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The Icelandic and Faroese Economies: A Comparison of the Fishing Sectors

The Prime Ministry of Denmark

1994

FOREWORD

This study is an input into the work of a committee appointed by the Danish Prime Minister to prepare a report on the development of the Faroese economy, especially that of the banks, from the beginning of 1980s to the present day. It has been made possible by good assistance from many people both in Iceland and the Faroe Islands in supplying statistical data. We want in this respect especially to thank Dr. Ásgeir Daníelsson of The National Economic Institute of Iceland, Andras Kristiansen of The Fisheries Laboratories of the Faroe Islands, Bjarni Olsen of The Statistical Bureau of the Faroe Islands and Marner Jacobson of The Savings Bank of The Faroe Islands. We are also grateful to Sigríður Benediktsdóttir, stud.econ., who has done a most valuable work on the data and Professor Tór Einarsson for reading the manuscript.

The Institute of Economic Studies

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1. Introduction

This study is a part of the work of a committee appointed by the Danish Prime Minister to prepare a report on the development of the Faroese economy, including that of the commercial banks, from the beginning of the 1980s to the present day. The committee soon realised that although many reports had been written on the economy of the Faroe Islands, there was a need to look more closely into its structure at the micro level. Further, because of the preponderance of the fishing sector in the Faroese economy, comparison with the Icelandic economy seems natural. This should also be of interest to Icelanders, both because of the similarity of the problems envisaged and the necessity to understand what went wrong in the Faroese economy. By looking into the productivity of labour and capital, remuneration of production factors, fisheries management and the utilisation of resources, we expect to find a clue to the differences in performances of the two economies.

In chapter 2 we use available statistical information to calculate labour and capital productivity's for the two respective countries. This is done both for the fisheries and fish processing by using SALTER-diagrams. By excluding industrial fishing it turns out that both catch per tonne and catch per fisherman are much higher in Iceland. Nevertheless, including subsidies in the Faroese Islands, efficiency of wages is approximately equal for the two respective fishing fleets. The general conclusion is that by using subsidies, driving a wedge between the landing price and market price of fish inefficiencies in the fisheries are being concealed.

Chapter 3 is on fisheries management in Iceland and the Faroe Islands. It is maintained that the management system used in Iceland has led to cost reductions and improved efficiency in the fisheries.

In chapter 4 the optimal fishable stock is estimated for cod, haddock and saithe. Also the recommended TACs and landings are shown. The difference between these can be used as an indication of the success of fisheries management.

Finally, in chapter 5 a "Faroese shock" is supplied to the Icelandic economy. A shock of this magnitude has severe consequences in the Icelandic economy, despite its lesser dependence on fish.

2. Productivity in Iceland and the Faroe Islands

In this chapter we look at some statistics on productivity in the fishing industry in Iceland and the Faroe Islands. We calculate labour and capital productivity in the two economies respectively and investigate how it has changed over the last five years. Productivity at the micro level is studied. It is argued, by employing SALTER-diagrams, that the implementation of the individual transferable quota system in the Icelandic fisheries in the mid 1980s has raised productivity. Also by using SALTER-diagrams we study productivity in the fisheries and the fish processing industry.

2.1 The fisheries

An obvious starting point is to compare fishing capacity of the two fishing fleets. Total catches in Iceland are normally about 1,5 mio. tons while being 0.25-0.3 mio. tons in the Faroe Islands. In a normal year more than 50% of the Icelandic catches is capelin, which is used for industrial use only, i.e. processed into fish meal and oil. In the Faroe Islands the catch for industrial use is about 40% of the total catch and it includes species like capelin, blue whiting and Norway pout. Industrial fishing requires a special kind of fleet. The industrial fishing fleet is something like 10% of the total number of ships in Iceland and 3% in the Faroe Islands.[1]

Table 2.1 displays the total number of ships, including the industrial fleet, and the capacity of the fishing fleets in the Faroe Islands and Iceland during the last five years.

Table 2.1: *Number and total tonnage (in* 1000) *of all ships* >20 *tons*

	Number of ships >20 *tons*					*Total tonnage of ships* >20 *tons*				
	1989	1990	1991	1992	1993	1989	1990	1991	1992	1993
Faroe Islands	256	233	225	214	203	67,8	61,0	61,3	58,7	54,2
Iceland	516	506	506	479		116	115	117	116	

Source: Fisheries Association of Iceland [*Útvegur* 1989,1992] and *Statistical Bureau of the Faroe Islands* [*Hagtíðindi* nr. 4, 1994].

[1] It should be noted, however, that in capacity terms, the industrial fishing fleet carries more weight. In the Faroe Islands the capacity of the industrial fishing fleet is around 10 percent of total capacity.

These figures are distorted, however. Boats under 20 tons are not included owing to lack of statistics from the Faroe Islands. In Iceland these boats make statistically a considerable importance.[2] This is a problem when calculating productivity figures.

Trawlers are of major importance both in the Faroe Islands and Iceland. After the collapse the of herring stock in the seventies both countries devoted their resources to build up a new type of fishing fleet for demersal fisheries. Tables 2.2 and 2.3 provide some information on the number and the capacity of ships exceeding 20 tons (trawlers excluded) and trawlers.

Table 2.2: *Number and total tonnage (in 1000) of ships >20 tons, trawlers excluded*

	Number of ships >20 tons					*Total tonnage of ships >20 tons*				
	1989	1990	1991	1992	1993	1989	1990	1991	1992	1993
Faroe Islands	140	130	125	115	110	22,4	22,4	19.8	17,2	16,0
Iceland	401	390	393	371		60,3	59,8	61,0	59,5	

Source: *Fisheries Association of Iceland* [*Útvegur* 1989,1992] and *Statistical Bureau of the Faroe Islands* [*Hagtíðindi* nr. 4, 1994].

Table 2.3: *Number and total tonnage (in 1000) of trawlers*

	Number of trawlers					*Total tonnage of trawlers*				
	1989	1990	1991	1992	1993	1989	1990	1991	1992	1993
Faroe Islands	116	103	100	99	93	45,4	40,8	41,5	41,5	38,2
Iceland	115	113	113	107		56,2	55,6	55,9	56,7	

Source: *Fisheries Association of Iceland* [*Útvegur* 1989,1992] and *Statistical Bureau of the Faroe Islands* [*Hagtíðindi* nr. 4, 1994].

From Table 2.3. one can see that, in terms of capacity, trawlers in Iceland are larger than trawlers in the Faroe Islands. The reason for this is that there are more freezing trawlers in Iceland than in the Faroe Islands, although Faroese fishermen started deep water fishing earlier.

In Table 2.4 we find figures for total catch, industrial fish excluded, and catch per ship tonnage which measures catch/capacity productivity, i.e. efficiency of the two fleets, respectively.

[2] When the individual vessel quota system was introduced in the Icelandic fisheries 1984 the politicians left a loophole in the system. A fisherman on a certain type of small boats are allowed to fish as much as he can as long as he uses hand- or longline. An overall catch quota is then laid on these boats and the fisherman who has the best boat and puts in the most effort will receive the highest catch and therefore the largest share of the overall catch quota. This calls for *capital stuffing*. The number of small boats fishing under this system have increased from ca. 1150 in 1984 to 2000 in 1991. Boats fishing under the system mainly catch cod which is the most valuable catch, excluding crabs. In 1984 the cod catch of small boats was ca. 6% of the total catch but ca. 14% in 1992. *Source: Committee for development of the fishery management system: A report to the Minister of fisheries.*

Table 2.4: *Total catch and catch per ship tonnage* (*in* 1000), *industrial fish excluded*

	Total catch					*Catch per ship tonnage*				
	1989	1990	1991	1992	1993	1989	1990	1991	1992	1993
Faroe Islands	192	180	190	172	142	2,83	2,95	3,10	2,93	2,62
Iceland	836	809	784	771		7,21	7,03	6,70	6,64	

Source: *Fisheries Association of Iceland* [*Útvegur* 1989,1992] and *Statistical Bureau of the Faroe Islands* [*Hagtíðindi* nr. 4, 1994].

We exclude industrial fish to get a more realistic picture of the efficiency of the two fleets. Unfortunately, we could not obtain statistics on the capacity of the industrial fishing fleet in the Faroe Islands, so catch per ship tonnage there includes the industrial fishing fleet tonnage. This leads to a lower productivity figures in both fleets, but on the assumption that the industrial fleets are of relatively same size in both economies, there should be no major problem in comparing the productivity figures.

Table 2.5: *Fishermen productivity, industrial fish excluded*

	Number of fishermen					*Catch per fisherman* (*tons*)				
	1989	1990	1991	1992	1993	1989	1990	1991	1992	1993
Faroe Islands	5555	5678	4805	3756	3050	34	32	39	46	46
Iceland	6286	6551	6135	5685		133	123	128	137	

Source: *Fisheries Association of Iceland* [*Útvegur* 1989,1992], *Statistical Bureau of the Faroe Islands* [*Hagtíðindi* nr. 4, 1994] and *Statistical Bureau of Iceland* [*Landshagir* 1993].

In Table 2.5 we show catch per fisherman, industrial fish excluded. The number of Faroes fishermen is an estimate from tax authorities on the islands. The figures include all fishermen. According to these data, the number of fishermen has declined in both economies. Catch per fisherman has increased considerably in the Faroe Islands over the last five years, or by 35 percent. It is obvious that catch per fisherman productivity is growing in both fleets. In conclusion, both fleets are becoming more efficient with regard to labour used, especially the Faroese fleet.

2.2 Productivity and the fisheries management system

In previous sections we have calculated various aggregate productivity figures for the fisheries in the Faroe Islands and Iceland. In this section we intend to look at productivity in the two economies at the micro level, using SALTER-diagrams. The two productivity figures calculated are capital intensity (Q/L) and wage productivity (Q/w), which one can define as efficiency of wage units paid to labour. The SALTER-diagrams are drawn in such a manner that on the y-axis one reads the productivity for the individual firm and from the x-axis its relative size compared to that of all firms in the sample.

The data used for Iceland consists of relative size of companies compared with that of the whole sample, capital intensity and efficiency of wage units for the fifty largest companies operating in the fisheries and/or fish processing in the years 1985 and 1992.[3] Although turnover data for individual firms are confidential we have a good reason to believe that the sample covers over fifty percent of the total turnover in the two industries. The reason for selecting the years 1985 and 1992 as sample years is that in 1984 individual vessel transferable quota fisheries management system (ITQ) was introduced in the Icelandic fisheries. This allows us to compare productivity of the fifty largest companies in the two sectors before (almost) and after the introduction of the ITQs and see how it affects productivity of capital and wages.

The theory predicts that under a competitive fisheries management system (or no system at all) fishermen will overinvest in capital and use too much labour in their search for higher profits. The resource rent will disappear and overutilisation of the fish stocks will result. This outcome is often referred to as the *tragedy of the commons*.[4] If the theory predicts correctly, productivity and profits will rise, at least in the fisheries, by the introduction of an ITQ fisheries management system, *cetris paribus*. It is also very likely that the transitional dynamics from one steady state to another will take a number of years.[5] We would require a system of differential equations to describe the dynamics fully and to predict the time the transition would take, but that is well beyond the scope of this report.

Figures 2.1 and 2.2 depict average productivity[6] of capital and wages respectively in 1985 and 1992.

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[3] We kindly a knowledge Ásgeir Daníelsson at the National Economic Institute for providing us with this data.

[4] See further Hardin (1968).

[5] For a excellent examples of potential dynamics from one stedy state to another see Árnason (1980), Árnason (1990a) and Clark (1976).

[6] Which is proportional to marginal productivity if one assumes a Cobb-Douglas production technology in the two sectors.

