



Are individual transferable quotas an adequate solution to overfishing and overcapacity? Evidence from Danish fisheries



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ABSTRACT

Individual Transferable Quotas stand in large parts of the fisheries economic literature as the panacea that solves all problems of overfishing and overcapacity of world's fisheries. However, they are also criticized by a number of authors based on their negative social effects. Individual Transferable Quotas have been increasingly used during the past decades and are the main management system in a number of countries today. This paper provides evidence of the economic, social and environmental effects of one such system ten years after its introduction in Danish fisheries starting in 2003 with herring and being fully implemented from 2007. It is found that together with an important reduction in the fleet size, economic profitability improved. The direct contribution to GDP from the fleet in terms of economic return increased and indirectly through the capital and labour released from the fisheries sector, which have been absorbed by other sectors. Full-time employment has been reduced by 68% with fishermen salary largely unchanged, which might have affected the social cohesion in the local fishing communities negatively. However, no significant difference in the evolution of unemployment in local fishing communities compared to the national average was found. The Danish experience proves that Individual Transferable Quotas can be an adequate solution with regards to overfishing and overcapacity with also positive effects on the environment due to reduced fuel consumption and fishing activity. The social effects are ambiguous seeing that fisheries employment decreases; however, unemployment rates in the affected communities are below the national average.

1. Introduction

Since the first proposal by Christy Jr. [1], Individual Transferable Quotas (ITQs) have generally been considered an appropriate solution to the management problems in the fishing sector. The common-pool nature of fisheries relates to the so-called Tragedy of the Commons [2], which creates a pervasive economic incentive to catch as many fish as possible; leading the fisheries to overfishing and overcapacity and so low profitability. ITQs, as a way of assigning rights to catches to individual fishers, may bring efficiency improvements and reduce overcapacity in the fishing sector [3,4]. ITQs also provide the foundation for biological management, where the regulator can fix quotas at a level corresponding to the Maximum Sustainable Yield or Maximum Economic Yield, or other alternatives when focusing on the short run. ITQs make sustainable and efficient management possible, but only when applied for that purpose. The effect can be positive as argued by Costello et al. [5] or negative, as discussed by Clark et al. [6]. The economic effects are in general considered to be positive for the fleets, through improvements in cost-efficiency but also through raising

revenues [7]. The major concern relates to their impact on employment [8,9] and on local fishing communities [9–12]; as well as potential increases in inequality through an uneven distribution of benefits due to the concentration of quotas [13]. In addition, the impact of ITQs on by-catch or discarding has also been an issue for discussion [14] or even the effect of ITQs on environmental stewardship [15]. Generally, it must be emphasized that to assess the final impact of a given ITQ policy, it is important to be informed on the detailed design of the system, regarding distribution of quotas, transferability and other particularities [see e.g., 16].

An increasing number of countries have been adopting ITQs as their management system, since the first experiences in the 1980s in Iceland and New Zealand. In 2008, approximately 10% of the marine harvest was under some type of ITQ management system [17]. Danish fisheries have been regulated with ITQs since 2003–2007 and reveal interesting information on effects that are important for proper decision making in fishery reforms in other countries, where ITQs are often an option on the agenda.

The introduction of ITQs in Danish fisheries intended to encourage a

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more sustainable exploitation of fish stocks, through the adaptation of the fishing capacity of the fleet to the existing fishing opportunities; as well as improve the operation and planning by the individual fisher of their fishing capital and activities. It also had the purpose of increasing and securing fishery's total earnings after the low fishing profits in 2000–2001 [22,23].

This article adopts a descriptive approach to identify the economic, social and environmental effects of ITQs in Danish fisheries, a focus that is needed for policy considerations. It attempts to answer the following questions, related to the effects considered by the literature on ITQs and the specific objectives of the Danish ITQ reform formulated above: is the fishery's capacity better aligned today to fishing opportunities? Has ITQs reduced overcapacity in the fishery? Is it now easier for the individual fisher to plan their fishing activities? Has the economic efficiency in the fishery improved? Have fishery's total earnings increase as a consequence of ITQs? Have ITQs negatively affected employment and local fishing communities? Have ITQs brought any environmental improvement to the fishery?

Economically, the article covers the evolution of profit and profitability and capital intensity in the private sphere, while resource rent is estimated from a socioeconomic perspective. Social effects covered in the article include employment and wages but also distributional and local effects. Environmentally, a brief assessment of the likely evolution of some environmental factors is given. The article focus on the period 2002–2014, starting just before the introduction of the first ITQs in Danish fisheries for herring in 2003 and following the development of the fishery with the extension of ITQs to most species in 2007 and until today.

