

In Proceedings of the International Council for Small Business.  
47th World Conference. San Juan. Puerto Rico. 16-19 June 2002

### **Agust Einarsson**

Professor, Faculty of Economics and Business Administration  
University of Iceland, Oddi, Sudurgata, 101 Reykjavik, Iceland  
Tel: 354-5254500. Fax: 354-5526806. E-mail: [agustei@hi.is](mailto:agustei@hi.is) Website: [www.agust.is](http://www.agust.is)

## **Enterprises in Fisheries – Changes and Modifications. The Icelandic Example**

### **Biography of the author**

Professor Einarsson is the former dean of the Faculty of Economics and Business Administration at the University of Iceland. He obtained his PhD in Germany. He is the author of 6 books on microeconomics, business administration and cultural economics and over 50 journal articles and conference papers and over 400 shorter articles on economics, fisheries and politics in magazines, newspapers, and on websites. Professor Einarsson is a former Member of the Icelandic Parliament and Chairman of the Board of the Central Bank of Iceland and served as a delegate for Iceland at the General Assembly of the United Nations in New York.

### **Abstract**

The aim of the paper is to analyze the position of enterprises in fisheries, describe the changes over the last two decades in Icelandic fisheries, demonstrate the importance of SMEs in the industry and explain how operating result depends on the real exchange rate and the indices of catch and catch value. Fisheries enterprises are in many ways in a unique position. The main production factor, the fish, is organic and deteriorates in very a short time if no precautions are taken, the fish banks are widely distributed over huge areas in the high seas all around the world, the procurement depends very much on natural conditions and the fish itself is a wild living animal. Industries that depend primarily on catching wild animals, as fisheries do, are very rare in the world. All these factors make the planning of operating activities within the enterprises and their management extremely difficult. Among the conclusions of the research is that the fishing industry has changed profoundly in the last two decades, e.g. as a result of increased fish farming. The description of the Icelandic fisheries as an example shows that technical changes have heavily affected the structure of the industry. Although mergers of enterprises have increased in the fishing industry, there is also a significant rise in the number of SMEs. It is demonstrated that the framework of the fisheries

management system is vital for operating results, and so are the changes in the price mechanism. A multiple regression analysis of the profit and loss accounts for most of the companies operating in Icelandic fisheries explains how the operating results depend on exchange rate policies and prices of fish in international markets. Statistical tests show the significance of this dependence.

## **1. Introduction**

The structure of this paper is that first we will describe the Icelandic economy, focusing primarily on the fishing sector. Then we will analyse the many changes within the fisheries sector over the last 30 years. This will be followed by an illustration of the operating results of the enterprises within the fishing sector, which shows the statistical relationship between operating results and externalities. Finally, we will raise some questions which could be interesting subjects for further research.

## **2. Iceland's Economy and Fisheries**

The fishing sector, or fisheries, which is divided into fishing and fish processing, has always played a very important role in Iceland's economy. Iceland is 103,000 square km in area and its inhabitants are 280,000. Iceland is an independent country in the North-Atlantic and the distance from the capital Reykjavik to the mainland of Europe is about 2,000 km, which corresponds approximately to the distance from Paris to Sofia. The country achieved independence from Denmark in 1944 and enjoys a very high standard of living. In 2000 Iceland's GDP in PPP in US \$ per head was 27,500, which put the country in 12<sup>th</sup> place in the world according to OECD statistics (OECD 2001). Iceland is one of the Nordic countries and co-operates closely and extensively with the other Nordic countries, Denmark, Finland, Norway and Sweden. In 2000, 9% of the labour force was working in fisheries, which contribute 10% of the GDP. In 2000, fish products accounted for 63% of the export of goods and 40% of foreign currency income. Unemployment in Iceland is low, or 1.3% in 2000, and inflation in the same year was 5%. Iceland is a member of the UN, NATO and the EEA (European Economic Area) but is not a member of the EU, which sets Iceland apart from most of the other countries of Western Europe.

