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Cost-benefit analysis of the Greenland offshore shrimp fishery

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Cost-Benefit Analysis of the Greenland Offshore Shrimp Fishery

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Abstract

This paper examines the social economic value of the Greenland off-shore shrimp fishery. The contribution of the fishery to the economy is examined using a cost-benefit analysis where the objective of the report is to examine the current state of the fishery rather than possible changes, which are a political decision.

The analysis is undertaken by examining the state and development of the off-shore shrimp fishery in Greenland, as well as the changes in profits, sales and production in the years 2006 and 2007. Financial accounts and costs data provided by the companies fishing in Greenland have contributed to estimating the net value of the industry. The management cost is included as well in the analysis.

The paper concludes that there is a positive economic benefit from the shrimp fishery in Greenland, which is believed to be caused by the efficient management system of the fishery (based on Individual Transferable Quotas). It is further shown that the companies and the crew gains nearly the whole net-benefit from the fishery, while the public finance are not gaining much.

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Keywords: Greenland, shrimp, fishery, Cost-Benefit Analysis, economic rent

1. Introduction

Shrimp fishery is an important industry for Greenland as most of its exports are fish and shrimp products. Various developments in the industry have been observed in the last two decades. These include the introduction of Individual Transferable Quotas (ITQs), the reduction in the fishing fleet and the emerging of a few main companies that deal with shrimp fishing. Moreover, decreasing shrimp prices internationally have influenced the development of the industry.

The aim of this paper is to analyse and assess the economic contribution of the offshore Greenlandic shrimp fishery to the economic welfare of Greenland. In order to determine the economic value of the industry a cost-benefit approach is applied. The aim is *not* to assess the economic impacts, i.e. the economic activity generated by the fishery, but the economic net benefit or rent of the fishery. The surplus of output over input value is a measure of the net benefit (economic rent or added value) generated by using inputs or resources (labour, capital, biomass, oil, etc.) to produce shrimp products. Positive added value[1] is a gain to the economy as a whole: Production generates outputs that are more valuable than the resources used in creating it. Another objective is to show the distribution of the total added value between the different economic agents in Greenland.

This analysis is based on information from the accounts of the offshore shrimp-fishing companies about their activities in Greenland, which has been acquired with a questionnaire sent to the companies. This questionnaire can be acquired by contacting the authors. The companies that have been included in this analysis are Ice Trawl A/S, Niisa Trawl A/S, Polar Seafood Trawl A/S, Qajaq Trawl A/S and Royal Greenland A/S. From Greenland Statistics we have received yearly accounts, allocated quotas and catches of each firm.

1 Another concept is value added, which is calculated as the value of outputs minus the expenses to materials. Value added does not reflect that the use of capital and labour has an (opportunity) cost, and hence it can be considered as a measure of the economic impacts of the production.

This paper includes three main parts – a methodology part discussing the cost-benefit approach used (section 2), an introduction to the fishery and the management system presenting the main characteristics of the Greenlandic shrimp fishery (section 3), and a result and discussion part (section 4 and 5). The paper ends with the conclusion, which summarises the main findings of this analysis.

2. Methodology

The purpose of the following chapter is to explain the necessary methodology in order to be able to perform the analysis. The first step is to define the overall constraints of the final analysis, meaning which steps of the product life cycle will should be included. Due to the aim of this report, the authors have set the constraints from sea to sales of the shrimp product out of Greenland. Sea in this context is defined as all activities necessary in order to fish the shrimps limited to Greenland as the fishing area, whereas sales refers to the delivery of the product to the sales companies, which can also be situated in other countries. Subsequent steps will therefore be disregarded.

The second necessary step is to acquire information concerning the production and cost and earnings of each vessel. This was obtained by asking the companies to complete a spreadsheet about all costs, operating profit and investments for each vessel in each target year, as well as the type of product specified in shrimp size category, unit size of shrimp packs, quantity of catch and finally the price. All data focus on the shrimp fishing and production for the target years 2006 and 2007. This information is supplemented with the annual accounts and data on yearly quotas and catches from Greenland Statistics.

Subsequently a cost-benefit analysis approach is used in order to analyse each vessel separately and the total costs and benefits generated by the industry.

2.1. A short introduction to cost-benefit analysis

There are several reasons why cost-benefit analysis (CBA) is a useful economic policy evaluation tool, see Arrow *et al*. (1996). CBA is the most comprehensive one.[2] Economic evaluation tries to assess the social desirability of a regulation compared to a given baseline situation or some other alternative but can also be used as an approach to determine the actual state of a given situation. Therefore economic evaluation can help public policy in focusing on the need for regulation and to find the scope and design of the regulation, e.g. by showing that a current regulation is not least-cost efficient. In cost-benefit analysis the impacts in terms of benefits and costs are systematically determined and compared by transforming the impacts to monetary units.[3] CBA has also been applied to evaluate fishery policy by Freese, Glock og Squires (1995), Herrick *et al.* (1994) and Schwindt *et al.* (2000). Brown and Macfadyen (2007) apply a cost-benefit analysis to evaluated management responses to "ghost fishing".

The basic foundation in CBA is a financial statement of the (changes in) the flow of income and cost that the (new) regulation cause for the consumers and producers, i.e. the consumer and producer surplus[4] are determined. As part of the CBA, the single producer's income and cost can be determined making it possible to set up an individual profit balance. This is important information, because changes in profit influence the producer's incentives and hence reaction to policy changes. Considering these aspects and due to the focus on incurred costs and gained benefits by a society from a certain resource use makes cost-benefit analysis an economic rather than a financial analysis. Therefore,

2 Another method is cost-effectiveness where the ratio between impacts measured in physical terms and the monetary cost are compared of different alternatives. In this case the benefits are not assessed in monetary terms.