In trying to isolate the effects of ITQs from other exogenous influential factors, the biology of the stocks and evolution of market prices are introduced in the discussion. The biological evolution of the stocks affects the fishery independently of the management system in place because the Danish fleet fishes mainly stocks shared with other countries, from which they catch a fixed share of total quotas due to the relative stability principle of the Common Fisheries Policy (CFP). In the case of fish market prices, these are fixed by international markets because most of the catches are exported, and therefore, they have an impact, but are not influenced by Danish fisheries. A comparative analysis of the development of the Danish fishing fleet with those of Germany, Sweden and the United Kingdom is also provided as they fish similar stocks, subject to the same international market prices and with similar access to fishing subsidies. These countries also have a similar management system to that of Denmark before the introduction of ITQs, so the evolution of these countries' fleets is considered a proxy for the hypothetical evolution of Danish fisheries in case no ITQs had been implemented.

The article is organized as follows. The next section gives an overview of the Danish ITQ system, and in the third section, some of the exogenous factors that affect Danish fisheries, such as the biology of the stocks and evolution of market prices, are introduced. In section four, the effects of ITQs through the description and discussion of the economic, social and environmental development of Danish fisheries for the period 2002–2014 are presented. The last section concludes the article.

2. The Danish individual transferable quota case

The CFP is the regulatory framework for Danish fisheries [18]. Total Allowable Catches (TAC) are agreed annually in the Council of Minister and allocated to each member state as fixed shares following from the relative stability principle. The CFP also set technical conservation measures including mesh size and minimum fish size limits. Days at sea limits are decided commonly for all EU countries as well as the EU over time haven given subsidies for Danish fisheries for new vessels, modernization of vessels and decommissioning of old vessels.

Allocation of individual quotas and subsidies are the responsibilities

of the Danish Ministry of Food, Agriculture and Fisheries [18]. Until 2003, regulation of Danish fisheries was performed using command and control instruments, including licenses combined with individual weekly and monthly non-transferable vessel quotas [19,20]. Days at sea were also rationed for each vessel, and subsidies were given for decommissioning to reduce overcapacity until 2006 [21].

In 2000–2001, earnings in the Danish fishing sector were very low with deficits in profit (after interest and remuneration to owners) in the commercially active fleet as a whole [22]. Overcapacity existed, despite that decommissioning subsidies having been in use for many years [21]. Hence, with fish stock management remaining an EU responsibility, it became a Danish priority to ensure the survival of the fishing sector through improved economic viability. It should be noticed that it refers to the survival of the sector as a whole and not of every individual vessel and therefore e.g. a reduction in number of vessels or fishermen would not oppose the purpose of the regulation.

On 1 January 2003, ITQs were introduced in the Danish fishery management for herring, followed by mackerel in 2004. In 2007, the ITQ system was extended to the entire Danish fleet [23]. Quota shares were allocated to individual vessels by the grandfathering principle [see e.g. 24], based on catch shares in 2003–2005. As such, each vessel gained a share of the Danish part of the TAC for each species, which could then be traded. Based on these catch shares, individual yearly vessel quotas can be calculated and regulated when the TAC are changed each year. The quota share runs infinitely, unless an 8 years' notice period for ending the regulation is agreed upon by a parliamentary majority and upheld for the next eight years by possible shifting governments [24]. The quota shares are fully transferable between all vessels, except for a personal limit of ownership to avoid concentration [24]. This limit varies from stock to stock, mainly dependent on the size of the stock. For example, the limit for personal ownership of the Danish part of the cod quota in the North Sea is 5%, while it is 7.5% for plaice in Kattegat [25]. Transferability is free between large and small vessels, and between vessels using different gear. To ensure the flexibility of quota transfers, the vessels are allowed to form common pool quota communities, within which quotas can be transferred with a minimum of administration. In 2014, two-thirds of the Danish vessels were members of such a pool.

Simultaneous with the introduction of ITQs in 2007, a special arrangement for the coastal fisheries was implemented [23]. The arrangement was voluntary and covered only vessels below 17 m having 80% of their fishing trips being completed within a maximum of three days [26]. The purpose of the special arrangement was the survival of the small-scale coastal fishery. Vessels in the arrangement were allocated extra quotas for cod and sole, given on top of their ITQ's when enrolled in this arrangement. The vessels have to stay in this arrangement for at least three years and can only sell permanent quota shares and annual quotas to other vessels within the arrangement [26], not to vessels outside the arrangement that might be able to pay a higher price. However, after the three years, the vessels have the option of leaving the arrangement and sell permanent quota shares freely to all vessels.

3. Exogenous factors affecting the Danish fishery

3.1. The biology of the most important Danish fishing stocks

The evolution of the 12 most important stocks, from a value point of view, for the Danish fishing fleet is taken as the departure point for the analysis for the period 2002–2014, illustrating the status of these stocks before and after the introduction of ITQs. The Danish fleet almost exclusively fish on stocks shared with other countries, from which they catch a fixed share of total quotas, owing to the relative stability principle of the CFP. The development in the fish stocks is considered an exogenous factor for Danish fisheries, affecting the economic and social situation in fishing dependent communities. In Table 1, an

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