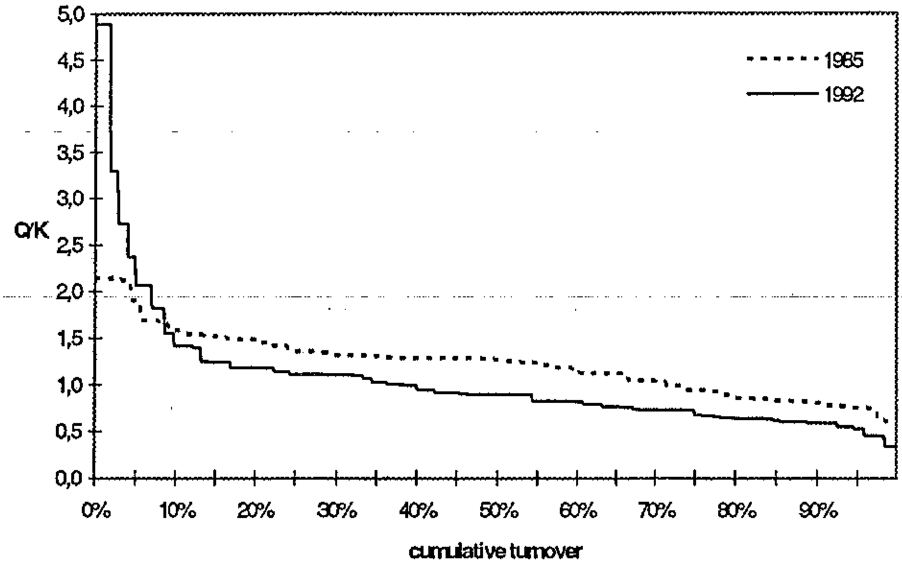

Figure 2.1: *Capital intensity for the fifty largest firms in the fishing sector in Iceland in 1985 and 1992*

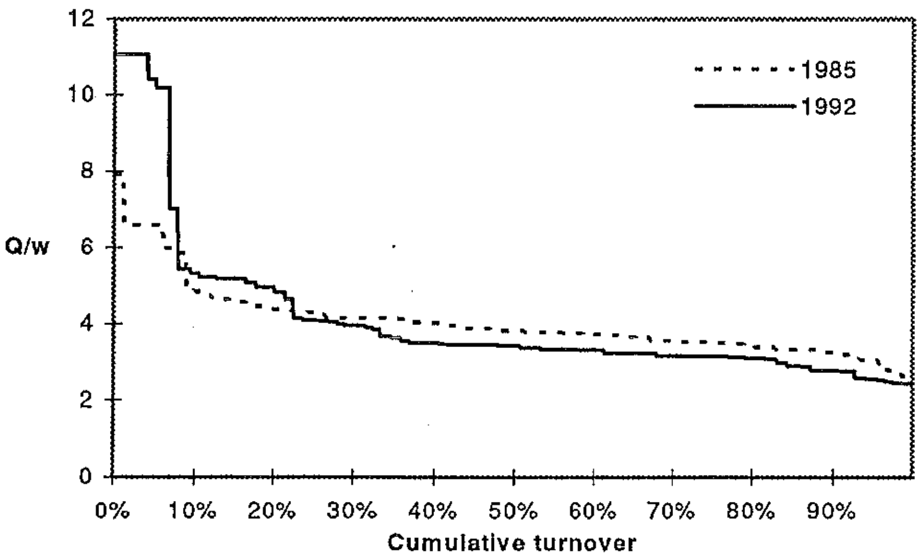

Figure 2.2: *Efficiency of wage units for the fifty largest firms in the fishing sector in Iceland in 1985 and 1992*

While looking at the two diagrams one has to bear in mind that the cod stock, which is the most valuable fish stock in Iceland, was in a very bad shape in 1992 due to overutilisation and harsh biological conditions. Therefore one can not truly reveal the changes in productivity before and after the introduction of the ITQs. On the other hand, as can be seen in Figure 2.1, that 10 percent of the fifty largest firms are enjoying a substantially higher capital productivity in 1992 than in 1985. This indicates that

firms are getting more productive and that overcapacity is being reduced. To our surprise there does not seem to be any sign of scale effects in the industry[7] and therefore, a constant returns to scale production technology would seem a potential approximation to the true technology.

By calculating weighted average of capital productivity for the whole sample one observes that in 1985 it was 1.22 while in 1992 it was 1.05. This reveals the fact that capital productivity has been declining in the whole sample, which should be considered normal bearing in mind the reduction of catches.

In Figure 2.2 we have drawn a SALTER diagram for the efficiency of wage units. Approximately 24 percent of the fifty largest companies enjoy more efficiency of wage units in 1992 than in 1985. This can be explained partly by the fact that real wages fall in Iceland during the late eighties and the early nineties. We truly believe that the introduction of the ITQs plays a great role in these increases in wage productivity. Weighted average productivity of wages in 1985 was 4.04 while in 1992 it was 4.10. This indicates that labour productivity for the whole sample has risen after the introduction of the ITQ's. It is obvious that increased efficiency of wage units will take place much sooner than that of capital because of the nature of fixed capital. This draws attention to what was mentioned earlier, that is, the transitional dynamics from a competitive fisheries system to an ITQ system.

The general conclusion is that the fifty largest firms seem to be more competitive after the introduction of the TACs in the mid 1980s. When the fish stocks have been built up again it is very likely that the resource rent will be substantial, and not until then will the benefits of the ITQs become fully apperent.

[7] That is, there seems to be a equal probability of large firms showing high productivity figures as small ons, if one exercises a random draw by the eye from the sample.

2.3 Productivity at the micro level: The fisheries

In this section we look at the productivity in the fisheries in Iceland and the Faroe Islands and as before, we employ SALTER-diagrams. The data from Iceland consist of efficiency of wage units and capital productivity.[8] The data used for the Faroe Islands consist of efficiency of wage units, net of subsidies, and the output net of subsidies/rents paid to capital, ratio.[9] The ratio is used as a proxy for capital intensity. For our calculations we use turnover, net of subsidies. It is worth mentioning that using gross turnover, productivity figures in the two fishing fleets are approximately equal.

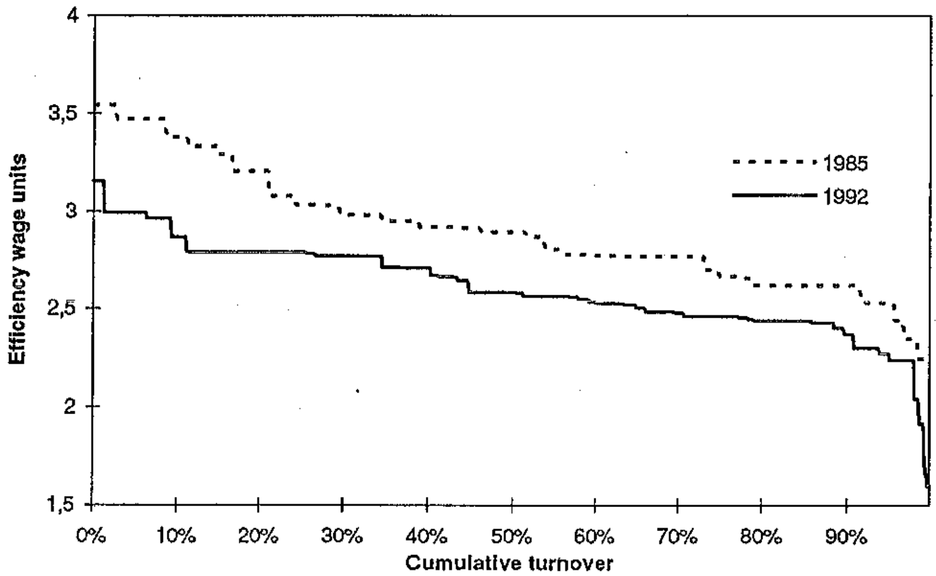

Figure 2.3: *Efficiency of wage units in the Icelandic fisheries*

Beginning with the Icelandic fishing fleet we can observe from Figure 2.3 that efficiency of wage units has fallen substantially between the years 1985 and 1992. This is somewat paradoxical, bearing in mind the results from the fishing industry in general, described earlier. This can partly be explained by the fact that decreasing income was followed by a fall in catches. In Iceland the wages in the fisheries are based on a

[8] The data were providied by National Economic Institute of Iceland. A firm is defined to be in the fisheries if it has more than 80% of its income from operating a fishing vessel. The sample for 1985 includes 30 firms and the 1992 the sample 45 firms.

[9] The data were provided by Bjarni Olsen at the Statistical Bureau of the Faroe Islands

revenue sharing system. The shares are linked to oil prices and therefore higher oil prices in the mid-eighties could be the reason for changes in efficiency of wage units, i.e. share to labour could be higher in 1992 due to lower oil prices. The third reason for lower productivity in the nineties is that world prices for fish has fallen, resulting in lower income in the fisheries.

In Figure 2.4 one observes that 90 percent of firms in the Faroese fisheries have lower efficiency of wage units in 1992 than in 1985.

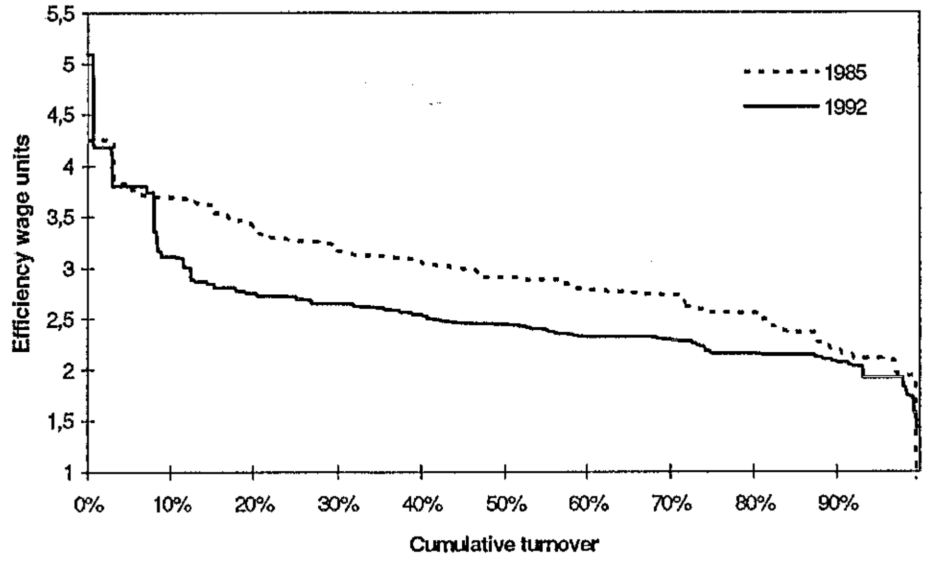

Figure 2.4: *Efficiency of wage units net of subsidies in the Faroese fisheries*

Recall that the Faroese productivity figures are net of subsidies, but including those, the figures for the two fleets are approximately equal. The argument used for explaining lower productivity in the latter sample year in Iceland also applies to the Faroe Islands.

In light of the productivity figures displayed in chapter 2.1 and 2.2 it comes as a surprise that efficiency of wages is nearly the same in the two fleets. This leads us to the conclusion that the two fleets are almost equally efficient in regard to wages paid to labour.

In Figure 2.5 we can see that productivity of capital in the Icelandic fleet has fallen. This indicates either a fall in income or an overinvestment in the fishing fleet. From previous exercises we know that income has fallen because of lower catches and

fish prices. Therefore we cannot conclude, without further evidence, that overinvestment has played a role in the productivity decrease without more evidence.