3 It is not possible to "put money on all impacts". However, a complete cost-benefit report will contain a description of the non-monetary impacts.

4 Consumer surplus is defined as the difference between the price consumers are willing to pay for a certain product and the price they actually pay; producer surplus expresses the difference between the price that producers are willing to supply a market and the price they actually receive.

the financial statement has to be corrected, so the statement is seen from a social point of view. Certain payments that occur in a financial analysis do not reflect a transfer of resources from one member of society to another and are irrelevant from the perspective of society as a whole and are therefore not considered in cost-benefit analysis. Neglected transfer payments include direct taxes, interest payments as well as depreciation, whereas subsidies, for example, need to be included since they represent a real resource cost to the society. Furthermore, it is important for a CBA to consider the following:

- whether market prices can be applied directly or a shadow price has to be calculated (more about this aspect latter),
- the extent of externalities (in fisheries there are normally significant negative externalities), and
- the mentioned flow of transfers which in a private analysis count, but not in social analysis.

Finally, also cost from changes in management can be important to include. Since these costs normally are not included, the implicit assumption is that the changes in management cost are zero. This might be a reasonable assumption, when small changes in management are analyzed. Since we are assessing the actual economic state of the fishery, the current management cost is included.

The time perspective is a crucial issue in CBA, because often the cost will be high in the short term due to initial investment cost, while the benefits tend to be higher in the medium to longer term. Therefore, in order to be able to compare the changes in benefits and costs they are discounted back to the present period, given present values. The weighting of these flows at different time periods is possible by using the price of holding money, the discount rate. The choice of discount rate is important and has to reflect the weight the society put on the future. It is more or less accepted that a private agent tends to discount the future too much and hence the social discount rate is smaller than the market money rate. However, the choice of the appropriate interest rate to use for

the discounting is a widely discussed topic (see e.g. Weitzman 2001). We will not consider this further in the paper. Nevertheless, the applied discount rate will be stated and briefly argued in the analysis section 4.

The goal of economic organization is to maximize the net benefit or added value emanating from the production of goods and services over time. The overall economic net-benefits to the society of the fishery are therefore determined as follows:

$$\text{Net-benefits to society} = \text{NPV (benefits} - \text{costs} + \text{external benefits} - \text{external costs)} \quad (1)$$

where NPV is the net present value of the elements in the brackets since timing of costs and benefits matters. If the net-benefits (or NPV) to society are positive then the regulation or the actual state of a situation contributes to the economic welfare, which means that the overall possibilities for consumption are increased. However, the analysis concerning the distributional issues as who will experience a gain and who will experience a loss is in this perspective not relevant, only that potential gainers could compensate the potential losers such that both would be better off (Pareto efficient). It is not the case that the compensation actually happens; merely that it is possible (potential Pareto improvement). However, in practice distributional issues and consequences are important and normally included in the cost-benefit analysis. In this part the financial flows becomes important.

3. State and development of Greenlandic shrimp fishery

The North Atlantic Ocean is abundant in northern shrimps (Pandalus Borealis), which are the primary shellfish there. In Greenland, shrimps have been harvested for more than 100 years, while since the 1960s the greatest increase in commercial shrimp-fishing has been observed (Hvingel 2006). Greenlandic shrimps are considered of high quality and have high retail value. In 2005, the European Union imported more shrimps from Greenland than from any other

country (European Commission 2007a). Nowadays approximately 85% from the Greenlandic exports are fish products, from which 55% are shrimps (Statistics Greenland 2007).

3.1. The shrimp fishing regulations: Individual Transferable Quotas (ITQs) and Total Allowable Catch (TAC)

Shrimp fishing is regulated by quotas and licence regulations, where the Total Allowable Catch (TAC) is based on the biological advice by the North Atlantic Fishing Organisation in order to ensure sustainable use of the resource. The TAC for shrimps has increased from 50,000 tons in 1990 to over 130,000 tons in 2007 and it is assessed that currently the amount of harvested shrimps is at the Maximum Sustainable Yield (Hvingel 2006; Sermitsiaq 2007).

Individual transferable quotas (ITQs)

In general, fisheries can be organised by many different property rights arrangements, whereas sole ownerships, territorial use rights, individual non-transferable quotas and individual transferable quotas are some of the most used arrangements nowadays. Individual quotas basically define property rights in harvesting volume. Referring to the literature these property rights are of high quality, when being permanent, exclusive, secure and transferable. Therefore, it is argued that if other market imperfections are disregarded, harvesting with the usage of individual quotas will be conducted in an economically efficient way. This in return implies that the total allowable catch will be taken at minimum cost (Arnason 2005). Greenland's individual transferable quota system for offshore and coastal shrimp fisheries has been introduced by the Ministry of Fisheries and Hunting in 1990 and 1997 respectively. It is stated that this system sufficiently regulates fishing capacity according to the available resources and assures that quota owners do not have any economic incentives to invest more than their respective quota share can support (OECD 2005). The Greenland Home Rule determines the TAC each year and may renew the allocation of the individual shrimp quotas every five years. The TAC is usually determined in

accordance with the advice from international research institutions such as ICES (International Council for the Exploration of the Sea) and NAFO (North Atlantic Fisheries Organization).