Fishing around Iceland in the 20<sup>th</sup> century was characterized by repeated extensions of the fishing limits and resulting struggles with neighbouring countries. The fishing zone was expanded to 12 miles in 1958, to 50 miles in 1972 and to 200 miles in 1976. Today, the 200 mile fishing zone is the most common in the world. If there is less distance than 400 miles

between two countries, the median line determines the limits of the fishing zone. Almost all the fishing grounds around Iceland are within the 200 mile fishing zone.

There were no restrictions on fishing in Iceland for most of the 20<sup>th</sup> century, but in the seventies the total allowable catch (TAC) was severely limited because of overfishing. In 1984 a system of individual quotas and effort quotas was implemented, but since 1990 a system of individual transferable fishing quotas (ITQs) has been in effect. The main characteristics of this system are that the TAC for each species is decided for one year. Fishing companies, i.e. their fishing vessel or vessels, are allocated through the Ministry of Fisheries a share of the total catch based on their fishing experience three years preceding the establishment of the system. The share of the TAC for each vessel remains constant from one year to the next. To give an example, let us assume that a boat receives a 0.1% permanent share of the projected annual haddock catch. The Minister of Fisheries, based on scientific information and advice, decides the TAC. If the TAC for haddock is determined as 50,000 tonnes this vessel will receive an allocation for the next year of 50 tonnes of haddock. The company owning the vessel can catch this quota, but it can also lease additional quotas from other companies or lease a part of its own 50 tonnes to other parties. It may also buy or sell its permanent share of the TAC. This allows the transfer of fishing quotas, which can also be divided. The argument for the system of ITQs is, among other things, that free trade has the same advantages in fisheries as elsewhere. Systems similar to the Icelandic one have been implemented elsewhere, e.g. in Namibia, the Netherlands and New Zealand (Arnason 1996).

Iceland is among the biggest fisheries nations of the world. In 1999 Iceland caught 1.7 million tonnes, ranking 14th in the world. The biggest fishing nation of the world is China. Fish farming or aquaculture has increased very much the last years. In 1994 the total aquaculture production was 20.8 million tonnes, but in 1999 it was 32.9 million tonnes, which represents an increase of 58% in 5 years. The total capture was 91.4 million tonnes in 1994 and 92.3 tonnes in 1999, which represents an increase of 1% in 5 years (FAO 2000). Fish farming in Iceland is very limited.

Fisheries are in many ways different from other industries. The fish itself is a wild, living animal, mostly caught on the high seas for human consumption. This form of food production has become very rare in the world. Most animals for human consumption are harvested or farmed in delimited areas in a manner similar to fish farming or aquaculture. Fish is an extremely vulnerable, organic product and deteriorates easily if no precautions are taken, e.g. by placing it in ice or processing it by salting or freezing. The fish banks in the high seas are widely distributed, and although technical progress in recent decades has been

very extensive in the fishing sector, especially as regards electronic fish finding instruments, catches are very uncertain, which makes fishing a risky business. Management in fisheries, whether by governmental authorities or by private enterprises, is therefore very difficult in comparison with other industries (Chaston 1981).

### **3. Changes Within the Fishing Industry 1970 to 2000**

The changes in the operation of Icelandic fisheries enterprises over the last three decades can be classified into 12 related categories.

1. The rebuilding of the fleet through modern stern trawlers, which started in 1970, was coming to an end in the late seventies. 60% of the trawlers, the most important type of fishing vessel in Iceland, were built from 1970 to 1979 (Statistics Iceland 2001).
2. The use of big freezer trawlers started after 1980. In 1980 almost no fish was frozen at sea but by 2000 the proportion was 30% of the total demersal catch. The power of the main engines of trawlers over 500 gross tons, the size of the majority of freezer trawlers, more than tripled from 1980 to 2000.
3. The price system for fresh fish has changed profoundly. Fish auctions in organized fish markets were first started 1987. In 2000, 25% of the demersal catch was sold on these domestic fish markets, mostly for further processing. Prior to 1987, the price of fish for domestic processing was more or less decided by governmental authorities. In connection with such decisions the economic policy of the government was determined, e.g. the exchange rate of the króna (Einarsson 1991).
4. The stock exchange in Iceland, which was founded in the nineties, was of great significance for fisheries enterprises. At the beginning of 2001, 17 of the 49 companies listed on the stock exchange were fisheries enterprises. A special growth list maintained by the stock exchange consists of 17 companies, of which 5 companies belong to the fisheries sector. It is clear that companies in the fishing sector have a great impact on the stock exchange.
5. There was extensive horizontal integration in the fishing industry in the eighties and the nineties, which also took place across geographical regions. Of the 17 companies mentioned above, 11 have merged with other companies. Four of these 11 companies went through 3 mergers, three companies went through 2 mergers and four companies went through 1 merger.

