

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14 The authorities have made an effort to protect vulnerable fishing communities. For a while, the consent of local labor unions and civic authorities was required before quotas could be sold to a buyer outside the community, but this clause in the 1990 law was repealed in the late 1990s. The law also permits the authorities to allocate (on a limited scale) new quotas to local communities as a form of economic aid.
interest for the protagonists in the acrimonious debate over the ITQ-system Iceland.\textsuperscript{15}

Ocean fisheries are common pool resources, which Ostrom (1990) and others have exhaustively studied. For agricultural land resources, empirical studies indicate that self-enforcing internal governance is most likely to emerge when the rules of the game emerge through trial and error within the user group itself. Operational rules imposed by a third party, especially by a distant central government, are likely to fail (Ostrom 1990). The most vocal and powerful critics of the Icelandic ITC system in its current form focus nearly entirely on redistribution and advocate disabusing the industry of any illusions of ownership. The leading critics demand that quota rights be first recalled and then rented out to the industry by the rightful owner, the nation.\textsuperscript{16} A nation can only be a symbolic owner of an asset, which means that the proposed reforms require increased state involvement in managing the industry.

The current status of the system is something of a draw. In an attempt to appease the critics, the government plans new levies on the fisheries that eventually will cover the government’s transaction costs, including both the costs of exclusion and internal governance. Special taxes on the industry have increased in recent years. In 2002 they covered about one-half of the government’s costs of managing the fisheries.\textsuperscript{17}

\textsuperscript{15} Admittedly, the government has tried to improve its regulations to close various loopholes as they appear.

\textsuperscript{16} The distributional justice of such reversals becomes more ambiguous as time passes. Many original owners have sold their quotas and collected their windfall gains. The biggest firms in the industry are now owned by a large number of shareholders. Many of those who would be forced to give up their quotas, according to these reform plans, would have recently purchased them at high prices. Most plans for recalling the quotas therefore suggest gradual erosion of quota rights, i.e. stepwise recall over many years.

\textsuperscript{17} In response to bitter criticism and several court cases, in 1999 the government (Parliament No.1/1999) appointed a committee to revise the 1990 ITQ legislation (No. 38/1990) for the purpose of creating a consensus over the fisheries management system but without sacrificing its efficiency properties. The
Why the critics were surprised

Since Iceland gained its independence in 1944, few domestic issues have caused such intense and widespread anger in many quarters as the ‘free quotas.’ Yet in 1984 the introduction of ITQs and free quotas was a peaceful occasion that did not create a storm of protest. The critics were not on guard. The explanation lies with asymmetric distribution of knowledge. Most players, with their incomplete social models, were unaware of the long-term dynamics of the system. The public was aware of the heavy losses in the fishing industry and declining fish stocks. Few people saw ‘free quotas’ as a potential gift of millions of dollars from the government to select individuals; user charges or fishing fees were not on people’s minds at this point. Additionally, it would have been an absurd political move to present a rescue plan for the failing fisheries that required the industry to pay for access to the resource it had used freely for generations.

However, the reformers, industry leaders, and other knowledgeable actors viewed the crisis in the fisheries through the lenses of informal or formal versions of the classic sustainable fisheries model (Gordon 1954), shown in figure 1. The model illustrates both why the industry was in a fix in 1984 and how the reformers hoped to rescue it. Yet, the actual outcome has not been exactly what the reformers planned, as we shall see.

committee, which reported in 2001, was bitterly divided but the majority suggested as a compromise that the industry carry at least the transaction costs of operating the system.
The diagram in figure 1 traces the relationship between fishing effort, e, and three variables: revenue, R, total cost, C, and sustainable fish stocks (biomass), m. As the crisis mounted in the early 1980s, the fishers, driven by the logic of open access, had taken fishing effort to point x in the diagram where total cost and total revenue are equal and all rent from the fisheries is dissipated. In 1984 the correlates of point x were common knowledge: namely, fish stocks at critically low levels, excessive effort, zero or negative industry profits. The dynamics of the model, however, were not common knowledge. Not many people understood that the aggregate value of individual transferable quotas in a successful ITQ program would equal the present value of future maximum rent from the Iceland fisheries.