The Greenland Fisheries License Control (GFLK) is in charge of the control and compliance with quota and license regulations and is also responsible for monitoring Greenlandic vessels fishing outside Greenlandic waters. In average about 50 fisheries license controllers are employed at the GFLK. Furthermore, two inspectors are installed onboard on all high sea vessels in Greenlandic waters and a satellite system has been installed in order to control the operations and monitor all trawler movements and activities in Greenlandic waters respectively.

TACs and Greenland quotas

Table 1 depicts the Greenlandic fishing quotas for the year 2000 till 2008. The most important result analysing the data is that the fishing quota for shrimp has increased considerably during the last decade. In 2000 the total quota was 104.000 tons, while in 2003 it increased to 129,000 tons and in 2007 to about 135.000 tons (OECD 2005; Departementet for Fiskeri, Fangst og Landbrug 2007). In comparison, the shrimp quota was only 47,900 tons[5] in 1997 (Anon 1998). Being more specific for the year 2006 and 2007 it can be stated that about 41% of the quotas have been issued for inshore shrimp fishing, whereas the other 59% for offshore fishing and are allocated in the following way: 5% to the East coast and 54% to the West coast of Greenland in 2006 and 4% and 55% in 2007 respectively. Furthermore, it is important to mention that most shrimp fishing is undertaken by Greenlandic companies where the European Union has an agreement of up to 11,000 tons per year for the period 2007-2012 (European Commission 2007b).

5 However, the figures can't be compared directly. The figure for 1997 has to be adjusted by a conversion factor, so the adjusted TAC is close to 70,000 ton.

Table 1. Total Greenland fishing quotas for shrimp for Greenland fleet 2000-2008. Thousand tons

Year	2000	2001	2002	2003	2004	2005	2006	2007	2008
West Greenland In-shore Off-shore	95.5 46.2 49.3	113.0 48.3 64.7	112.2 44.9 67.3	123.0 52.9 70.1	130.0 55.9 74.1	130.0 55.9 74.1	130.0 55.9 74.1	130.0 55.9 74.1	123.3 53.0 70.3
East Greenland	8.5	6.0	6.0	6.0	6.7	6.7	6.7	5.4	5.4
Total Fishing quotas for shrimp	104.0	119.0	118.2	129.0	136.7	136.7	136.7	135.4	128.7

Source: Anon 2008.

3.2. The off-shore shrimp industry

The shrimp-fishing industry is highly specialised as it involves long-term investments in large shrimp-harvesting vessels that can process the shrimps onboard. These trawlers are usually allowed to process up to 75% of their catch onboard (FAO 2008). The last 25% of the catch has to be landed to on-shore production facilities where the shrimps are processed to an un-peeled product. Smaller vessels have reduced in number due to the restructuring of shrimp fishing industry and the introduction of Individual Transferable Quotas. Today small vessels harvest only inshore (Hvingel 2006). Currently, there are five-six main companies who harvest shrimp offshore and which altogether possess approximately 10-11 vessels,[6] see Table 2.

6 During 2006 and 2007 there have been some mergers between companies, which make it difficult to state the exact amount of firms and vessels.

Table 2. Number of vessels in the off-shore shrimp fishery in the period 1990-2007

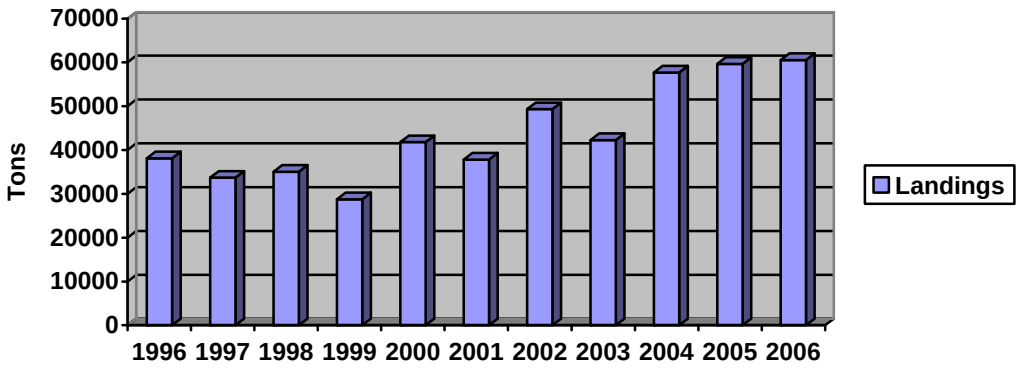
Year	1990	2003	2006	2007
Number of vessels	46	12	11	11

Source: Anon 2006a and catch reports from GFLK.

Production and price development

Offshore shrimp catch in 2007 was 71,800 tons, which was a 1.7 % increase from the year before (Departement for Fiskeri, Fangst og Landbrug 2007). Landings to on-shore shrimp processing facilities have increased from approximately 24,000 tons in 1987 to 60,000 tons in 2006 (see following figure), whereas about 45,000 tons is from the inshore fishery.[7]

Figure 1. Landings to production facilities in the period 1996-2006

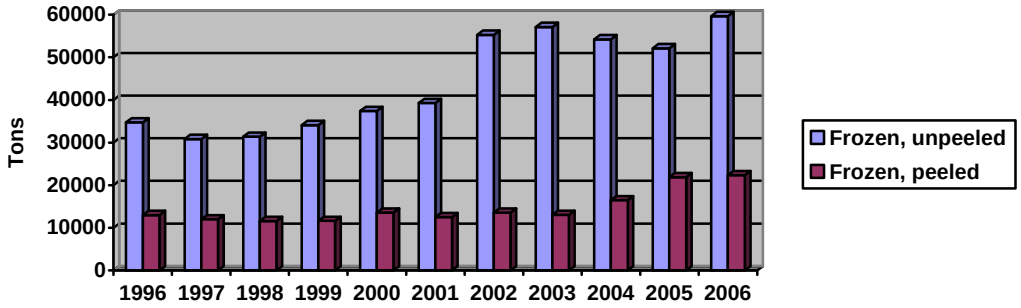


Source: Statistics Greenland.