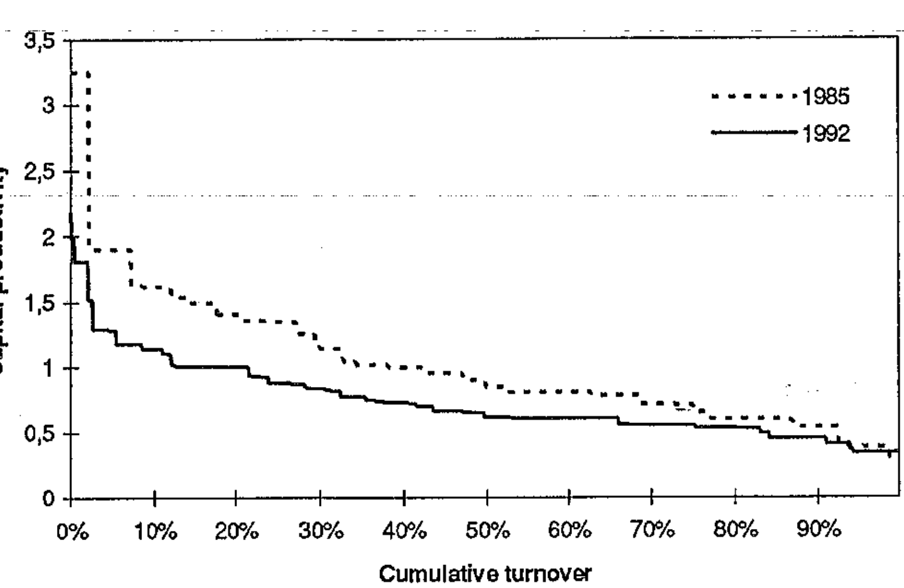

Figure 2.5: *Capital productivity in the Icelandic fisheries*

In Figure 2.6 we show the turnover net of subsidies/capital share ratio in the Faroese fisheries. We observe that 40 percent of firms in the fisheries pay relatively higher capital share in 1992 than in 1985 while 60 percent pay approximately the same share in both sample years. This does not come as a surprise since it is widely believed that the Faroese fisheries were more indebted in the latter sample year.

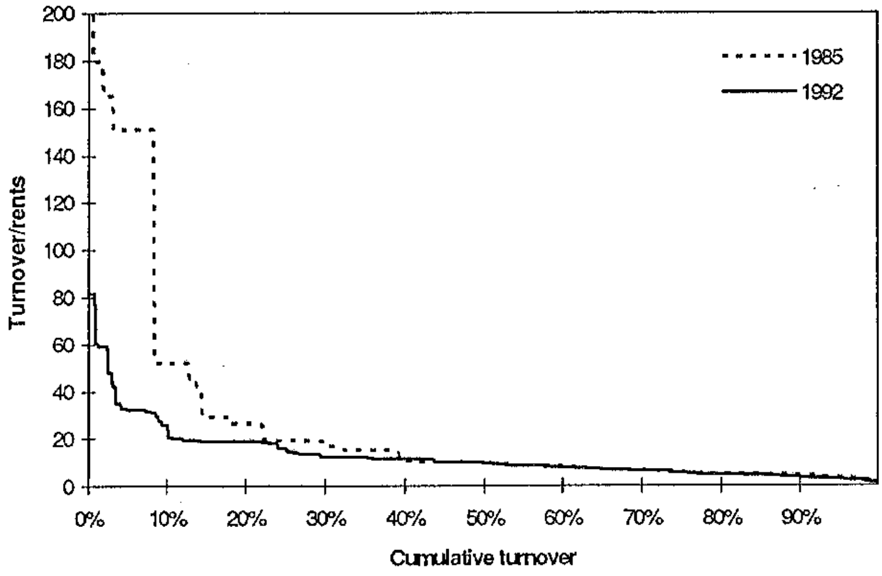

Figure 2.6: *Turnover net of subsidies, capital share ratio in the Faroes fisheries*

The general conclusion from the SALTER-diagrams is not clear-cut. It seems that the efficiency of firms is essentially the same in the two fleets with regard to the efficiency of wage units. Share of income paid to labour is very comparable in the two fishing fleets. In 1985 it was 37.7% in the Faroe Islands while it was 35.2% in Iceland. In 1992 it was 39.1% in Iceland and 40% in the Faroese fleet. Share of income accruing to capital, i.e. rents, has risen considerably in the Faroese fisheries. In 1985 it was 14.9% and rose to 31.2% in 1992. This increase in rents gives us a reason to believe that debt has risen drastically and income has fallen. Unfortunately, we cannot calculate the share of income paid to capital in Iceland due to lack of data.

The wage shares figures do not differ greatly. This is somewhat puzzling because productivity of fishermen is substentially higher in Iceland, (see Table 2.5). Consequently we must look at the entire fisheries sector, i.e. both fisheries and fish processing, in order to find a plausible explanation for this result.

2.4 Productivity at the micro level: The fish processing sector

One possible explanation for the similar productivity figures in the two fleets is that income in the Faroese fisheries is higher than in the Icelandic one. Fish processing plants purchase raw material (fish) from the fisheries and therefore the price paid by the fish processing sector plays a great role in determining how efficient/productive the two sectors are in terms of turnover per wage unit. If prices are high the fisheries look efficient and the fish processing firms inefficient and vice versa, at given market prices.

In Figure 2.7 we show the efficiency of wage units in the Icelandic fish processing sector.[10] Output per wage unit has risen for all firms, which induces us to conclude that the fish processing firms are becoming more efficient. We also observe that there is a greater difference between the most productive and the least productive firm. In Figure 2.8 we show the capital intensity in the fish processing sector in Iceland. We observe that capital productivity is higher, nearly across the entire sample and more videly distributed. The general conclusion for Iceland is that although income has fallen the firms are becoming more productive. This can partly be

[10] The sample includes 49 firms in 1985 and 44 in 1992.

explained by a decrease in real wages and partly by the restructuring of fish processing firms followed by the reduction of cod catches.

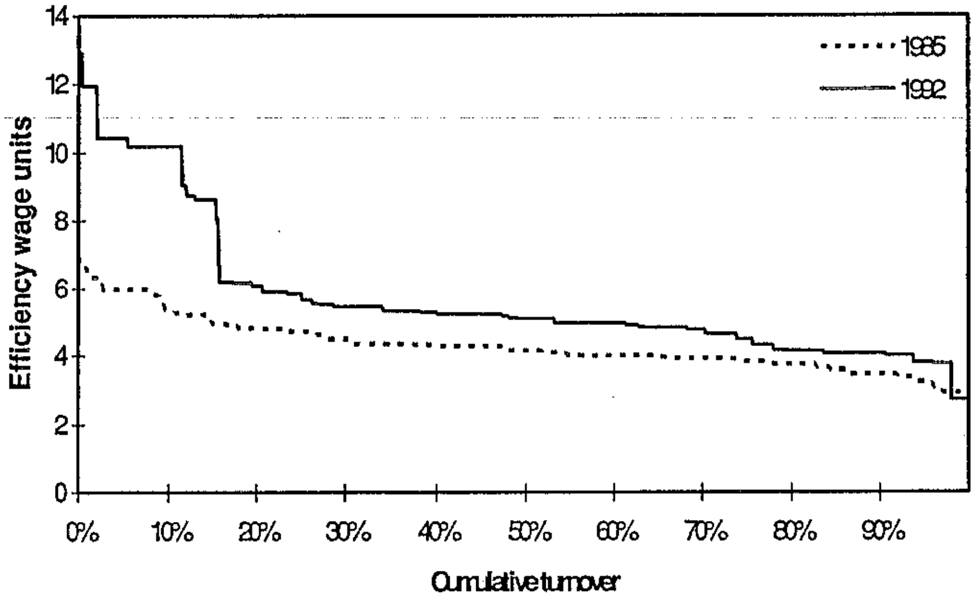

Figure 2.7: *Efficiency of wage units for the fish processing industry, in Iceland*

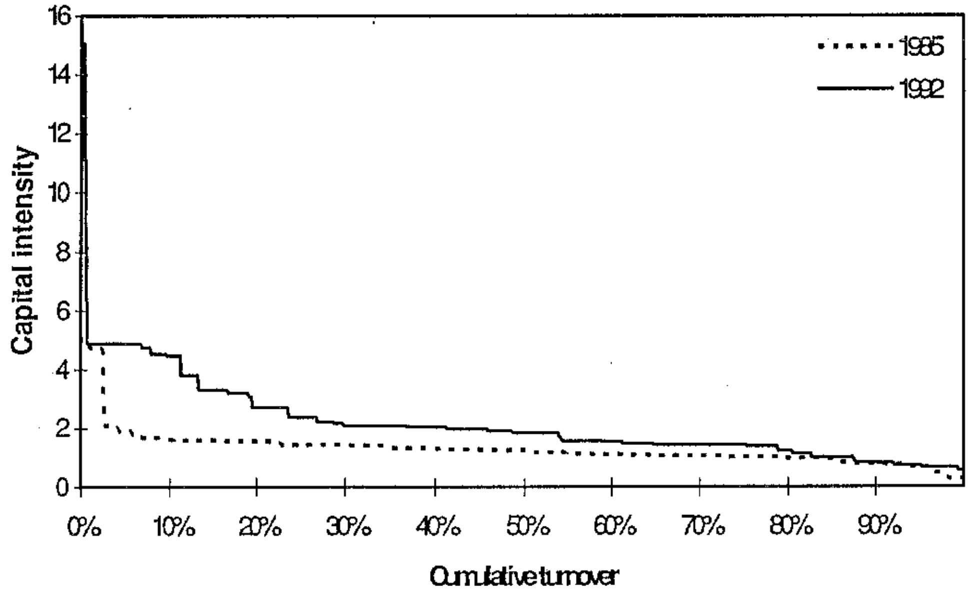

Figure 2.8: *Capital intensity in the fish processing industry, in Iceland*

In Figure 2.9 one can find the efficiency of wage units in the Faroese fish processing sector.[11] Income of firms in the Faroese sample includes subsidies. Unfortunately we could not get subsidie figures for all firms, so excluding subsidies from income is not possible. 25% of the income of 8 firms in the 1989 sample consists of subsidies, 19% of income for 9 firms in the 1991 sample and 16% of 2 firms in the 1992 sample. Studying the SALTER-diagrams for the Faroese fish processing industry one has to bear this in mind, i.e. the productivity when income is netted of subsidies is lower than shown in figures 2.9 and 2.10. Unfortunately, comparable data were not available for 1985.

Efficiency of wage units rose considerably between 1989 and 1991 although subsidies decreased from 25% to 19% of income. In 1992 output per wage unit of approximately 40% of firms lowered again, possibly because of lower income and lower subsidies.