6. The quota system was implemented in demersal fishing in 1984, but quotas were introduced in herring fishing 1975 and in capelin fishing 1980. Since 1990 ITQs have been the general rule in the Icelandic fishing industry (Petursdottir 1997).
7. Fishing outside the 200-mile zone, e.g. in the Barents Sea, at the Flemish Hat and in Africa, became significant for Icelandic enterprises after 1990. This was a new development in Icelandic fisheries. In addition, it became quite common after 1992 to import raw material, e.g. frozen fish from Russian vessels, for further processing in Iceland. In 1998 the quantity of this import was 215,000 tonnes, including both demersal and pelagic catch.
8. The share of small boats increased substantially after 1980. There is a special system for their fishing – a kind of combination of individual quotas and effort quotas. The share of the total catch value of the small vessel fleet increased fourfold over 15 years from 1982 to 1997.
9. After 1990, Icelandic fisheries enterprises expanded their operations abroad and bought or founded companies in other countries, e.g. in Chile, Mexico, Germany, France, Spain, Canada and Norway. Such enterprises were very rare prior to 1990.
10. Iceland's fisheries are a small-scale industry. The mergers mentioned before usually took place among bigger companies. Big companies are those which employ a workforce in excess of 60 man-years. In 1997, 4% of Icelandic fisheries enterprises had a workforce exceeding 60 man-years. This proportion was 6% in 1983. Small and medium-sized enterprises (SMEs) are those which employ a workforce of less than 10 man-years. In 1983 the proportion of those enterprises was 70% but in 1997 this proportion was 81%. The total number of enterprises has increased in these 14 years by 4%. The trend is for the big companies to become bigger and fewer and the SMEs to grow in number. The introduction of fish markets after 1987 made it easier for small companies to operate in fish processing.
11. There were great changes in the Icelandic national economic policy in 1990, when the government, the labour unions and the federation of employers made a joint effort to reduce inflation. From 1980 to 1990 the annual rate of inflation had been 30.8%, but from 1990 to 1997 the annual inflation rate was 3.8%. This is a huge difference and represented a significant contribution to the improvement of the operating results of the enterprises.
12. There have been improvements in productivity over the past two decades, especially in fishing but to some degree also in fish processing. The reasons for this trend include the decrease in inflation, the effect of the fisheries management system, technological progress and quality improvement (Einarsson 1992). Capital assets in fisheries increased threefold from 1970 to 2000, but capital assets in machinery and technical equipment increased fivefold over the same period, both in real terms (Statistics Iceland 2001).