Shrimp production is divided in two main categories – frozen, peeled shrimps and frozen, unpeeled shrimps. The variations in production and export of each type can be seen in the following figure.

7 As the vessels are smaller in the inshore fishery most of them is landing all their catches to the on-shore production facilities.

Figure 2. Shrimp exports 1996-2006

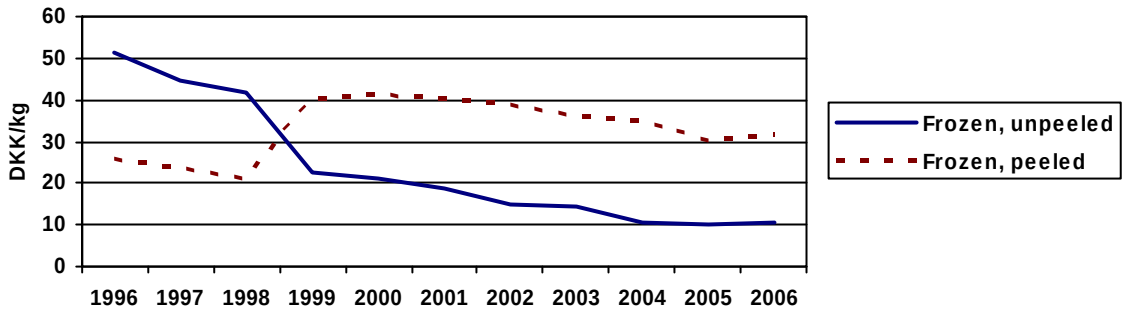


Source: Statistics Greenland.

Furthermore, shrimp prices changes for each production type are shown in Figure 3. Shrimp prices have changed in a non-uniform way. Especially the frozen, unpeeled shrimps have reduced in value by a factor of 5 in the period 1996-2006. This decrease has been triggered most likely by the increased world market supply of warm-water shrimps, mostly from Asian countries (Departementet for Fiskeri, Fangst og Landbrug 2008).[8]

8 The jump in prices for peeled shrimp in 1998 is due to change in the principle of transfer prices (pers. comm. 2009).

Figure 3. Shrimp export prices (Danish kroner per kilogram). Current prices. 1996-2006



Source: Statistics Greenland.

Employment

Fishing (including processing) is the primary industry in Greenland and employs 25% of the work force. The processing industry accounts for 40% of that share, whereas fishing accounts for the remaining 60% (OECD 2005). It has not been possible to get exact information about the employment numbers. However, in the official company accounts the average employment is disclosed to be around 31 per vessel. In the Anon (2006a) the employment per vessel is assumed to be 40-50, while in Anon (2006b) the employment per vessel is assumed to be around 40. The employment rate has an impact on the assessment of the net benefit from the fishery and the distribution of the net benefit between vessel owners, crew and the public sector. We will therefore apply sensitivity analysis to the employment figure, assuming either an employment of 30 or 40 persons per vessel.

4. Assessment of the benefits and cost

One has to realise that the assessment of benefits and cost by estimating the value of the shrimp and the cost to harvest them has the limitation that it does not address the potential net benefit of the harvest if the fishery was better man-

aged, i.e. the benefits and cost is specific to the current regulatory system. However, the ITQ management of the fishery is assessed to be highly efficient (Anon. 2006a) and consequently, using the actual benefits and costs are assumed not to be a serious limitation.

Equation (1) can be formulated as follows:

$$NPV = \sum_{t=0}^{20} \frac{B_t - C_t}{(1+d)^t} = \sum_{t=0}^{20} \frac{HV_t - (PC_t + HRC_t + EC_t)}{(1+d)^t} \tag{2}$$

where benefit (B) is equal to the value of harvest (HV). Cost (C) is equal to private cost (PC), Home Rule cost (HRC) and external cost (EC). All the benefits and cost are evaluated at their willingness to pay and opportunity cost, i.e. market or observed prices are adjusted to reflect people's willingness to pay or what they have to give up when using the factors in the shrimp fishery. In the following we will assume that the external cost of the fishery (EC) is equal to zero. We hereby ignore the value of other species that prey on shrimp (e.g. cod),[9] and the existence values associated with preservation of this resource. We also ignore the impact the fishery might have at other fish stocks through the catch of juveniles.

In the following we determine the harvest value, the private cost and the management cost.

4.1. Total harvest and value of the harvest

We assume that the gross benefits of the shrimp harvest in any given year are reflected in the landed value of the catch (producer surplus). This ignores potential consumer surpluses. However, this is not a significant problem, because

9 Since the 1970s the cod stock in Greenland waters have been low and therefore this effect of the shrimp fishery is insignificant. This might change in the future due to climate changes, see Vilhjálmsson (2005).

most production is exported, and we assume, as is the usual convention, that only those costs and benefits that accrue to Greenland count. Under these circumstances, consumer surpluses accruing to people from Greenland are very small and can therefore be safely omitted from the calculations.