To maximize the rent, figure 1 shows that fishing effort must be reduced to point z where the gap between revenue and cost is at maximum and equal to y. Equivalently, efficient management requires that total catch be constrained to a level that corresponds to z. Conventionally, the cost function in the sustainable fisheries model represents minimum cost, but we expect C to shift down with the introduction of ITQs when the Coasian trade in fishing rights rationalizes the structure of the industry. A downward shift in C, therefore, can improve profits in the fisheries, even when effort continues to be at x. In other words, a government that is unable or unwilling to restrict effort to z may still reap some success from ITQs through spontaneous industrial reorganization. As the recovery of fish stocks since 1984 has in most cases be negligent or non-existent but the

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18 In the diagram the rent is measured by the vertical distance between R and C. Actually, the industry apparently did overshoot point x. Official statistics show that in the mid-1980s the industry was making large losses.
profitability of the industry has improved, it is reasonable to conclude that C, the cost line, has drifted down.

**Political economy and overshooting total allowable catch**

According to the conventional wisdom, big operators in the fisheries and their national associations are the most influential lobby in Iceland, but fishers on small boats, through their numbers and strategic locations in electoral districts, also have had their say. In fact, governance in the Iceland fisheries is made of two systems: one for medium size and large vessels, the other for small boats. The regime governing small boats is changeable and complex, at one point involving five different sub-regimes. Usually small boats have been allowed to choose between quotas and direct restrictions (fishing days), and rules governing entry have been lax. Both the number of small boats and their share in the total catch has grown rapidly in a remarkably clear demonstration of economic incentives at work. In the 1990s the government was relatively successful in enforcing total allowable catch of medium and large vessels, but the failure to prevent overshooting of TAC targets for the industry as a whole lay with an unwillingness to control the effort of small vessels. The true victims of economic rationalization in the fisheries are small and often remote communities that have found substitutes in small boats and simple gear such as lines and hooks. It is not surprising that the government finds restricting the fishing effort of these vessels a sensitive issue.

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19 The share of small boats in the total catch in Iceland, measured in value terms, increase from 1.4% in 1977 to 4.7% in 1997 (National Economic Institute, p. 177). The number of small boats doubled 1984-90, and in recent years the catch by small boats has been 15-20% of the total in the valuable cod fisheries (Agnarsson 2001).
ITQs and dumping at sea

The transaction costs of operating a common pool resource involve exclusion and internal governance. Exclusion is not a serious problem in the new fisheries management system. Incursions by foreign vessels are rare and illegal fishing by unlicensed domestic vessels is not a big issue. The main management difficulties concern internal governance—preventing vessels from exceeding the permitted quota, dumping fish at sea, using illegal gear or fishing in restricted areas. Bitter disputes over the legitimacy of the system probably have made enforcement in these various areas more difficult.

The monitoring of ‘insiders’ by the government is a complex operation. When vessels return to harbor to unload, the catch is weighted and inspected by a network of government agents but efforts to monitor operations at sea are much more sketchy.20 The fishers are subject to a whole set of restrictions intended to protect breeding grounds and small fish. They are required to stop fishing when a given portion of individuals in the catch falls below a certain size limit, and in principle the vessels are only allowed to catch species for which they have a quota (each species has its quota).

The popular discourse on violations in the ITQ system has emphasized dumping at sea as a serious problem. Dumping at sea reflects not only attempts to continue fishing in restricted areas such as breeding grounds, it can also be a response to expensive quotas,

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20 The government occasionally puts inspectors on board fishing vessels to monitor their compliance with regulations, which is not an effective approach when limited to a small sample of ships.
which create strong incentives to maximize the value of the catch. Hair-raising stories about dumping at sea regularly erupt in the news media, but hard facts are scarce. Various studies and even questionnaire surveys suggest that illegal dumping is an issue but the estimates are not shockingly high. Figures less than 10% of total catch are often mentioned (Agnarsson 2000, 172-174). Incentives for dumping can be reduced by making the quota system more flexible, and some such adjustments have been made or are planned in the ITQ system. For instance, fishing vessels do not have full control of their output mix—the species that they catch. If a vessel that possesses quota for species X is allowed to land a small quantity of species Y, for which it has no quota, the incentive to dump Y at sea is diminished.

However, the relevant question to ask about dumping at sea is whether such behavior is more extensive under ITQs than under other arrangement, especially the previous fishing-days system. Vessels constrained by restrictions on fishing days obviously dump their catch when doing so is more profitable than landing the fish. The calculation boils down to comparing, on the one hand, the price ashore minus the cost of landing, and, on the other hand, the cost of discarding the fish. With ITQs the price (the opportunity costs) of the quota becomes the reference point rather than the market price of fish (in a particular quality category), which creates special incentives to only land high quality (value) fish. However, high quota prices can also have the opposite effect. Valuable quotas can create incentives for vessels to avoid areas of low quality fish and adjust their gear and search for the most valuable fish rather than race to catch whatever is available before the
permitted fishing days are over (Agnarsson 2000, 173). The net effects of the two systems on dumping are uncertain.