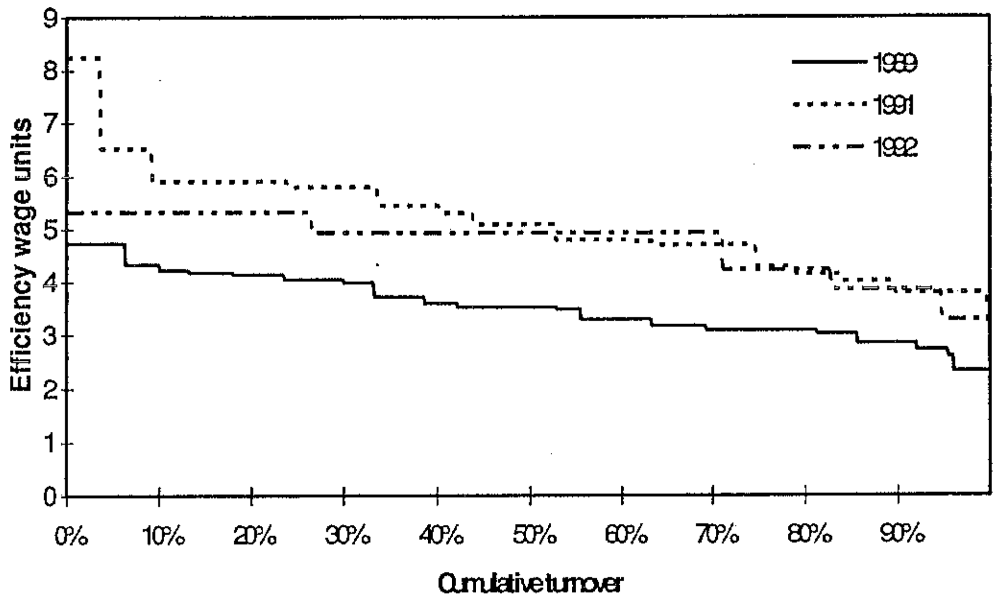

Figure 2.9: *Efficiency of wage units for the fish processing industry in the Faroe Islands*

In Figure 2.10 we show the output/capital share ratio for the three sample years. Using this measure we observe that productivity rose substantially between 1989 and 1991. In 1992 approximately 50% of the firms show lower productivity

[11] The 1989 sample consists of 18 firms, the 1991 sample 18 firms and the 1992 sample 6 firms.

figures than in 1991. This can be explained by lower income and increased their indebtedness.

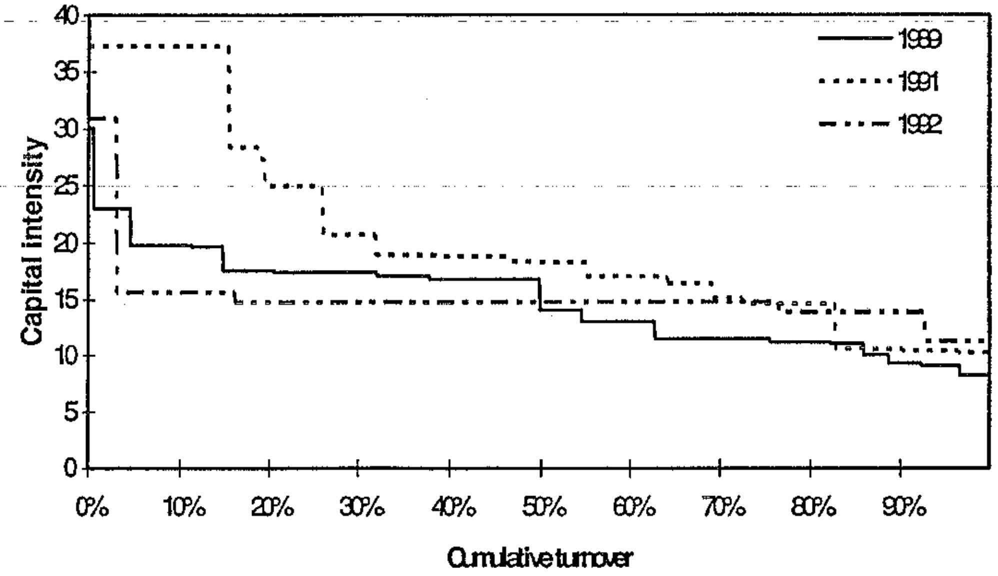

Figure 2.10: *Capital intensity in the fish processing industry in the Faore Islands*

The general conclusion is that the subsidies in the Faroese fisheries sector have distorted the derived demand schedule of fish processing firms for fish. By keeping up revenue in the fisheries by paying "market prices" for landed fish, inefficiency in the fisheries is "transplanted" to the fish processing industry.

3. The fisheries management

In this chapter we look at the fisheries management systems in Iceland and the Faroe Islands.

3.1 The fisheries management system in Iceland[12]

The current fisheries management system in Iceland was introduced in 1984.[13] Up to 1984 anyone was allowed to fish as much as he could. This entailed an overinvestment in capital used in the fisheries. In 1984, a vessel transferable quota fisheries management system was introduced in the fisheries for the major species and was made approximately uniform in 1988.[14] The system works more or less in such a manner that each vessel is issued an annual catch quota. The size of the quota is simply a multiple of the total allowable catch (TAC) and the vessel's calculated share therein. A particular vessel may hold TAC-shares in many different species. The TAC is determined by the Ministry of Fisheries on the basis of recommendations from the Marine Research Institute.

An important feature of the current system is that the Ministry of Fisheries has some autonomy in the annual allocation of quotas. This means that in allocating a quota the Ministry of Fisheries is not really bound by the rule described earlier. Thus, according to previous practice of the Ministry, proven seaworthiness and some minimal fishing activity of the vessel seems to be a prerequisite for receiving a quota. Quotas may be revoked at any time, if the vessel in question is judged to have violated the fishing regulations set down by the Ministry of Fisheries.

All TAC-shares can be officially modified by a permanent transfer between vessels. The allocated vessel quotas are transferable subject to some restrictions. The quotas are perfectly divisible so that any fraction of a given quota may be transferred. The particulars of the exchange are not registered. As quotas are only issued for a year at a time transfers of future quotas, although by no means prohibited, are really only feasible on a contingency basis. The only way for an entry of an individual into the fisheries is by purchasing quotas from vessels already participating in the fisheries. This adds considerably to investment costs and therefore, in practice, it has made entrance almost impossible.

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[12] This section is based more or less on Árnasons (1990b).
[13] With slight modifications in 1988.
[14] The system is not a true ITQ system as one can observe in footnote no. 2 in chapter 2.

Although the system is economically efficient it has invoked a considerable political debate in Iceland and is now under inspection with potential changes in mind.

3.2 The Faroese fisheries management system

On the 10 March 1994 a new fisheries management system in the Faroe Islands was set in action by law from the Lögting. The system introduced seems to be based on the idea to maintain the current structure of the fishing fleet. The government sets out a total allowable catch quota (TAC) for cod, saithe, haddock and redfish after a recommendation from the Fisheries Laboratory of the Faroer Islands. Then the total quota is split into shares earmarked for six different types of fishing vessels, i.e. trawlers, par trawlers, longline ships, boats over 20 GRT, boats under 20 GRT and others. In Table 3.1 one can see how quotas are allocated to six different types of vessels.

Table 3.1: *Quota shares for different types of vessels*

	Cod	*Haddock*	*Red fish*	*Saithe*
Trawlers	4%	1.75%	89.5%	13%
Pair trawlers	21%	10.25%	8.5%	70%
Longliners	23%	28%	1%	0%
Boats > 20	27%	28%	1%	10%
Boats < 20	24%	30%	0%	7%
Other	1%	2%	0%	0%

Source: Law no. 28, 10 March 1994, set by Föroya Landsstýri

After the quota shares have been allocated to six different types of vessels it is split up again within each category of vessels. Trawlers are categorized in to (a) deep water trawlers over 400 GRT, (b) deep and medium deep water trawlers over 400 GRT and (c) trawlers under 400 GRT Now the three categorized quota shares for trawlers are split on to individual vessels. Pair trawlers are categorized in to (a) pair trawlers over 200 GRT built after 1984, (b) other pair trawlers over 200 GRT and (c) pair trawlers under 200 GRT. Now the quota shares for pair trawlers is split on to individual vessels. The quota share for longliners are not categorized further so the share of the total quota is split straight on to individual vessels. The rules for splitting the quota for boats over 20 GRT are somewhat complicated and are not repeated here. The quota for boats under 20 BRT is split straight on to individual vessels.

Quotas are given to individual vessels for one year at a time by a government agency. Quotas can be transferred from one ship to another but if it is done two years

in a row, that vessel looses its rights for a quota share in the future. The fishing year is three equally long periods.

The system seems to serve well in avoiding entrance of new ships in the fisheries and therefore in avoiding new investments except for renewal of old ships. The rules for allocating fishing rights to individual vessels are very complicated and serve no other purpose than to retain the present structure of the fleet. This could be very inefficient in the long run because changing from an inefficient vessel type to a more efficient one seems impossible. Giving quota to ships for one year only at a time increases uncertainty about future quotas and encourages discarding of small and less valuable fish. The rules for transferring quotas are inefficient for if quotas were transferable good fishermen would drive out bad fishermen and the fisheries would become more efficient over time. The rule that splits the fishing year into three sub periods precludes fishermen from fishing when most efficient. On the other hand, the rule can be defended on the grounds that the fishermen would otherwise catch their quota in a relatively short period, leading to unemployment among the fishermen and fish processing workers for the reminder of the fishing year. Notably, this is not the case in Iceland, which in it self should serve as a counter-argument.

The system might serve well as a first step, but it is of paramount importance to develop it further in order to reduce current overcapacity so that the resource rent can be collected. An increasing pressure from the industry for a more efficient system is developing, so changes may be under way in the near future.

4. Fish stocks and catches

In this chapter we take a look at the development of the fish stocks in Iceland and the Faroe Islands. Also we show the differences in recommended and realised TACs and how fishing effort has changed. We conclude by calculating aggregate optimal and actual fish stocks for the two countries.

4.1 The Icelandic fish stocks

Cod, haddock and saithe account for the largest part of Faroese landings and cod is the most valuable one. Although species such as redfish, herring and caperlin are important species in the Icelandic fisheries we do not report it. We want to make inferences about the fish stocks of the two countries as comparable as possible and therefore, we confine our analysis to the three aforementioned stocks.

In Figure 4.1 we can see how the total biomass and catches have developed from 1945 to 1993 for cod and saithe and from 1961 for haddock. The total biomass (fishable stock) is an estimate from the Marine Research Institute in Iceland (MRI) and as such, it has the usual statistical properties an estimate has. Further, we show total allowable catch recommended by the MRI and the optimal stock size, an unofficial estimate by the MRI. [15] As one can observe from the figure we draw the optimal stock size as a constant which is a simplification due to volatile fishing mortality rates. The mortality rates depend on biological conditions and fishing effort and hence, it is dynamic, reflecting the evolvement of the optimal stock size over time.

The fishable cod stock has a downward sloping stochastic trend from 1945 onwards. After the World War II the stock was at a historical peak, weighting more than 2.5 mio. tonnes. During the war almost no fishing took place in Icelandic waters, for reasons widely known, leading to this large stock. Icelandic catches seem to have been fairly stable during the sample period although they increased after the extension of territorial waters to 200 miles in 1974. Up to 1974 foreign catches in Icelandic waters were considerable. One can argue that the extension of the fisheries zone lead

[15] The optimal stock size is the stock that gives maximum sustainable yield (MSY).