The answers from the 5 companies include 7 vessels in 2006 and 9 vessels in 2007, which explains why the reported catches in Table 3 are lower than in Table 1. The whole off-shore shrimp fishery in 2006 is therefore not covered. Also the information about production from the companies in Table 3 does not match the catch exactly, which might be due to the different timing of registration of catches and production and differences in the methods of determining catches and production (per. comm. 2009).

Table 3. Harvest volume and harvest value

	2006	2007
Total License/Quotas (tons)*	55,305	70,675
Total catch (tons)*	55,305	64,432
Total harvest value (1000 kr.)**	562,970	679,470
Total Production (tons)**		
Cooked at Sea	23,666	31,286
Raw (“Italy” and “Japan”)	7,803	7,208
Industrial (landed)	14,049	18,028
Total Harvest value (1000 kr.)**		
Cooked at Sea	283,556	402,692
Raw (“Italy” and “Japan”)	132,837	111,509
Industrial (landed)	77,167	96,542

Source: *Catch reports from GFLK. **Information from the fishing firms in the questionnaire.

4.2. Private cost

We are interested in both the private harvest cost and public sector costs. The primary source of information on the costs of operating the shrimp fleet is the data provided by the companies in their yearly accounts. It is reasonable to assume that expenditures on inputs approximate the opportunity costs of the inputs. There is no reason to believe that industry purchases have a significant impact on input prices or that the markets for most inputs are distorted. Many of the inputs are imported and hence the price is determined by the world market prices. However, crew costs may be an exception. This issue will be investigated in more detail in the next section.

Operating expenses (fuel, other), crew wages and fixed annual costs (e.g. repairs and gear) are included under “running costs”. To assess the capital cost, an estimate of the opportunity cost of capital investment annually is required in the framework we use here, which is not straightforward. The costs of investments should be converted into a value of the stream of consumption that would have resulted if the investments had not taken place. The opportunity cost or shadow price is the return the capital could have earned in its best alternative use. Estimating this shadow price includes an assessment of the gross rate of return applicable to this capital and the economic depreciation rate (Hulten, 1990). The capital cost included in the annual accounts cannot be applied directly. First, the figures do not include the opportunity cost of the equity capital. Second, they use depreciation claimed for accounting purposes, not based on an economic rate. Third, they include cost for all capital employed in the industry. The first two issues do not need more clarification as they are common in CBA; the third issue is however not common and deserves some elaboration.

Table 4. Cost in the shrimp industry. 1000 kr.

		2006	2007
Running costs	Operation expenses	202,240	243,739
	Fuel	118,488	138,595
	Landing, packages	57,925	70,349
	Admin. and crew	25,827	34,796
	Wages	139,954	177,649
	Fixed costs	59,333	68,274
Capital costs		85,755	106,307
Total private cost		487,283	595,970

A significant portion of the capital employed represents the value of ITQ fishing licenses which from the perspective of the fishermen is an asset. Needless to say, an ITQ license is a requirement for participation in the fishery. For those who purchased their licenses, the cost of the ITQ license is a significant part of their capital investment. From a social point of view, the value of the ITQ license should not be included in the capital stock used to harvest shrimp, as it is not a real resource that is used up in the process of catching shrimp.[10]

Therefore, to estimate annual capital costs, we have ignored the value of ITQs licenses and used only vessel values. Using the answer from the questionnaire, we assume that the useful life of a fishing vessel is 20 years. To determine the rate of return applicable to this capital, we use annual rates of return to capital employed at 7 %. The annuity, i.e. the annual capital cost is then calculated using the well-known formula:

10 This will be an example of the well-known "double-counting" problem in CBA, see Schwindt et al. (2000).

$$I = capital\ cost * \frac{1 - \frac{1}{(1+r)^n}}{r} \tag{3}$$

where I is the investment, r is the discount rate and n is the time horizon of the investment.

4.3. The management cost: Greenland Home Rule[11]

In addition to the private costs incurred by fishermen, the Greenland Home Rule, who has the responsibility for the shrimp fishery, spends resources to manage the shrimp fishery. The government expenditures on the fishery will approximate the social cost. However, it is difficult to quantify the costs of managing the shrimp resource for a number of reasons. Several public agencies and hence budgets are involved, and it is difficult to accurately share these various budgets and expenditures to the shrimp fishery. And while some costs are directly derivable from budgets, other costs are indirect and extremely difficult to accurately estimate. There are no species-specific management budgets of Greenland Home Rule. However, it is possible to estimate an order of magnitude with respect to expenditures by the Home rule government. The expenditures in the fiscal years 2006 and 2007 are set out in Table 5. We include expenditures on scientific research and advice, control of the fishery and fees for membership of international organizations. The Science research and advice program at the Greenland Institute of Natural Resources involves expenditures on the biological sciences (e.g. stock assessment required to set the total allowable catch).

11 In 2009 Greenland became more independent called the Greenland Self-Government.

Table 5. Public management cost. 1000 kr.

	2003	2006	2007
Greenland Institute of Natural Resources fisheries related activities	20,000	21,224	21,649
Fishery- and License control	26,000	27,591	28,143
Fees for membership of organizations	1,000	1,061	1,082
Total	47,000	49,876	50,874
Off-shore shrimp fishery		17,089	17,431

Source: Information is from Anon 2006a, where the figures from 2003 are found. Assuming an increase at 2% per year gives the figures for 2006 and 2007.