#### **4. Operating Results**

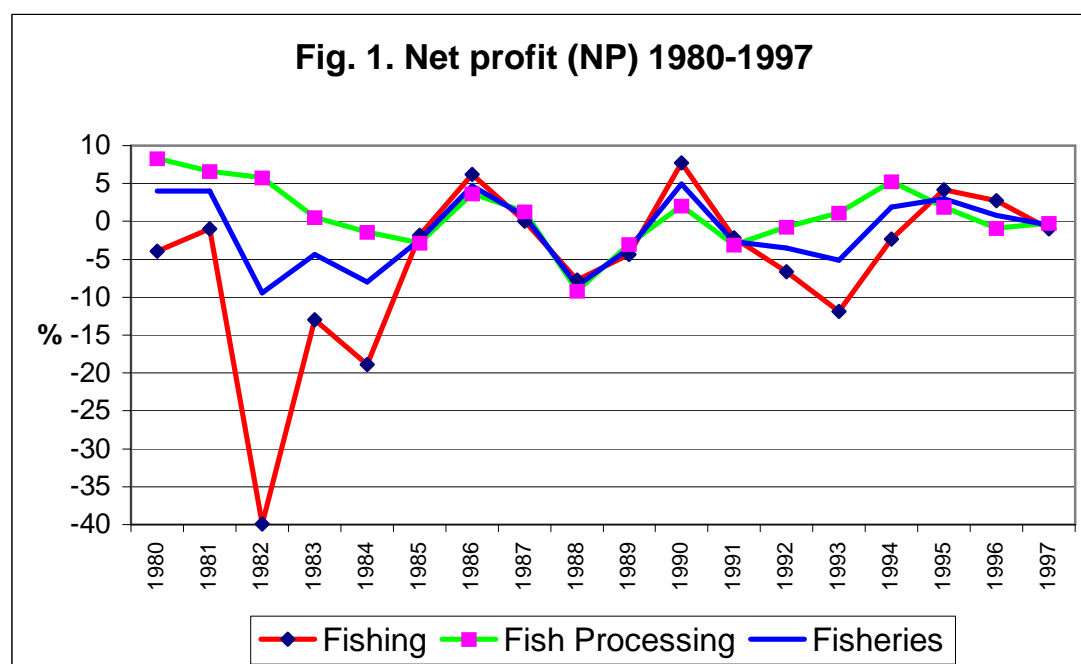
The operating results of enterprises engaging in fisheries in Iceland have fluctuated greatly in the course of the past two decades. In this part of the paper we will analyse the results of the fishing, fish processing and the fishing sector as a whole. We will look at three types of profits: net profit (NP), earnings before interest, taxes, depreciation and amortization (EBITDA), and earnings calculated by the annuity method (EBAM).

In Iceland it has been difficult to evaluate the financial statements of enterprises, especially the interest, owing to the high rate of inflation. Under Icelandic accounting law an inflation adjustment process was introduced to meet this problem by displaying the impact of inflation in the accounts and showing real interest, but even so the National Economic Institute has developed a method of subtracting an annual cost item instead of the registered interest and depreciations, annuity method. This is done to enable more accurate comparison of financial statements between years and to differentiate between fishing and fish processing, as most companies operate both in fishing and fish processing and do not always differentiate clearly between the two in their accounts. This annual cost item is calculated, in the case of fishing, from the insurance value of the vessels and, in the case of fish processing, from used capital, bearing in mind the lifetime of the plants and equipment.

Table 1 shows the net profit (NP) and the earnings by the annuity method (EBAM) as a share of regular income of almost all enterprises in the fishing sector in Iceland (National Economic Institute. Annual Reports 1987-2000 and National Economic Institute. Historical Data 2001).

Year	NP			EBAM		
	Fishing	Fish processing	Fisheries	Fishing	Fish processing	Fisheries
1980	-3.9	8.3	4	-8.1	-1.9	-5.8
1981	-1	6.6	4	-11.8	0.2	-5.7
1982	-39.9	5.8	-9.4	-21.9	2	-8.6
1983	-13	0.5	-4.4	-16.1	-0.8	-9.1
1984	-18.9	-1.4	-8	-9.5	-4.6	-9.2
1985	-1.8	-2.8	-2.4	-3.8	-3.3	-4.9
1986	6.2	3.7	4.7	0.7	1.1	1.3
1987	0	1.3	0.7	0.2	-0.2	0
1988	-7.7	-9.2	-8.5	-1.1	-5.9	-5
1989	-4.4	-3	-3.6	-2	-1.1	-2.1
1990	7.7	2.1	4.9	2.5	-0.5	1.4
1991	-2.2	-3.1	-2.7	1.3	-1.7	-0.3
1992	-6.6	-0.7	-3.5	2.5	2.1	3.2
1993	-11.9	1.1	-5.1	2.7	3.1	4
1994	-2.3	5.3	1.9	1.5	5.5	5.1
1995	4.2	1.9	3	4.9	1.2	4
1996	2.7	-0.9	0.8	4.5	-1.1	2.1
1997	-1	-0.2	-0.5	1	3	2

Figure 1 and figure 2 show graphically the net profit and earnings by the annuity payment method of the fisheries enterprises included in table 1.