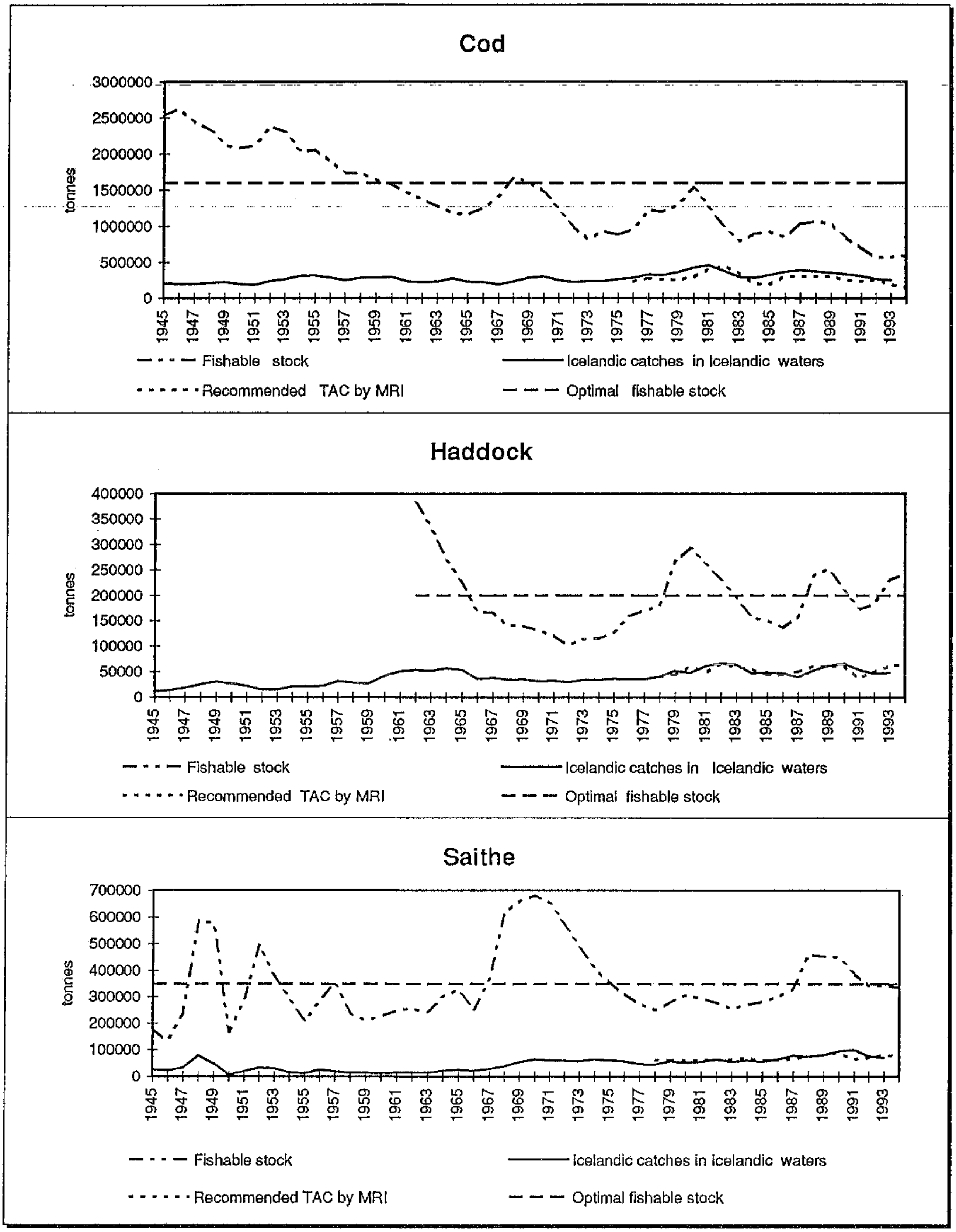

Figure 4.1: *Biomass, recommended TACs, landings and optimal stock in Iceland,1945-1994*

to an increase in the fish stock until 1980, when overutilisation and harsh biological conditions caused it to decrease. The MRI has recommended TAC to the government since 1976. On that recommendation the Ministry of Fisheries has set TAC for cod. In Figure 4.4 one sees the difference between recommended TAC and actual landings. The cod is the most valuable specie in the Icelandic as well as in the Faroese fisheries.

The MIR did not begin measuring the haddock stock until 1962. It looks as if the stock has been moving around the optimal fishable stock size, especially since 1977. This should be the objective of a good fisheries policy, i.e. to keep the biomass as close to the optimal size as possible. In general we can say that the fishable haddock stock is in a good condition and if its current management is withheld, the resource rent from it can be collected in the future under an ITQ system.

The saithe stock is different in nature from the cod and the haddock stocks since it is a migratory stock. Because of its migratory nature it is essentially meaningless to assess an optimal size for the local saithe stock. To give an idea of a potential optimal stock size we show an unofficial estimate from the MRI. After 1975 the saithe stock looks very stable compared to the two other stocks. On this measure, the stock is now close to its "optimal" size.

Although we do not explicitly describe other fish stocks in the Icelandic fisheries it is worth mentioning that, the cod stock apart, all relevant stocks are in a resonable good shape, ignoring the sprawning stock size.

4.2 The Faroese fish stocks

As mentioned before the three most important fish stocks for the Faroese fisheries are cod, haddock and saithe. In Figure 4.2 we show the estimated stock size, recommended TACs by the International Council for the Exploration of the Sea (ICES), landings and the median stock size. The Fisheries Laboratories of the Faroe Islands do not calculate official figures for the optimal stock size. To see what the potential optimal stock size could look like we calculate the median stock size for the three species.

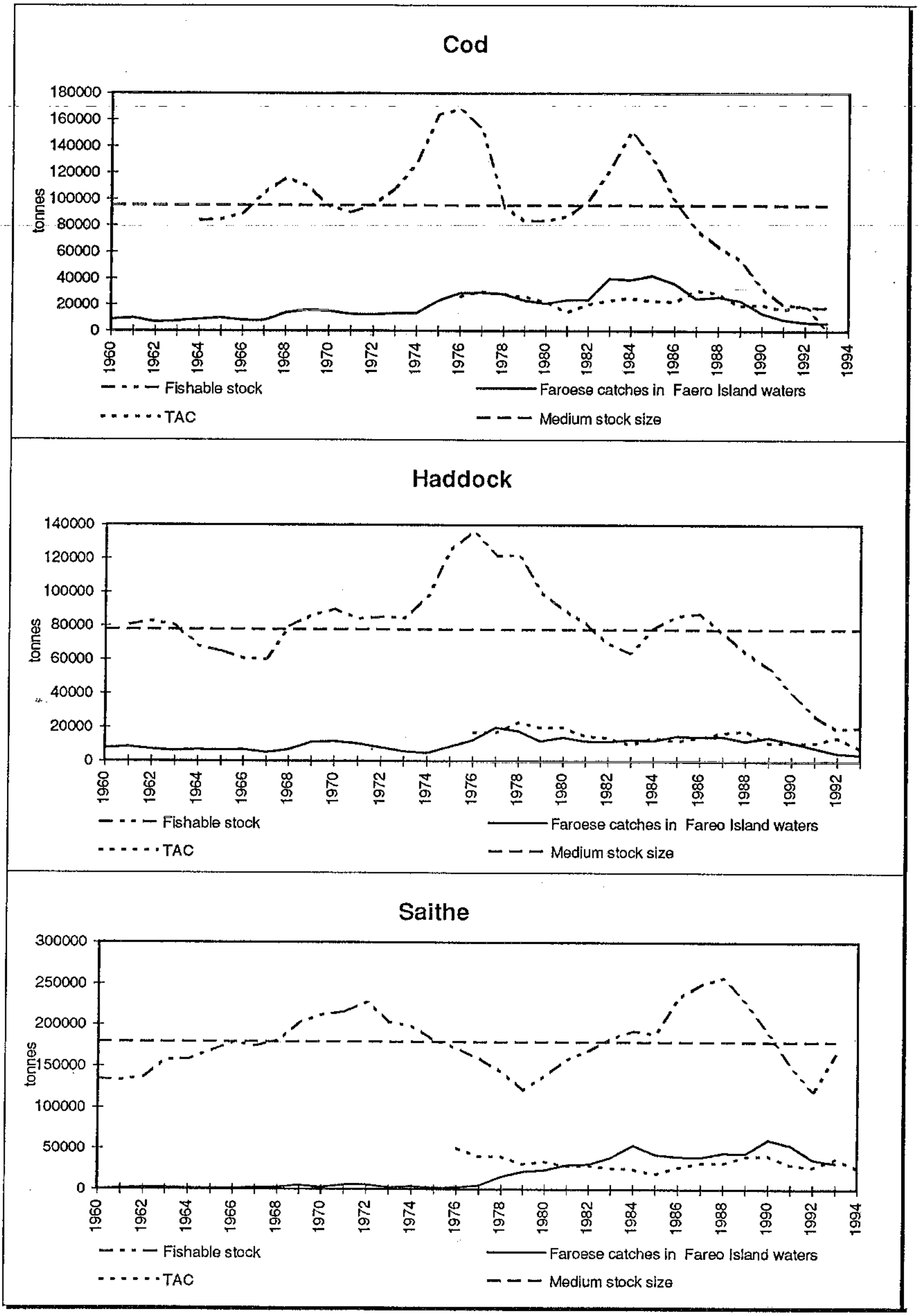

Figure 4.2: *Biomass, recommended TACs, landings and medium stock in the Faroe Islands*

average so it it is possible that the sprawning stock will expand and the fishable stock could be in good condition in two years time if mortality rates are kept low, according to the Fisheries Laboratories. The TACs have been fixed at 42 thousand tonnes for the 1994-1998 period although ICES has recommended catches not to exceed 22 thousand tonnes in 1995. The saithe stock is the only one among the three mentioned here, of which the ICES advises the Faroese to utilise at all. In 1993 the catches of saithe were 33 thousand tonnes, a sizable decline from very high catches at the beginning of the nineties.

4.3 Utilisation of the fish stocks

It is of interest to see how well authorities in Iceland and the Faroe Islands have managed their fish stocks. The stocks are of course renewable but due to the problem of the commons it needs to be managed by the government or a coalition of firms operating in the fisheries. The way in which the Icelanders and the Faroese manage their resources is to give the state the greatest authority. The government in Iceland takes advice from the MRI, which recommends TACs in the fisheries based on the development of the fish stocks. The government allocates TACs to the fisheries and in an ideal setting, the TACs issued by the government and TACs recommended by the MRI would be approximately equal. This is, however, not the case. In figure 4.3 we show the relative difference between landings and TACs for cod, haddock and saithe recommended by MRI in the period 1976-1993.

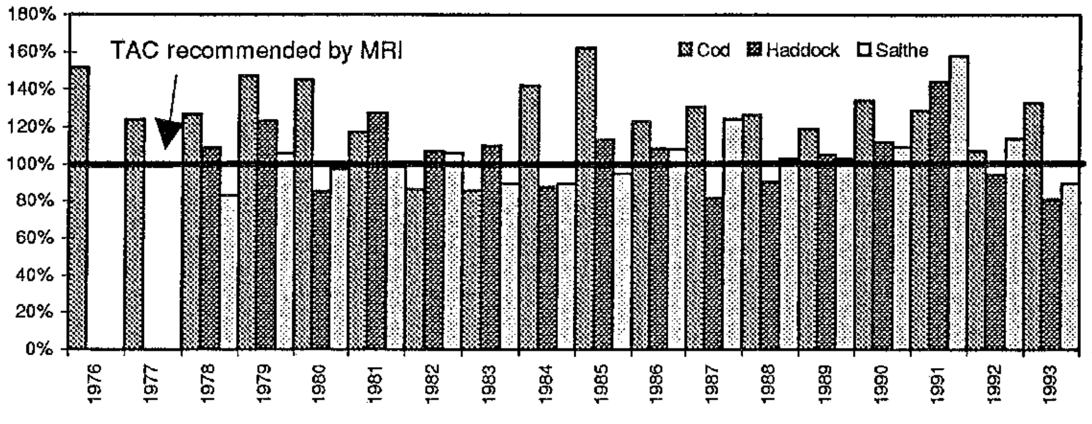

Figure 4.3: *Recommended TACs and landings, Iceland*

The figure should be interpreted in the following way: The line which shows the TACs recommended by the MRI is drawn at the 100% level. When a bar tops at the same level as the line the recommended TACs and actual landings are exactly the same, indicating that the advice from the MRI has fully been taken into account by the government. If for example a bar reaches the 160% level it can be interpreted as if TACs for that species was set 60% higher than the MRI recommended. In such case, it shows us how poorly that stock is managed that year.