Incomplete models and governance in ocean fishing

Inefficient governance in ocean fisheries is partly due to perverse outcomes in a political economy game with powerful special interests but imperfect knowledge also plays a role. Attempts to introduce effective social technologies in ocean fisheries are unlikely to succeed unless the reformers possess reliable and appropriate models in two areas: industrial organization and marine biology. Available models in both areas are seriously incomplete.

Specialists involved in designing fisheries policy naturally turn for guidance to the economics of renewable resources, and in particular to fisheries economics. In its initial phase and until some 20 years ago, however, fisheries economics was strictly a neoclassical affair, elegant but with a dangerous potential for misleading policymakers. Its modeling world was one of full information with costs of monitoring and enforcement implicitly assumed away. Initially, fisheries economics generated static models followed by comparable but more complex dynamic models with two stock variables, fish and capital. The major purpose of this endeavor was to derive optimal solutions given various assumptions about fish stocks and capital assets. (Árnason 2001b). The theory was silent about property rights and management systems and offered no insights into effective implementation. Of course, a similar approach based on full information (and neglect of
political economy) has also characterized applied microeconomics, for instance in the work on optimal pollution taxes. A generous interpretation of such theoretical approaches is to interpret them as basic research, but they also have affected the mindset of generations of reformers that recommend direct regulations without fully allowing for information scarcity, incentives, and enforcement.

Incomplete models of marine biology also have undermined fisheries management. Until recently, most theories of fisheries management have assumed a monotonic and stable relationship between fishing effort and fish stocks, as shown in figure 1. Accumulating evidence indicates that other important variables intervene and confound the relationship between effort and stocks. Marine species feed on each other and various environmental factors have strong impact. The weak correlation between fish stocks and effort has opened a Pandora’s box of homespun theories about fisheries management, especially when the authorities attempt to reduce effort. One school, relatively popular among fishers and others directly involved in the industry, claims there is an inverse relationship between effort and sustainable stocks. According to this view, the proper way to restore fish stocks is to increase effort; otherwise crowding will deprive the fish of nutrition. Others argue that the protection of young fish is counterproductive. If the fishers only capture individuals above a certain size, they will initiate genetic drift that will reduce the average size of the species. Incomplete and rival biological models influence not only the quality of management schemes but also the degree of voluntary compliance.
Compliance with a new system of property rights depends in part on its legitimacy in the eyes of the players involved: on their (normative) models of legitimacy. The critics of the “free quota system” claim that the decision to grandfather fishing rights constitutes grand larceny: the nation was robbed of its most valuable communal asset. These beliefs concerning communal ownership of the fisheries and other natural resources often are based on not entirely accurate interpretations of the country’s history and its ancient law codes. Actually, the fisheries have a long history as an open access resource, which until the late 19th century was exploited primarily by Icelandic farmers in small open boats and fishers from several major European countries in decked vessels (Eggertsson 1996). 21

With growing scarcity in the 20th century, foreign vessels were excluded from the grounds and the government introduced increasingly complex regulations for the industry. In the years immediately prior to the ITQ system, the law did not allow new vessels to enter the fisheries (except as replacements). Excluding new entry, and giving those already involved gratis use of the fishing grounds is a free transfer of rights but less transparent than ITQs. In Iceland the idea of people’s property is positively correlated with rising values of quotas on the market. 22

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21 To make their case for communal fisheries, many commentators have compared the fishing grounds to Iceland’s traditional communal mountain pastures, which the farmers in each district shared. The pastures, however, were not national property. The rights were associated with the farms in each district in proportion to their value, and a farmer was allowed to rent his or her pasture rights to outsiders. Finally, the local owners managed the pastures collectively in a classic Ostrom (1990) manner (Eggertsson 1992).