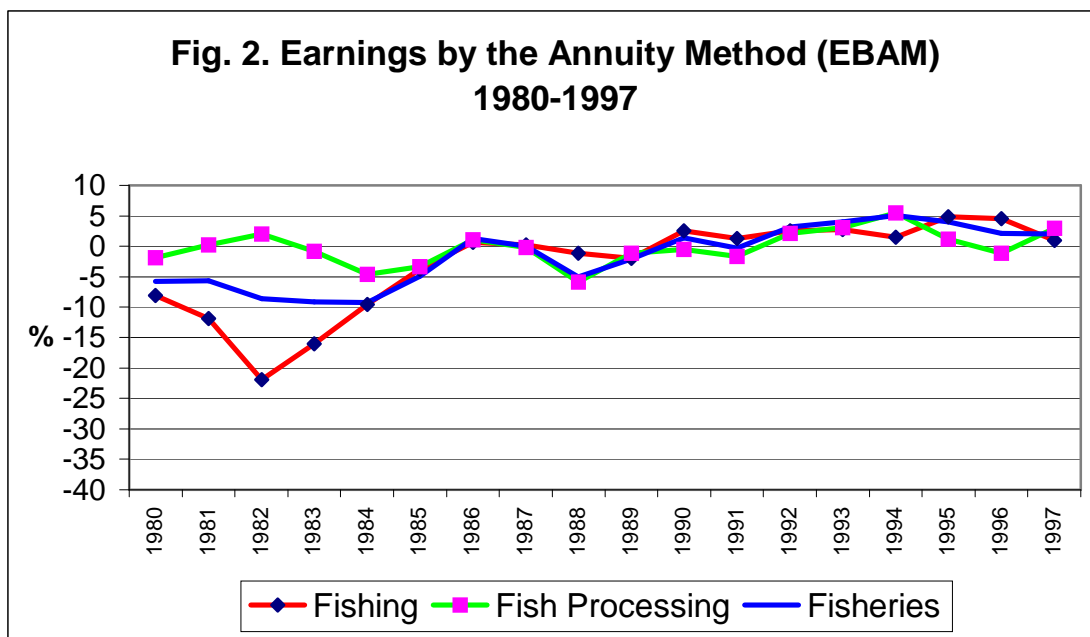


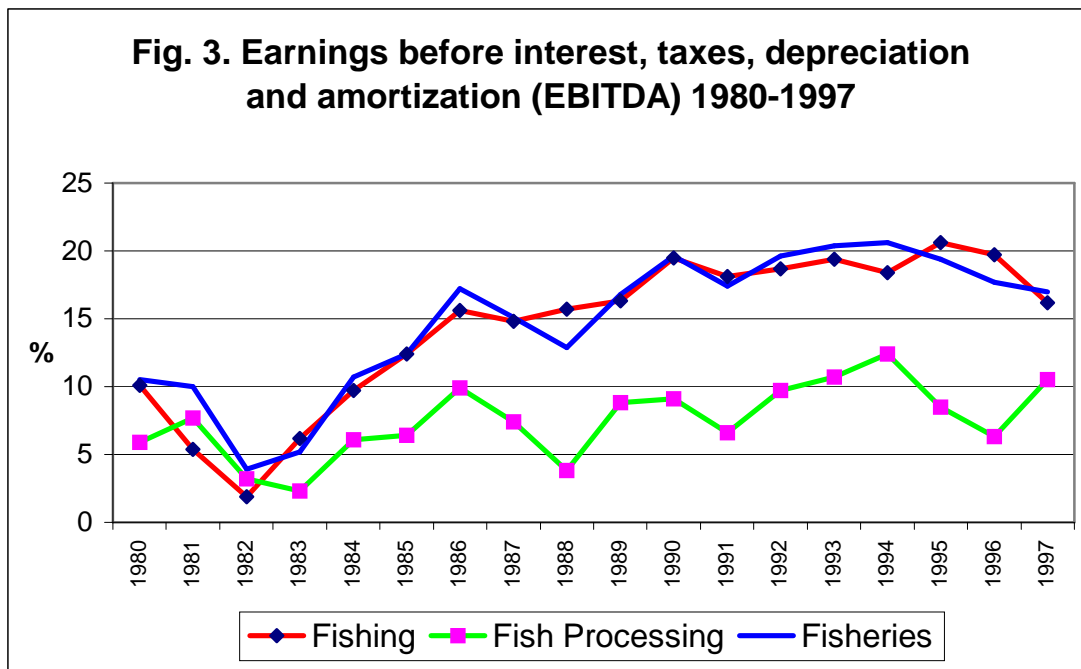
Table 1 and fig. 1 show that the net profit fluctuates greatly. As a proportion of net income it ranges from losses of 40% to gains of 6%. In 13 of these 18 years, fishing registers losses. Fish processing shows better results, from annual losses of 9% to gains of 8%. Fisheries as a whole are operated with losses for 10 of the 18 years. The annual average loss is 1.3%. The period from 1990 to 1997 is better, with an annual average loss in fisheries of 0.2%.

Fig. 2 shows much less fluctuation than fig. 1. EBAM for fishing this period shows performance ranging from 22% annual losses to gains of 5% and the second half of the period is much more successful. Fish processing shows a more even result over the whole period. Financial cost differs substantially from one year to the next, which is one of the reasons for the use of EBAM.



<b>Year</b>	<b>Fishing</b>	<b>Fish Processing</b>	<b>Fisheries</b>	<b>Index of catch value (m)</b>	<b>Real exchange rate (r)</b>
1980	10.1	5.9	10.5	100	100
1981	5.4	7.7	10	99.9	104.3
1982	1.9	3.2	3.9	88.1	95.7
1983	6.2	2.3	5.2	82.6	90.2