In the period 1976-1993 landings did exceed recommended TACs for cod sixteen times out of eighteen, for haddock ten times out of sixteen and for saithe seven times out of sixteen. The average percentage per year for cod TACs exceeding the advice from MRI is 27%, for haddock 5% and saithe 4.5%.

In Figure 4.3 we show landings exceeding TACs recommended by ICES in the Faroe Islands.

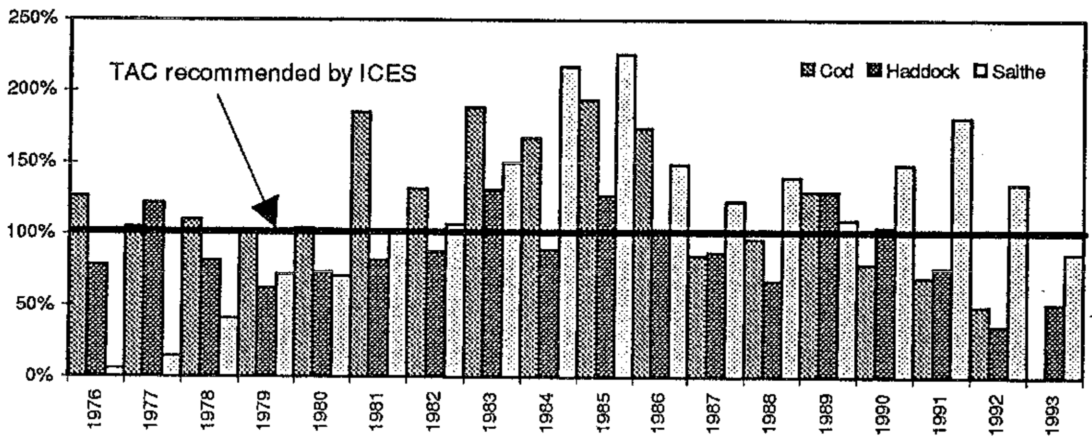

Figure 4.3: *Recommended TACs and landings, the Faroe Islands*

In the sample period, landings did exceed the TACs advised by ICES twelve times out of eighteen for cod, with the average of 31% per year. Four times out of eighteen for haddock, underutilising it by 15% on average per year. Eleven times out of eighteen for saithe, exceeding it by an average of 14% per year.

It is obvious from those figures that the governments have not been taking advise from specialists very seriously, neither in Iceland nor the Faroe Islands. If one is to find someone to blame for the collapse of the cod stock in Iceland and the Faroe

In Figure 4.6 we show the aggregate and optimal fish stocks in Iceland during 1945-1993. The aggregate stock is calculated using method developed by Gunnarson (1990). The aggregation method is based on the idea of making a composite stock by weighting individual stocks according to the value share of each stock in relation to total catch value.[16] The optimal stock is calculated by replacing estimated stocks with optimal individual stocks, leaving the value shares unchanged.

In Figure 4.6 we show calculated aggregate and optimal stock size. Although the aggregate stock is measured in tonnes one should look upon it as an index.

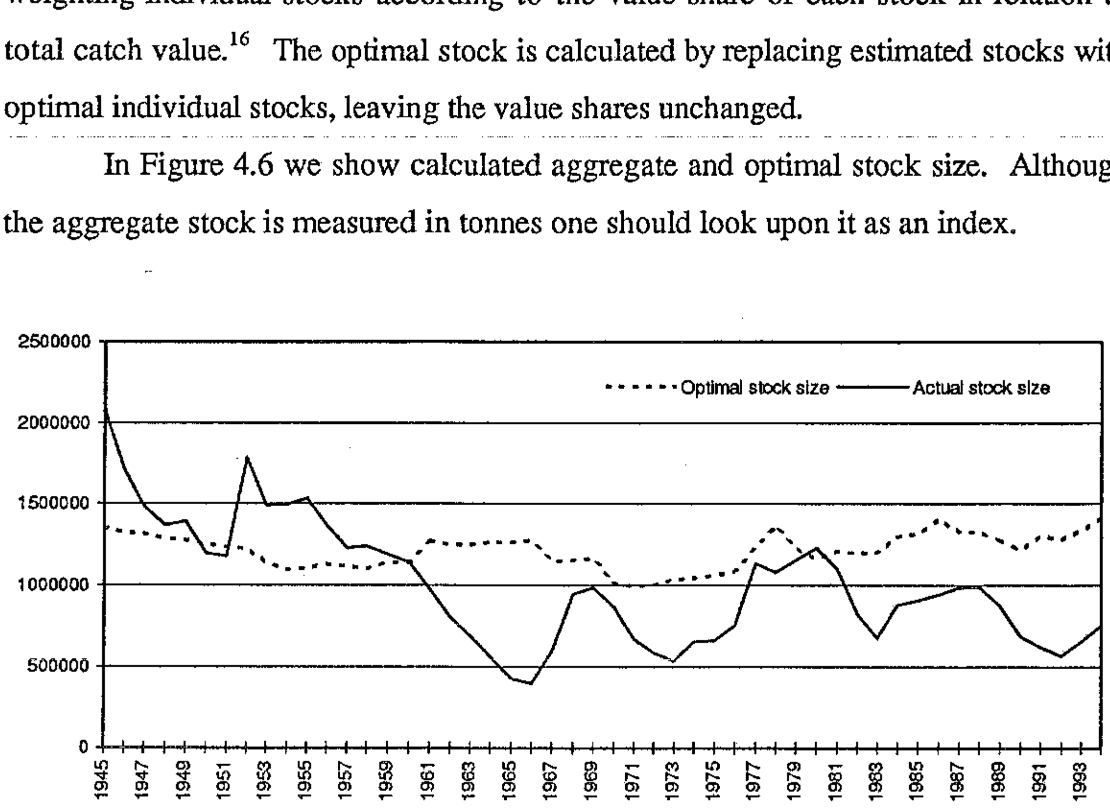

Figure 4.6: *Calculated aggregate stock and optimal stock in Iceland*

As we observed in Figure 4.1, the cod stock in Iceland was at a historical peak at the end of World War II. This fact is clearly reflected in the aggregate stock, since the cod is the most valuable catch in Iceland. We further observe that in 1967 the stock is at a historical minimum. The reason for this is the collapse of the herring in the late sixties. When the fisheries changed from catching herring to cod, the stock increases again, due to changes in shadow prices, i.e. the fishermen value stocks they can make profits from more than those that are so small that their exploitation is too costly.[17]

[16] Aggregate stock $= \sum_{i=1}^{I} w_i S_i$, where i is stock type, w stands for value share of catches from stock i in value of total catches, and S stands for stock i.

[17] In general, shadow prices control variations in the aggregate stock size, i.e. if a stock is low the cost of utilising it is high, and since rational agents set relative prices of input and output equal to shadow prices it must be low.

Since 1988 the aggregate stock has been declining due to a decline in the cod stock, although some recovery is apparent since 1991.

In Figure 4.7 we show the aggregate stock in the Faroe Islands. The method for calculating it is similar to what has been described earlier. It looks as if the Faroese aggregate stock has been closer to its optimal size after 1971 than with the Icelandic stock. The reason for it being below its optimal size reflects the fact that the Faroese underutilised their stocks before the extension of territorial waters in the mid seventies.[18]

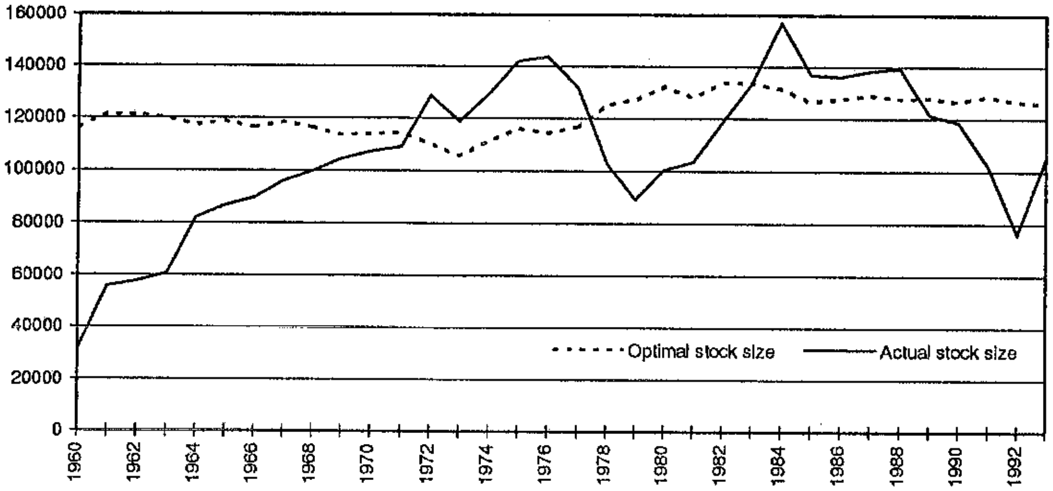

Figure 4.7: *Calculated aggregate stock and optimal stock size, the Faroe Islands*

Parallel to what happened in Iceland, the aggregate stock started to decline in 1989. It looks as if the stock is growing again and that mainly owes to increases in the saithe stock. We should alert the reader ta at least one flaw in the aggregate stock index. It only shows the total fishable biomass but not the sprawning stock size.

[18] Remembering they were mainly fishing in deep waters.

5. A Faroese supply shock to the Icelandic economy

It is of interest to see how a supply shock of the Faroese size would affect an economy like that of Iceland. Exports did go down by approximately 26% in 1993 or 550 mio DDK. If one estimates the unconditional standard deviation in exports during 1962-1992 it is close to 900 ± 300 mio DDK, where ±300 is the 95% confidence bound on the estimate. As one can observe from the figures, the fall in exports is close to the lower limit confidence bound on the standard deviation estimated for exports. We can utilise this fact to see how an export shock of the Faroese size would affect the Icelandic economy. By estimating a VAR(3) econometric model for Iceland and performing an *innovation accounting* exercise on it, we can simulate a one standard deviation shock in Icelandic export revenue and see how it would affect GDP and consumption in Iceland five years ahead.