22 Criticism of ITQs in Iceland is expressed in terms of various other beliefs, some of recent origins. Many individuals (including clergymen in their Sunday sermons) are horrified by the rampant commercialism of selling fish (via transfers of quotas) still alive and swimming in the ocean. Icelandic farmers and other owners, however, have for generations sold fishing licenses for trout and salmon in the country’s rivers and lakes. Also, since the ITQ-system seems to favor large-scale operations, many critics deplore that the new system is destroying a valuable lifestyle associated with small-scale fishing. The inability of the Icelanders to go beyond small-scale fishing in previous centuries brought the nation to the brink of extinction in the 18th century (Eggertsson 1996). In the first part of the 20th century, urbanization and the move out of agriculture met strong ideological resistance drawing on beliefs about moral decline associated even with
Finally, the ITQ-system itself is based on incomplete social models, which the law implicitly recognizes by calling for periodic reevaluation of what has been learned so far by trial and error. In the paper’s last section I discuss the feedback from this social experiment. Other countries besides Iceland have experimented with ITQs, but only New Zealand has done so on a national scale. Limited experiments have been conducted in hundreds of fisheries in several countries. According to some estimates 5% of the aggregate ocean harvest in the world is regulated with ITQs (Árnason 2001a). In the USA, however, Congress has put a moratorium on the use of transferable quotas in the country’s fisheries.

The feedback: mixed signals

If social experiments would rapidly send unambiguous signals that were interpreted by relevant players in a similar manner, most actors might agree on the positive aspects while disagreeing on normative evaluations. However, the feedback generated by the Icelandic ITQ-system during its short lifetime is open to multiple interpretations and these lessons have not created consensus about the objective consequences of the system. As is usual with social experiments, all other things have not been equal; social experiments have overlapped in time and little understood variables have intervened,

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23 ITQs in fisheries obviously were inspired by the use of transferable quotas in pollution control (and by the Coase theorem). To my best knowledge, models of ITQs as a management tool for fisheries were first developed at the University of British Columbia in Vancouver, the home of Professor Anthony Scott, a founder of fisheries economics (Scott 1955). The economists Ragnar Árnason in Iceland and Phil Major in New Zealand have been leading advocates of ITQs in their home countries. Both men received Ph. D. in economics at UBC.
making tests of the ITQ-system over-determined. Leaving aside hidden political agenda, this section considers whether the ITQ-system in Iceland has met its two main official goals: to restore and maintain fish stocks, and to ensure profitability in the fisheries. I will argue that the exact contribution of the new system to either of these goals is not clear.

If we return to figure 1, the ITQ-system has not restored fish stocks to levels that corresponds to point z or even moved stock size anywhere close z, with the exception of the volatile surface species capelin and herring that have recovered nicely. Stocks of the important demersal species, which include cod and haddock, have either continued on a path of decline or stabilized somewhat. Cod available for harvesting, traditionally the most valuable species in the demersal fisheries, was estimated at 1.5 million tons in 1980, only 0.5 million tons in 1992, and 0.75 million tons in 2000. Admittedly, Iceland’s experience with its cod fishery is relatively favorable compared with the collapse experienced in many other fisheries around the world.

The success of a management tool such as ITQs in restoring fish stocks to their desired levels depends on two factors. The ability of scientists to calculate what changes in total effort or catch are need to reach particular goals for sustainable stock levels; and the ability and willingness of the government to set and enforce the recommended catch or effort levels. When evaluating the Icelandic case, the glass is either half full or half empty depending on the drinker. In the 1990s, the government set TAC levels for various species that often were higher than those recommended by the country’s Institute for Marine Biology. In addition, the total catch has often exceeded the inflated government limits,
which is especially true for small vessels. In the period 1991-1999 there are three years when the important cod catch exceeds the recommendations of the biologists by 25-30%, and other three years when the overshooting is in the 6-9% range (Agnarsson 2000, 165). Finally, the marine biologists themselves have often been wide off target with their predictions for the state of fish stocks.

A comparison of ITQs with the previous system of limited fishing days and direct regulations shows that outcomes under ITQs are closer to the allowable total catch recommended by the experts. The explanation may lie with some features of ITQs that makes enforcement relatively easy either in a technical or political sense. Alternatively, the government may have reevaluated the potential damage from excessive fishing and given higher priority to enforcement. These issues need further scrutiny.

What have been the economic consequences so far of ITQs in the Iceland fisheries? We have already seen that recovery of fish stocks has been modest. The logic of the system suggests, irrespective of what happens to fish stocks, that productivity should increase through Coasian trade in quotas. A quota system also eliminates wasteful behavior that a system of limited fishing days generates, especially various costly races. In fact several recent studies conclude that productivity in the industry has increased since 1990

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24 We cannot exclude the possibility that the science advisers acted strategically and recommended lower ATCs than their true targets, knowing that the government was under pressure from the industry to exceed the targets of the scientists.
In terms of figure 1, the increase in productivity is represented by a due to a downward shift of the total cost curve, C.