Table 6. Calculation of the off-shore shrimp fishery's share of the total fish export. Mill.kr.

Exports	2006
Fish and fish products	2,038
Total exports of shrimp	1,197
Exports of frozen, unpeeled shrimp	533
Exports of Cooked, peeled shrimp	664
Off-shore shrimp fisheries share of fish exports[1)]	0.3426

It is assumed that 25% of the off-shore catches are produced as industry shrimp and the basis of distribution of total catches between the off-shore and in-shore fleet is 57%/43%.

These calculations yield an estimate of fisheries-related expenditures in Greenland. However, these expenditures relate to all fisheries, not just shrimp. In 2006, the export value of frozen, unpeeled shrimp accounted for 26.2% of the total value of fish exports, see Table 6 for further details. This percent has to be adjusted upwards, because the off-shore shrimp fleet is landing shrimp for further processing on shore as cooked and peeled shrimps (8.1%). Consequently, the share of the off-shore shrimp fishery of total fish exports is 34.3%. Using this assumption that 34.3 percent of the Greenland Home Rule fisheries-related budget can be allocated to the shrimp fishery gives an estimate of Greenland

Home Rule expenditures on the shrimp fishery in 2006. This estimation procedure is also applied to the budget for year 2007. The results are set out in Table 5.

Needless to say, the estimates of government costs attributable to the shrimp fishery are not precise and they may understate public expenditures on this fishery. First, the estimates ignore the Greenland Home Rule expenses in the Directorate of Fishery, Hunting and Agriculture. Second, both the fishermen and other sectors use harbors. Parts of the harbor expenditures can be allocated to the fishery. There is no harbor fee in Greenland and hence the fishing fleets do not pay for using the harbors. Finally, the calculations ignore the marginal excess tax burden, that is, the costs of taxation to fund these government expenditures. However, some revenues are capture from the shrimp tax.

5. Results of the Cost-Benefit Analysis

As said before, we focus on analyzing the current economic value and hence economic contribution of Greenland's off-shore shrimp fishery without comparing this situation to possible changes in the net-benefits to society by applying for example a different fishery policy or a modified resource allocation of ITQs. This means in detail that all benefits and costs including public management cost are assessed annually and discounted to derive the net present value. Furthermore, market prices have been replaced with calculated shadow prices if necessary. This has been the case for the crew cost. Finally, the distribution of the net-benefits is estimated as this is an important policy issue in Greenland.

5.1. Results: Annual net benefits and net present value

The following section presents the numerical results of the analysis, which includes on the one hand side the private and Home Rule costs and on the other hand the production, including the products with the shrimp size categories,

quantities and price per kilo resulting in estimates of the gross output (harvest value).

One missing issue is an evaluation of whether the applied prices reflect opportunity cost. In section 4.2 it was indicated that crew cost might be a problem in that respect. Using the employment figures from the yearly accounts (around 31 persons per vessel) the average yearly salary is estimated to be around 700,000 kr. This figure is very high. Assessing the opportunity cost is however a difficult task. Some of the crew is probably very essential for the fishery and can't be replaced. Therefore just assuming that the opportunity cost is the average income in Greenland will not be correct. It was decided to use the average yearly income of people outside the municipalities, around 460,000 kr., as opportunity cost, because many of these people are highly specialised. This leads to a downward reduction of the labour cost by 1/3 or in other words the crew is receiving some of the net-benefit, i.e. a salary beyond what is needed to keep them employed. This is called crew rent. We will, however, calculate the rent with employment at 40 persons per vessel.

The estimates in Table 7 show that the yearly net-benefit or economic rent from the fishery and hence contribution to the Greenland economy is considerable, around 19% of the total harvest value. It is important to understand that this economic rent is due to an efficient fishery management system. The same kind of management system is also in function in for example Iceland and New Zealand where it has shown the same positive economic results. Needless to say, the size of the economic rent will vary from year to year depending on the price and cost development and the amount of quota (TAC).

Table 7. Annual benefits, cost and net benefits generated by the off-shore shrimp fishery. 1000 kr.

	2006	2007	Average
Harvest value	562,970	679,470	621,220
- Private cost	487,283	595,970	541,626
= Private net benefits	75,688	83,500	79,594
- Home Rule cost	17,089	17,431	17,260
= Fishery net benefits	58,598	66,069	62,334
+ Crew rent[1)]	46,651	59,216	52,934
Social net benefits	105,249	125,285	115,268

1) Crew rent = The difference between the actual salary and the opportunity cost of labour.

The yearly benefits and cost can be extrapolated forward over 20 years using a proper discount rate and the Net Present Value (NPV) using equation (2) can be calculated. Using different assumptions about the social discount rate (3%, 5% and 7%), the net present value of the average annual net benefits using a time horizon at 20 years varies between 1,221 Mill.kr. and 1,715 Mill.kr.

5.2. Distribution of Net benefits

In this section the net benefits are distributed between fishing firms, the crew and the public section, i.e. the Home Rule Government and the municipalities.

In order to be able to do this, the tax revenue has to be calculated. We use the information provided by the firms themselves in the questionnaire and the flat tax rate (42%) for Nuuk, the capital of Greenland. The tax revenue related to the net-benefit is the shrimp tax, the company tax and the tax of the crew rent, see Table 8. Given the tax revenue and the benefits and cost calculated in the last section, it is possible to calculate the distribution of the net benefit or the resource rent between the firms, the crew and the public sector, see Table 9.