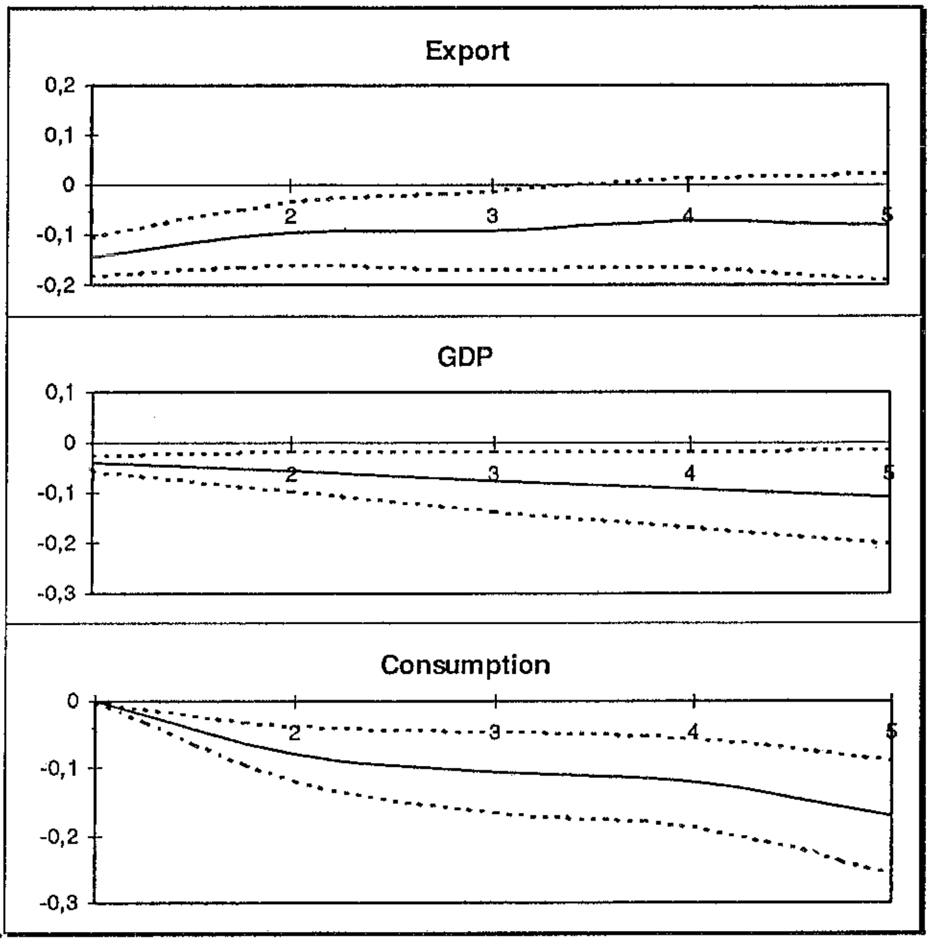

Figure 5.1: *A Faroese size shock to the Icelandic economy*

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Appendices

Table A1: *Data for the Icelandic fish stocks*

	COD						HADDOCK						HERRING					
			Catch in Icelandic waters						Catch in Icelandic waters						Catch in Icelandic waters			
Year	Fishable stock	Recommended TAC by MRI	Icelandic catch	Foreign catch	Total Catches	Annual value of catch Ikr.	Fishable stock	Recommended TAC by MRI	Icelandic catch	Foreign catch	Total Catches	Annual value of catch Ikr.	Fishable stock	Recommended TAC by MRI	Icelandic catch	Foreign catch	Total Catches	Annual value of catch Ikr.
1945	2539000		211849	4098	215947				12104	1665	13769		80000		53575	5835	59410	10100
1946	2628000		199165	38772	237937				14120	14233	28353		180000		133012	17114	150126	36200
1947	2439000		200242	45955	246197				18601	14383	32984		274000		216206	27379	243585	57100
1948	2340000		213177	80157	293334				24862	27043	51905		227000		150122	30085	180207	44800
1949	2127000		221419	93135	314554				30264	36273	66537		268000		71487	33520	105007	28700
1950	2084000		197433	124017	321450				27099	33274	60373		314000		60441	14120	74561	45200
1951	2118000		183252	143687	326939				22173	32178	54351		341000		84837	20837	105674	73900
1952	2384000		237314	154616	391930				15166	29786	44952		375000		32038	29426	61464	31800
1953	2319000		263516	251695	515211				14954	38341	53295		511000		69518	25904	95422	61500
1954	2042000		306191	240061	546252				21324	40732	62056		751000		47262	13888	61150	40800
1955	2056000		315438	221329	536767				21703	42638	64341		872000		52574	21928	74502	52400
1956	1910000		292586	189578	482164				22054	39844	61898		960000		101171	22988	124159	96400
1957	1736000		247087	205949	453036				31302	45111	76413		1015000		115363	28624	143987	102700
1958	1736000		284407	226107	510514				28624	41528	70152		996000		107484	43715	151199	118200
1959	1643000		284259	169966	454225				26534	37165	63699		1031000		182601	55390	237991	230400
1960	1576000		295668	169355	465023				41988	44439	86427		1014000		136437	88041	224478	133600
1961	1469000		233874	141753	375627				51360	56984	108344		974000		325872	135712	461584	360200
1962	1372000		221820	164602	386422		382255		54288	64315	118603		813000		478127	172381	650508	563000
1963	1286000		232839	176537	409376		331776		51834	50728	102562		483000		396476	111223	507699	488200
1964	1184000		273584	160926	434510		268900		56586	42661	99247		347000		544396	81745	626141	770900
1965	1164000		233483	160069	393552		223455		53506	45620	99126		249000		590445	33595	624040	1265500
1966	1252000		223974	133423	357397		166552		36028	24113	60141		123000		430128	52487	482615	1251700
1967	1417000		193449	150524	343973		166094		37997	22485	60482		120000		94283	24200	118483	597400
1968	1682000		227594	151863	379457		140130		34014	17213	51227		35000		27589	3186	30775	340800
1969	1610037		281680	123488	405168		139505		35026	11573	46599		16737		23513	590	24103	442200
1970	1489543		302875	167882	470757	2273345	130729		31833	12655	44488	367625	20009		16445		16445	753303
1971	1227758		250324	202679	453003	2470300	120575		32376	13731	46107	446800	13572		11831	5	11836	829300
1972	987394		225354	173174	398528	2688900	102234		29252	10018	39270	454200	11041		312		312	614000
1973	832114		235184	144701	379885	3985400	113958		34586	11117	45703	744300	28705		254		254	1111200
1974	931780		238283	136704	374987	5821900	114699		34199	8225	42424	875400	45876		1273		1273	1198000
1975	890353		264975	106016	370991	9139632	125768		36658	9045	45703	1121213	116896		13280		13280	1389240
1976	950141	230000	280831	67532	348363	14998640	159779		34870	7497	42367	1549661	129289		17168		17168	2016169
1977	1214126	275000	329676	10377	340053	23699866	169953		35428	4230	39658	2461946	132893		28925		28925	1993729
1978	1205274	260000	319648	8572	328220	33374611	178697	40000	40552	2936	43488	4265008	175512		37333		37333	3140457
1979	1290260	250000	360077	7936	368013	55877288	266972	45000	52152	3182	55334	8792897	198145		45072		45072	5110986
1980	1547759	300000	429044	6000	435044	945700	293147	60000	47916	3196	51112	123800	212367		53268		53268	106900
1981	1262676	400000	461038	8063	469101	2475900	260351	50000	61033	2527	63560	189700	185746		39544		39544	104800
1982	978846	450000	382297	6090	388387	1898100	230005	65000	67038	2387	69425	296400	192721		56528		56528	172900
1983	795026	350000	293890	5923	299813	2761975	194578	60000	63889	2054	65943	528368	218872		58867		58867	262699
1984	900418	200000	281481	2385	283866	3583431	155470	55000	47216	1069	48285	542843	231888		50304		50304	249315
1985	920142	200000	322810	2456	325266	5568095	150298	45000	49553	1378	50931	980381	248750	50000	49368		49368	364931
1986	853082	300000	365852	2781	368633	8316916	137648	45000	47317	1546	48863	1292650	257427	65000	65500		65500	338164
1987	1035404	300000	389808	2449	392257	11140866	157227	50000	39479	1282	40761	1455286	359749	70000	75439		75439	415898
1988	1062545	300000	375741	2243	377984	12952421	239356	60000	53085	1117	54202	2407700	422454	90000	92828		92828	697964
1989	1031693	300000	353630	2324	355954	15127021	251500	60000	61792	1089	62881	3761564	394095	90000	97270		97270	830143
1990	841416	250000	333348	2042	335390	20092542	209603	60000	66004	1196	67200	5530608	357138	80000	101632		101632	810984
1991	706029	240000	306689	1871	308560	21805274	172528	38000	53515	1217	54732	4769917	299277	80000	98538		98538	555217
1992	564801	250000	266609	1105	267714	18474278	184021	50000	46004	1114	47118	3982321	375237	90000	106653		106653	753630
1993	569699	190000	251206	669	251875	16488836	230950	60000	47938	906	48844	3721264	571241	90000	101496		101496	819419
1994	593275	150000					240548	65000					591069					

Source: Marine Research Institute and the Fisheries Association of Iceland [Útvegur 1977-1993]

Table A1: *Data for the Icelandic fish stocks*

	GREENLAND HALIBUT						LOBSTER						SHRIMP					
			Catch in Icelandic waters						Catch in Icelandic waters						Catch in Icelandic waters			
Year	Fishable stock	Recommended TAC by MRI	Icelandic catch	Foreign catch	Total Catches	Annual value of catch Ikr.	Fishable stock	Recommended TAC by MRI	Icelandic catch	Foreign catch	Total Catches	Annual value of catch Ikr.	Fishable stock	Recommended TAC by MRI	Icelandic catch	Foreign catch	Total Catches	Annual value of catch Ikr.
1945																		
1946																		
1947																		
1948																		
1949																		
1950																		
1951										26	26							
1952										53	53							
1953										144	144							
1954										236	236							
1955										203	203				390		390	
1956										138	138				772		772	
1957										312	312				500		500	
1958									728	593	1321				768		768	
1959									1404	602	2006				1068		1068	
1960									2081	451	2532				1396		1396	
1961									1490	322	1812				1207		1207	
1962				2393	2393				2662	154	2816				541		541	
1963				3215	3215				5550	512	6062				733		733	
1964				3512	3512				3487	586	4073				675		675	
1965				5951	5951				3706	409	4115				926		926	
1966				7560	7560				3465	546	4011				1776		1776	
1967				30056	30056				2731	208	2939				1428		1428	
1968				21036	21036				2489	157	2646				2469		2469	
1969			5856	19164	25020		28945		3512	189	3701				3281		3281	
1970			7343	23477	30820	77191	21845		4026	119	4145	162504			4431		4431	68694
1971			5020	10029	15049	66100	19213		4657	155	4812	210900			6248		6248	128700
1972			4640	6025	10665	65900	16136		4321	260	4581	285300			5344		5344	111200
1973			2115	5271	7386	41100	13346	3000	2791	5	2796	249300		5800	7286		7286	244400
1974			2842	5024	7866	76400	12321	2000	1983	6	1989	218300		6600	6516		6516	272800
1975			1212	2096	3308	33002	12738	2000	2357		2357	356685		5200	4941		4941	238777
1976	132549		1686	3761	5447	79014	12944	2800	2780		2780	731978		5900	6781		6781	425764
1977	129344		10090	5589	15679	671589	13117	2800	2723		2723	784095	93400	6500	7149		7149	789484
1978	147377		11319	256	11575	1028632	13413	2500	2059		2059	795342	95380	7200	7263		7263	1494403
1979	144329	15000	16934	42	16976	1927884	14361	2500	1449		1449	843829	97060	6600	8843		8843	2476444
1980	166662	15000	27836	91	27927	36900	15886	2500	2398		2398	19900	107080	8100	9960		9960	48100
1981	169008	15000	15455	325	15780	32300	16027	2700	2520		2520	35600	112310	10200	8147		8147	4900
1982	209206	17000	28300	669	28969	78200	15834	2700	2603		2603	57900	113810	9400	9180		9180	67600
1983	207202	17000	28429	33	28462	173896	15433	2700	2672		2672	141607	120570	8600	13102		13102	267783
1984	208436	25000	30163	46	30209	250779	14806	2400	2459		2459	169102	115110	13400	24416		24416	599935
1985	212355	25000	29319	1	29320	343954	14340	2300	2385		2385	227211	116860	24100	24894		24894	723857
1986	222627	25000	31142	0	31142	686128	13787	2500	2564		2564	313378	116820	24000	35831		35831	2201973
1987	237413	25000	44889	15	44904	1496305	12963	2700	2712		2712	366042	103980	34300	38636		38636	3040052
1988	233872	30000	49189	379	49568	1849016	12104	2600	2240		2240	336599	94380	39400	29746		29746	3011850
1989	206944	30000	58497	719	59216	2899642	12187	2100	1866		1866	389223	95090	28400	26823		26823	3014098
1990	187972	30000	36679	739	37418	2692412	13279	2100	1692		1692	477903	109750	25600	29886		29886	3108412
1991	189679	27000	34885	273	35158	3286793	14460	2100	2157		2157	606544	119040	30900	38040		38040	4254547
1992	180369	25000	31955	23	31978	3203194	14410	2100	2230		2230	497299	121540	41900	46910		46910	4727803
1993	182456	30000	34340	166	34506	4727872	13984	2200	2381		2381	491029	116750	42400	53881		53881	5616949
1994	176801	25000					13557	2200					112350	47200				