1984	9.7	6.1	10.7	92.9	94.6
1985	12.4	6.4	12.4	105.3	93.1
1986	15.6	9.9	17.2	119.4	94.9
1987	14.8	7.4	15.1	126.4	104
1988	15.7	3.8	12.9	132.7	109.3
1989	16.3	8.8	16.8	131.3	100.5
1990	19.5	9.1	19.6	128.9	97.2
1991	18.1	6.6	17.4	123.8	99.8
1992	18.7	9.7	19.6	122.5	99.7
1993	19.4	10.7	20.4	126.3	94.3
1994	18.4	12.4	20.6	123.9	89.1
1995	20.6	8.5	19.4	122.4	89.3
1996	19.7	6.3	17.7	128.3	89.5
1997	16.2	10.5	17	124.7	90.2

Table 2 shows earnings before interest, taxes, depreciation and amortization (EBITDA) for fishing, fish processing and fisheries. Fig. 3 shows EBITDA in fishing, fish processing and fisheries. In fishing, the EBITDA ranges from 2% to 21% over the period and the operating results are improving during the period. In fish processing, EBITDA ranges from 2% to 15% and EBITDA in fisheries as a whole in this period ranges from 4% to 21%.



Column 5 in table 2 represents an index of catch and catch value. This index reflects the quantity of the catch and the international price of fish products for each year. Column 6 in table 2 shows the real exchange rate relative to prices. The real exchange rate heavily influences the operating results of fisheries.