Table 8. Calculations of the tax revenue. 1000 kr.

	2006	2007	Average
Shrimp tax	289	379	334
Company tax	1,310	5,055	3,183
Tax of crew rents	19,594	24,871	22,232
Total tax revenue of net benefits	21,193	30,306	25,749

Source: questionnaire and own calculations.

The payments of company taxes are low compared to what a calculated payment would give. The main explanation of this difference is the depreciation rules according to the law, where the vessels are depreciated over 10 years and where also depreciation on licenses is allowed. A calculation applying the depreciation rules confirms that the level of company taxes shown in Table 9 can be expected when the average life of the vessels are less than 10 years. If the average life is higher than 10 years, i.e. the vessels are fully amortized, then the company tax payment increases to a level of around 35-40 mill.kr. Another explanation for the low company taxes may be that some companies have activities beside shrimp fishery that contribute much lesser to the earnings than the shrimp fishery (pers. comm. 2009).

Table 9. Distribution of the net benefits generated by the off-shore shrimp fishery. 1000 kr.

		2006	2007	Average
Private companies	Private rents - Tax payments	75,688 -1,599	83,500 -5,434	79,594 -3,517
	Private surplus	74,089	78,066	76,077
Crew	Rents - Income tax	46,651 -19,594	59,216 -24,871	52,934 -22,232
	Crew surplus	27,057	34,345	30,702
Home Rule + Municipalities	Tax revenue - Government cost	21,193 -17,089	30,306 -17,431	25,749 -17,260
	Public sector surplus	4,104	12,875	8,489

Source: Own calculations.

The analysis of the distribution of the economic rent shows that the private companies and the crew are capturing the main part, up to 90%, see Table 9. If the company taxes are calculated using the tax rules, the annual tax revenue increases with 16 Mill.kr. The total net-benefit does not change but the public sector receives in this calculation a higher share of the rent, around 20%. Such levels of tax payments are however not currently realized and we will not use this calculation further.

If the number of crew members is 40 instead of 30 then the average payment falls and hence the crew rent will fall (Table 7). The salary payment to the crew is now only adjusted by 16%. The overall annual net benefit falls (Table 7) and this will also change the distribution of net benefits in Table 9. The annual net benefit will fall to 87.7 mill.kr. The private companies will have the same surplus, while the net benefits to the crew and to the public sector will fall (due to

less tax revenue from crew rent). The annual surplus to the crew is 14.7 mill.kr., while the public sector in this case has an annual deficit of 3.1 mill.kr.

5.3. Discussion of results

The economic rent or resource rent of the off-shore shrimp fishery is substantial and as explained due to the management system of Individual Transferable Quotas. The sensitivity analysis on the employment per vessel and the discount rate does not change this conclusion. The annual economic rent in 2006 and 2007 on average varies between 87.7 mill.kr. and 115.3 mill.kr. Since economic rent is showing the surplus when all the inputs have been paid, it is in principle a political decision how to share the surplus. The Greenland Home Rule has already a shrimp tax which due to low prices[12] does not provide significant revenue. So, the question is therefore can the revenue to the public sector be increased and under which circumstances is it a good idea? In Anon (2006a) there is a discussion about letting the industry pay for the management cost.

There are, however, limitations for the taxation. The economic rent can be divided into scarcity and intra-marginal rent. The scarcity rent comes from the limitation of a natural resource, here shrimp, while the intra-marginal rent is due to differences in the producers cost, i.e. the fishermen have heterogeneous skills. The "high-liners" in a fishery may have lower unit production costs than on average and therefore they earn intra-marginal rent. It is difficult to capture this part of the economic rent. And it is a very difficult task to separate the intra-marginal rent from the scarcity rent, because it will require a detailed study and estimation of the individual company's production and cost relationship. The off-shore shrimp fleet is relatively homogenous and the products the same, so the intra-marginal rent can be assumed to be relatively low. A second limitation is how the scarcity rent is spent. It is possible to design a system where the

12 If the average sales price is lower than or equal to 13.00 kr. per kilo the shrimp tax is zero. The shrimp tax rate increases by 1% per 1 kr. increase in sales price. The basis of the shrimp tax is the sales prices.

public sector collects a substantial part of the rent without impacting the incentives of the companies, see Kooten and Bulte (2000). If the public sector is spending the money wisely then it might be as good as having the private companies collecting the rent (assuming of course that the private companies are the best to find profitable investments).

6. Conclusion

The economic benefit of the Greenland off-shore shrimp fishery is estimated for the years 2006 and 2007. The annual economic rent or surplus of the fishery is around 100 mill.kr. (19% of the harvest value) which is a result of the current and well-functioning ITQ management system of the fishery. So, the fishery contributes positively to the Greenland economy and significantly, because the Greenland Gross Domestic Product was 10.5 billion kr. i 2007. The analysis has been limited to benefits (and cost) from the fishery accruing in Greenland, i.e. the harvest value is given the prices ab. Greenland.

The economic impact of the fishery is higher because it induces economic activities in e.g. sectors that deliver inputs to the fleet. It is also important to realise that it is easy to increase the economic impacts (f. ex. increase the number of vessels) of the fishery, but this is economically wasteful and will lead to lower growth in general of the Greenland economy.