Table A2: *Data for the Faroese fish stocks*

Year	COD Fishable stock	COD TAC	COD Catch in the Faroe Islands waters: Faroe catch	COD Foreign catch	COD Total Catches	HADDOCK Fishable stock	HADDOCK TAC	HADDOCK Catch in the Faroe Islands waters: Faroe catch	HADDOCK Foreign catch	HADDOCK Total Catches	SAITHE Fishable stock	SAITHE TAC	SAITHE Catch in the Faroe Islands waters: Faroe catch	SAITHE Foreign catch	SAITHE Total Catches	Kongafisk Catch in the Faroe Islands waters: Faroe catch	Kongafisk Foreign catch	Kongafisk Total Catches
1945			2500	6145	8645				2546	2546				1085	1085			
1946			5000	25483	30483				13810	13810				4141	4141		4	4
1947			5000	25990	30990				12531	12531				6341	6341		19	19
1948			5000	15710	20710				10079	10079				2707	2707		5	5
1949			5000	23132	28132				9805	9805				4968	4968		5	5
1950			5000	30970	35970				11983	11983				4665	4665		4	4
1951			5000	30074	35074				14409	14409				8698	8698		93	93
1952			4550	25705	30255			83	14188	14271				6851	6851		30	30
1953			4137	22895	27032			2788	12224	15012				7175	7175		155	155
1954			5190	30974	36164			2654	12758	15412			4	6181	6185		2116	2116
1955			7902	30676	38578			3865	12708	16573			89	7145	7234		10173	10173
1956			7938	19686	27624			4221	13294	17515			37	10847	10884		5050	5050
1957			6920	24469	31389			4453	16542	20995			979	25879	26858		5251	5251
1958			6535	21268	27803			6850	17021	23871			339	12639	12978		4522	4522
1959			4676	21176	25852			5670	14569	20239			536	14009	14545		3489	3489
1960	36959		8723	30497	39220			7772	17955	25727	134629		685	11160	11845		2631	2631
1961	36959		9831	19118	28949	80669		8454	12255	20709	133298		929	9863	10792		3663	3663
1962	36959		6731	17450	24181	82875		7042	20109	27151	136950		2494	7960	10454		2338	2338
1963	36959		7428	16676	24104	80176		6336	21233	27569	157674		2431	10262	12693	1	2506	2507
1964	83875		8888	16090	24978	67922		6952	12539	19491	158394		1338	20555	21893	0	7644	7644
1965	84864		9948	12149	22097	65035		6673	11734	18407	168502		1000	21181	22181	1	5806	5807
1966	89024		7957	14959	22916	60426		6902	11860	18762	178745		1167	24330	25497	0	3291	3291
1967	105272		7835	18878	26713	59936		5246	8126	13372	174037		2242	18884	21126	0	4995	4995
1968	115910		13763	25129	38892	79726		6751	11106	17857	181142		2629	17758	20387	1	6591	6592
1969	109927		15718	26411	42129	86158		11122	12178	23300	203020		4835	22602	27437	5	1321	1326
1970	94920		15245	21640	36885	89830		11791	9578	21369	211968		2694	26416	29110	0	1947	1947
1971	90115		12754	19279	32033	84216		10488	8923	19411	215841		5653	25280	30933	0	2352	2352
1972	96048		12143	12950	25093	85301		8314	8171	16485	228031		5646	40934	46580	0	4087	4087
1973	107837		13276	8440	21716	84636		6018	11958	17976	203697		2973	53633	56606	121	9575	9696
1974	127513		13237	10956	24193	97395		4811	9952	14763	198210		3726	42433	46159	28	7737	7765
1975	164284		22986	855	23841	125403		8757	11958	20715	181422		2517	39059	41576	9	8582	8591
1976	168071	26000	28959	11541	40500	136227	17000	12714	13497	26211	171287	50000	2560	30505	33065	33	5331	5364
1977	152718	30000	29028	10167	39195	121562	17000	20079	5474	25553	159584	40000	5153	29682	34835	54	7348	7402
1978	94464	28000	28270	14175	42445	122197	23000	18182	1018	19200	143704	40000	15879	12256	28135	1525	8281	9806
1979	83621	26000	23047	13453	36500	99995	20000	11975	449	12424	122071	31000	21935	5065	27000	5693	6981	12674
1980	83651	22000	20690	4180	24870	89994	20000	14323	693	15016	139040	34000	23810	1420	25230	5509	4530	10039
1981	87047	14000	23591	2688	26279	81611	15000	11994	239	12233	158737	29000	29682	421	30103	3232	3913	7145
1982	98860	20000	23571	270	23841	69573	14000	11872	65	11937	169481	29000	30808	165	30973	3999	4872	8871
1983	122367	23000	40200	300	40500	63903	10000	12865	29	12894	184012	26000	38963	213	39176	4642	4742	9384
1984	151525	25000	39103	92	39195	78924	14000	12343	35	12378	192720	25000	54344	321	54665	8770	5162	13932
1985	130321	23000	42335	110	42445	85835	12000	15071	72	15143	188975	19000	42874	1731	44605	12634	6252	18886
1986	98260	22000	36328	172	36500	87399	14000	14409	68	14477	234093	27000	40139	1577	41716	15224	5932	21156
1987	76880	31000	24712	158	24870	75878	17000	14786	96	14882	249871	32000	39301	464	39765	13478	3884	17362
1988	64764	29000	25953	326	26279	64343	18000	12027	130	12157	257876	32000	44660	625	45285	13318	2190	15508
1989	54658	19000	23034	446	23480	55497	11000	14165	157	14322	226732	40000	43893	584	44477	12860	2140	15000
1990	32792	20000	13611	444	14055	40244	11000	11431	916	12347	190139	41000	60809	752	61561	10364	1872	12236
1991	20337	16000	8851	229	9080	27242	11000	8291	416	8707	150090	30000	54284	561	54845	14055	1055	15110
1992	18209	20000	6743	334	7077	19158	14000	4954	1034	5988	118824	27000	36499	379	36878	14213	698	14911
1993	17729	0	6000	376	6376	20096	8000	4000	185	4185	165307	37000	32000	692	32692	9500	299	9799
1994		0					0					26000						

Source: Fisheries Laboratory of the Faroe Islands and Jógvan M¢rk¢re (1993)

Table A2: *Data for the Faroese fish stocks*

	Ling			Tusk			Kalvi			Tunga			Halibut		
	Catch in the Faroe Islands waters			Catch in the Faroe Islands waters			Catch in the Faroe Islands waters			Catch in the Faroe Islands waters			Catch in the Faroe Islands waters		
Year	Faroe catch	Foreign catch	Total Catches	Faroe catch	Foreign catch	Total Catches	Faroe catch	Foreign catch	Total Catches	Faroe catch	Foreign catch	Total Catches	Faroe catch	Foreign catch	Total Catches
1945		251	251		198	198		397	397		342	342		74	74
1946		781	781		238	238		998	998		1162	1162		154	154
1947		1219	1219		275	275		1277	1277		986	986		163	163
1948		791	791		302	302		793	793		1105	1105		141	141
1949		938	938		380	380		915	915		980	980		293	293
1950		871	871		6112	6112		1126	1126		1312	1312		387	387
1951		2312	2312		1279	1279		1598	1598		1258	1258		1055	1055
1952	56	1708	1764	187	479	666	243	1607	1850		1126	1126		462	462
1953	144	1896	2040	593	1287	1880	149	1514	1663		823	823		389	389
1954	122	2615	2737	560	1014	1574	226	1742	1968	27	945	972		429	429
1955	235	4821	5056	1005	1010	2015	333	2410	2743	0	787	787		498	498
1956	277	4343	4620	818	1211	2029	390	1552	1942	0	740	740		589	589
1957	259	3966	4225	845	1072	1917	374	2213	2587	0	1021	1021		845	845
1958	616	4322	4938	812	2288	3100	616	2247	2863	0	962	962		843	843
1959	394	3745	4139	984	2068	3052	404	2159	2563	0	1110	1110		911	911
1960	520	2779	3299	1306	2160	3466	218	2580	2798	0	1377	1377		1132	1132
1961	603	1602	2205	1301	2559	3860	222	2016	2238	0	1165	1165		873	873
1962	450	1541	1991	1902	2614	4516	137	1761	1898	0	1097	1097		824	824
1963	365	2595	2960	2007	1555	3562	161	1266	1427	0	848	848		780	780
1964	480	4775	5255	2775	1836	4611	174	1205	1379	0	444	444		575	575
1965	416	5668	6084	1645	2640	4285	276	1185	1461	0	545	545		540	540
1966	616	4544	5160	1488	1800	3288	169	1044	1213	0	445	445		514	514
1967	736	6121	6857	2070	3295	5365	245	1155	1400	0	439	439		431	431
1968	1209	4430	5639	2798	3584	6382	267	991	1258	0	508	508		498	498
1969	486	3023	3509	1454	1766	3220	205	852	1057	0	441	441		634	634
1970	699	3391	4090	1028	2020	3048	296	784	1080	0	492	492		679	679
1971	752	4712	5464	1489	2355	3844	234	679	913	590	379	969	230	664	894
1972	1572	5816	7388	1918	2956	4874	212	509	721	300	279	579	0	487	487
1973	1428	5949	7377	3402	3770	7172	256	639	895	1190	519	1709	535	613	1148
1974	1004	4105	5109	1541	2403	3944	141	587	728	607	640	1247	418	642	1060
1975	1281	5763	7044	2166	2386	4552	162	513	675	971	473	1444	456	287	743
1976	1500	5048	6548	2548	3464	6012	300	537	837	813	432	1245	511	629	1140
1977	1673	3890	5563	3062	2248	5310	316	311	627	778	224	1002	558	334	892
1978	1943	3853	5796	2497	2250	4747	353	254	607	746	47	793	909	169	1078
1979	2124	4074	6198	3877	2688	6565	442	417	859	797	13	810	988	71	1059
1980	1821	2689	4510	4717	3093	7810	407	210	617	489	3	492	735	38	773
1981	1400	2818	4218	2066	2784	4850	397	181	578	671	0	671	789	10	799
1982	2370	3727	6097	4148	2243	6391	451	147	598	753	0	753	829	15	844
1983	2505	2954	5459	3450	2034	5484	546	78	624	1015	0	1015	703	6	709
1984	2821	1587	4408	4394	1580	5974	579	44	623	1209	0	1209	714	8	722
1985	3190	2000	5190	5288	2019	7307	456	68	524	850	0	850	661	1	662
1986	2583	2374	4957	3625	1595	5220	516	81	597	636	0	636	573	4	577
1987	3938	2429	6367	4262	2267	6529	682	120	802	360	0	360	494	23	517
1988	2218	2235	4453	3439	2293	5732	516	135	651	451	0	451	716	18	734
1989	1862	2788	4650	2066	3119	5185	452	103	555	301	0	301	801	15	816
1990	1731	2138	3869	3346	2985	6331	298	103	401	342	15	357	836	17	853
1991	2337	2164	4501	4242	2059	6301	356	100	456	219	0	219	875	0	875
1992	1802	1822	3624	3381	2042	5423	478	29	507	235	0	235	1169	0	1169
1993	3000	1540	4540	2000	1508	3508	0	0	0	0	0	0	1000	0	1000
1994															