Our assumption is that the operating result, i.e. EBITDA, of enterprises in fisheries can be expressed as a function of the catch value index and the real exchange rate. It is logical that profit increases if quantity or price increase and if the real exchange rate decreases. To illustrate this relationship we use multiple regression and the logarithm of the indices. Equation (1) shows EBITDA in the year  $t$  where  $m_t$  is the catch value index for the year  $t$  and  $r_t$  is the real exchange rate for the year  $t$  based on the price level.

$$(1) \quad EBITDA_t = -17,031 + 31,450 * \log m_t - 25,668 * \log r_t$$

(3,363)                      (8,331)

The results are shown in table 3.

ANOVA						
	<i>df</i>	<i>SS</i>	<i>MS</i>	<i>F</i>	<i>Significance F</i>	
Regression	2	377,8883	188,9441	45,06413	4,55E-07	
Residual	15	62,89174	4,192783			
Total	17	440,78				
	<i>Coefficients</i>	<i>Standard Error</i>	<i>t Stat</i>	<i>P-value</i>	<i>Lower 95%</i>	<i>Upper 95%</i>
Intercept	-17,031	38,87177	-0,43813	0,667534	-99,8843	65,82225
Index of catch value	31,45045	3,362625	9,352946	1,2E-07	24,28318	38,61772
Real exchange rate	-25,6675	8,331414	-3,08081	0,00761	-43,4255	-7,90954

The Durbin-Watson test statistic suggests that autocorrelation is not serious. The simultaneous correlation between  $\log m_t$  and  $\log r_t$  suggests that multicollinearity is modest. The F-value of 45.06 together with the t-values, shown in parenthesis in equation (1), shows that the parameters of the model are highly significant. Based on the above and the fact that the coefficient of multiple correlation R is 0,93, it is concluded that  $m_t$  and  $\log r_t$  are important explanatory variables. Signs of the estimated parameters are as expected. The interpretation is that an increase of the catch value index from 110 to 121, or 10%, means a change in profit of 3%. A decrease in the real exchange rate from 100 to 90 increases the profit by 2.7%. This shows that a change in quantity and price of the catch and real exchange rate influence the operational results greatly.

## 5. Conclusions and Prospects

There have been great changes and modifications in Icelandic fisheries in recent decades. These changes can be divided into 12 categories. We analysed the operating results of enterprises in fisheries, i.e. in fishing and fish processing, for the last two decades, which have shown great fluctuations in net profit, profit measured by the annual payment method and EBIDTA. There is a statistically significant correlation between operating results and the indices of catch and catch value and the real exchange rate.

Enterprises in fisheries reflect numerous kinds of externalities. In this context it is interesting to analyse the effects of mergers of enterprises on the operating results and the changes in regional development. Furthermore, a closer look at the many changes in fisheries in Iceland, which surely have also occurred in other countries in one way or another, is also an interesting subject for research. Investments in fishing permits over a longer period accompanied by increased education among employers, especially at the management level,

and reduced inflation have most likely influenced the operating results of fisheries enterprises in recent years. A comparison of the operating results between companies in various countries could help to explain the different impacts of different fisheries management systems.

## References

- Arnason, R. Property Rights as an Organizational Framework in Fisheries: The Cases of Six Fishing Nations in B.L. Crowley (ed.). Taking Ownership: Property Rights and Fishery Management on the Atlantic Coast. Atlantic Institute for Market Studies, 1996
- Chaston I. Managerial Effectiveness in Fisheries and Aquaculture. Fishing News Books Ltd., Farnham, 1988
- Einarsson A. Icelandic Fishmarkets. Icelandic Economic Issues. Reykjavik, 1991.
- Einarsson A. Quality Planning and Fisheries Management in: Quality Issues in the Fish Industry. University of Iceland. Reykjavik, 1992
- FAO. The State of World Fisheries and Aquaculture. Rome, 2000.
- National Economic Institute. Annual Reports. Reykjavik, 1987-2000.
- National Economic Institute. Historical Data 1945-2000, Reykjavik, 2001.
- OECD. OECD in Figures. Paris, 2001.
- Petursdottir G. (Ed.). Property Rights in the Fishing Industry. Fishery Research Institute. Reykjavik, 1997.
- Statistics Iceland. Fisheries Statistics 2000. Reykjavik, 2001.