The collection of the rent or surplus is an open question which - from an economic point of view - depends on how the private and public sector is behaving. A private fishing sector that is capitalizing the rents into the value of quotas ending up as consumption among those who got the quotas or a public sector that use the money for short run popularity are arguments against having both of them to collect the rent. However, a private sector investing the rent profitably or the public sector using the money either to productive investments, e.g. in education, or to replace other taxes, are arguments for having both of them collecting the rent.

These economic arguments may overlook the political economic argument that the Greenland public opinion might not be willing to tolerate the distribution of income resulting from the way the quotas have been allocated, even if they understand the efficiency of the system. So, to maintain a wider acceptance of the system, it may probably be necessary to let the public sector collect a higher share of the economic rent. This acceptance is important, because an abandonment of the fishery management system to a more wasteful one will have a negative impact on the economic growth in Greenland.

References

Anon. 1998. Beretning om den økonomiske udvikling i Grønland i 1996/1997. Det Rådgivende Udvalg vedr. Grønlands Økonomi. Statsministeriet.

Anon. 2006a. Omsættelse kvoter og andre metoder til regulering af reje-fiskeriet. Rapport fra "Det uvildige udvalg" nedsat af hjemmestyret.

Anon. 2006b. Den økonomiske udvikling i Grønland. Det Rådgivende Udvalg vedr. Grønlands Økonomi. 2006. Statsministeriet.

Anon. 2008. Den økonomiske udvikling i Grønland. Det Rådgivende Udvalg vedr. Grønlands Økonomi. 2008. Statsministeriet.

Arnason, R. 2005. Property rights in fisheries: Iceland's experience with ITQs. *Fish Biology and Fisheries* 15:243–264.

Arrow, K., Cropper M., Eads, G., Hahn, R.L.L., Noll, R., Portney, P., Russel, M.S.R., Smith, V., Stavins, R., 1996. Is there a Role for Benefit-Cost Analysis in Environmental, Health and Safety Regulation? *Science* 272:221-2.

Brown, J. and G. Macfadyen, 2007. Ghost fishing in European Waters: Impacts and management responses, *Marine Policy* 31:488-504.

Departementet for Fiskeri, Fangst og Landbrug 2007. Licensoversigt; kvoteoplysninger. Nuuk, Greenland.

Departementet for Fiskeri, Fangst og Landbrug 2008. Redegørelse til Landstinget om TAC og kvoter i 2007. Nuuk, Greenland.

European Commission 2007a. *Trade in agricultural goods and fishery products*. http://ec.europa.eu/trade/issues/sectoral/agri_fish/fish/pq_en.htm, 26 June 2009.

European Commission 2007b. *About the Common Fisheries Policy. Greenland*, http://ec.europa.eu/fisheries/cfp/external_relations/bilateral_agreements/greenland_en.htm, 26 June 2009.

FAO 2008. *Fishery and aquaculture country profile*. Greenland. http://www.fao.org/fishery/countrysector/FI-CP_GL, 25 June 2009.

Freese, S., Glock, J., & Squires, D. 1995. Direct allocation of resources and cost-benefit analysis in fisheries: an application to pacific whiting. *Marine Policy*, 19, 199-211.

Herrick, S. F. J., Stand, I., Squires, D., Miller, M., Lipton, D., Walden, J., & Freese, S. 1994. Application of Benefit-Cost Analysis to Fisheries Allocation Decisions: The Case of Alaska Walleye Pollock and Pacific Cod. *North American Journal of Fisheries Management*, 14, 726-741.

Hulten, C.R. 1990. The measurement of capital. In E. Berndt & J. Triplett (Eds.), Fifty years of Economic measurement; The jubilee of the conference on research in income and wealth. Chicago: University of Chicago Press.

Hvindel, C. 2006. Construction on Biological Advice for the Management of a Northern Shrimp Fishery – the West Greenland Example. Greenland Institute of Natural Resources, Nuuk, Greenland.

OECD 2005. Country Note on National Fisheries Management System – Greenland, http://www.oecd.org/dataoecd/9/48/34431581.pdf, 26 June 2009.

Personal communication 2009. Director Henrik Leth.

Schwindt R., A. Vining and S. Gloverman 2000. Net Loss: A Cost-Benefit Analysis of the Canadian Pacific Salmon Fishery. *Journal of Policy Analysis and Management*, 19(1), 23-45.

Sermitsiaq Avis 2007. Lower shrimp quotas will hurt smaller companies. http://sermitsiaq.gl/erhverv/article25281.ece?lang=EN, 25 June 2009.

Statistics Greenland 2007. Greenland in Figures 2007. http://www.statgreen.gl/dk/aarbog/Greenland%20in%20figures%202007.pdf, 24 June 2009.

Statistics Greenland. Various year. Udenrigshandel. http://www.statgreen.gl/dk/publ/udenhand/, 24 June 2009.

Van Kooten, G.C. and E.H. Bulte. 2006. *The Economics of Nature: Managing Biological Assets*. Blackwell.

Vilhjálmsson, H., A.H. Hoel, S. Agnarsson, R. Arnason, J.E. Carscadden, A. Eide, D. Fluharty, G Hønneland, C. Hvingel, J. Jakobsson, G. Lilly, O. Nakken, V. Radchenko, S. Ramstad, W. Schrank, N. Vestergaard and T. Wilderbuer. 2005. Fisheries and aquaculture. In: *Arctic Climate Impact Assessment* (eds. C. Symon, L. Arris and B. Heal). Cambridge University Press, Cambridge, pp. 691–780.

Weitzman M. 2001. Gamma Discounting. *American Economic Review* 91, 160-171.

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