Two other factors, however, confound estimates of the productivity consequences of the ITQ-system. First, technological change in the industry has substantially lowered costs. For instance, large trawlers that process and freeze fish products at sea have had a revolutionary impact on productivity. Second, the new fisheries management system overlaps in the 1990s with a major reorganization of the country’s financial system, which included liberalization of a state-owned banking system and dismantling of a centralized and politically managed investment funds. Iceland’s excessive inflation of the previous forty years was brought under control and chronic unrest in the labor market died down. The old financial system was closely tied to electoral politics. State banks and politicized credit organizations funded inefficient fishing operations, especially in small communities around the country. Even the country’s fiscal end exchange policy had been largely aimed at keeping the fisheries going. The financial reforms of the 1990s compelled the fishing industry to reorganize and individual transferable quotas lubricated the process.

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25 The most reliable secondary sources concerning the impact of ITQs on the fisheries are commissioned studies and final reports of two recent investigative committees appointed by the Icelandic government. The Committee on Natural Resources, Audlindanefnd (2000) and a committee appointed to study ways for reaching broad consensus on fisheries management by charging the industry for using the resource. Both reports are available only in Icelandic.

26 Although the entire population of Iceland is less than 300,000 individuals, the country is relatively large, about 100,000 square km (the entire area of Ireland is about 85,000 square km). For more than a century the population of Iceland has gradually shifted to the southwest region, notwithstanding a regional policy by the government aimed at maintaining small towns, villages and farms throughout the country. The move of the rural population toward better opportunities in and around Reykjavik for education, occupation, healthcare, and entertainment is officially seen as one of the country’s most serious problem.
As one would expect, the willingness to reorganize both the fisheries management system and the financial system was preceded by severe destabilizing shocks. I have mentioned already that in 1982-83 the fishing industry went through a deep financial crisis. Five year later, the national economy entered a phase of economic stagnation and negative growth in GNP for a period of six years, 1988-1993. The coincidence of a full-scale ITQ-system with major economic reforms makes virtually impossible to estimate the net effects of ITQs on higher productivity in the fisheries industry.

Finally, I mention the puzzling steep increase in the rental and sales prices of fishing quotas, which have persisted in spite of speculations that a future government may recall the quotas, and in spite of very little success in pulling effort toward z in figure 1. In fact, recent government reports find virtually no evidence of resource rent accumulating in the industry. For instance, recent studies of the country’s National Economic Institute found no signs of excess profits in the fishing industry, relatively to other Icelandic industries (Agnarsson 2000, 178). Yet both rental prices and purchase prices of individual quotas have in recent years reached very high values.

Recognizing the puzzle, the National Economic Institute (1999, pp. 160-161) offers the explanation that high annual rental prices for fish quotas reflect short-term marginal profit opportunities rather than average returns in the industry. Nearly all observers agree that using rental prices to estimate total quota values would grossly overestimate the total fisheries rent. The rental price for quotas is often so high that buyers can break even only by landing highest quality fish, which may encourage dumping at sea.
Not only the rental prices but also the purchase prices of fishing quotas are surprisingly high. Matthiasson (2000, 24) uses the market value of quotas (the purchase price) to calculate the total value of the quotas held by individual fishing firms that are listed on the Icelandic Stock Exchange. He then produces a table (p. 27) that compares the stock market value of listed fishing firms with the value of their physical assets and fishing rights, net of debt. The table shows that the net value of physical assets and fishing rights are 2.5 times higher than the stock market value of the firms. Matthiasson (2000, 24) concludes, “it is quite obvious that buyers and sellers of stocks on the stock market indirectly value fishing rights at a much lower rate than do the buyers and sellers of fishing rights on the quota market.”

Again these issues require close inspection. The very high rental prices and purchase prices of fishing quotas have fueled the bitter debate about the distribution of rent from the national fisheries commune—at a time when there apparently is not much evidence of such rent. If that is true, then speculative bubbles or anomalies in the quota market have created an illusionary world for the Icelanders to debate.

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27 According to Matthiasson (2000, 24) both the Central Bank of Iceland and the National Economic Institute have recognized this discrepancy.
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Figure 1

$M$, biomass

$z$ and $x$

Effort, $e$

Revenue, $R$

Total cost, $C$

Biomass, $m$