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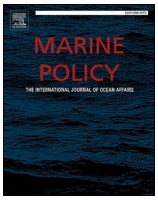

Full length article

Institution-based roots to fishing vessels profitability

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ABSTRACT

In fisheries, formal institutions are intentionally implemented to protect the stock of fish and to better adjust the fleet's catch capacity to the resource base. The present study, however, explores how the same institutions also influence competitive forces that shape industry attractiveness and the profitability of fishing boats. The empirical context is a sample of Norwegian seagoing purse seiners during a period that saw the introduction of two different individual transferable quota (ITQ) variants, the so-called unit quota system (UQ) system and the structural quota (SQ) system. The study analyses and compares the profitability of the vessels before ITQs were implemented in Norway (1985–1995), then under the original UQ regime (1996–2004), and finally under the present SQ regime (2005–2018). The findings disclose that the average profit margin was 8.8% in the pre-quota period, 20.6% in the UQ period and 24.3% in the SQ period. The differences between the pre-quota period and the two quota periods were significant ($p < 0.000$), whereas the difference between the two different quota periods were not ($p = 0.068$). Thus, the findings of this study draw a picture of an economically thriving industry after the introduction of ITQs. The paper argues that the significant profitability improvements achieved is rooted in the institutions that are established, which provide the players with essentially free and protected access to a common and valuable fish resource. Finally, implications of the findings are discussed.

1. Introduction

In open unregulated fisheries, fish is a common property that everyone has the right to exploit [1,2]. Thus, a vessel owner will find it a rational strategy to increase his/her fishing effort as long as the catch profit accrued exceeds the costs of fishing [3]. Hence, if all boat owners follow their individual rationale, this will lead to overexploitation of the limited renewable natural resource. For this reason, individual rationale and collective rationale are in conflict [1,2]. One cause of the tragedy of the commons is that the costs of overfishing are shared with all other fishermen. Another reason is the absence of deliberate collective action to protect the stock of fish. As a consequence, institutional measures are required to make a fishery biologically and economically sustainable [17].

Norway manages its most important commercial fish resources, such as cod and mackerel, together with other countries. The Convention on the Law of the Sea obliges the coastal states to collaborate in managing shared fish stocks. It is the International Council for the Exploration of the Sea that gives advice on the total quota for shared species. The distribution of total allowable catch systems (TACs) between the nations is next agreed through annual negotiations between the countries involved. Hersoug [4] presented an institutional perspective of the Norwegian quota regime, which emerged in the wake of negotiations among different stakeholders such as the government, industry, and organizations. Strong institutions have thus been established to anchor fishery management to scientific stock assessments. Furthermore, the Norwegian Directorate of Fisheries monitors the technical development of the fishing fleet and carries out economic analyses of the entire Norwegian fishing fleet annually. Thus, Norwegian fisheries are managed by and through institutions [5–7]. The closures of the commons, the introduction of TACs to protect the stock of fish, and the transferable vessels quota systems (first UQ, next SQ) to reduce overcapacity and secure vessel profitability are all regulatory expressions of the fishery management policy implemented in Norway [8]. Once the fishery is closed and access to fish is limited, fishing is again expected to generate profit.

As a general rule, only active fishermen can own fishing boats for commercial fishing in Norway (Participation Act, 1999). This is often referred to as the activity requirement and is a statutory requirement for a basic principle in Norwegian fisheries policy, which is to have a fishery-owned fishing fleet. Vertical integration is thus not allowed. A potential resource rent can then only accrue to the catch stage of the

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value chain.

Institutions are commonly known as the "rules of the game" [9]. The institutional economist Douglass North [10] defined institutions as "the humanly devised constraints that structure human interaction." He further distinguished between formal institutions (law, regulations, and rules), which are the focus of this study, and informal institutions (norms, cultures, and ethics). The current literature have a remarkable consensus that institutions matter [11]. The present paper, however, aims to tackle the harder and more interesting issues of how the individual transferable quota (ITQ) institution matters and to what extent it matters when it comes to profitability improvements of fishing vessels. The empirical context of this paper is therefore the Norwegian seagoing pelagic fishing fleet, which is subject to strict regulations.

To explore the issues of profitability in this institutional context, the paper integrates two leading theoretical perspectives within strategic management: Porter's [12,13] industry-based view of strategy; and Peng et al.'s [11] institution-based view of strategy (IBV). In this study, Porter is considered a complementary theoretical perspective to IBV. The paper contributes to the literature of strategic management in several ways. It enhances the understanding of how institutions matter in explaining the attractiveness of fishery industries and fishing boats' long-term profitability. Furthermore, the article attempts to accommodate the long-standing criticisms of lack of attention to the institutional context of the industry-based perspective [11]. Accordingly, the argumentation of this paper is illustrated by an economic analysis of longitudinal empirical data of more than half of the population of seagoing purse seiners from ten years before the introduction of the first Norwegian ITQ variant in 1996.

Moreover, to date, most research on IBV has been at the conceptual level, and empirical works have lagged behind [11]. In fact, few studies have convincingly shown why and to what extent institutional measures enhance industry attractiveness and profitability of firms. Furthermore, the majority of papers are applying IBV focus on non-developed and emerging economies, e.g., China and India [14]. As a consequence, only a part of the variation of the underlying dimensions of institutions is included. Selecting a fishery in a developed economy can help fill part of this absence of diversity in institutional contexts. This is hopefully another contribution of this study. The following research question (RQ) is raised in this paper:

RQ: Is the profitability development of the Norwegian average seagoing purse seiner related to the implementation of the original UQ system and the later more liberal SQ system?

The article proceeds as follows: Section 2 sets up the theoretical framework applied. Next, a description is provided of the institutional context of the Norwegian seagoing pelagic fishery. Thereafter, the research design, method, and data are presented before empirical findings. The paper ends with a discussion of the findings.

2. Theory

The major perspectives on business strategy ultimately seek to answer the same question: What drives firm performance? According to the resource-based view of strategy, firm specific resources differentiate successful firms from failing ones, as it is the existence of valuable, rare, and hard-to-imitate resources that can largely explain performance variations among firms [15]. Porter, by contrast, claimed that an overriding strategic goal of a firm is to uncover and select an attractive industry. Thereafter, Porter suggests that the next strategic task is to establish a position that is less vulnerable relative to powerful forces within the industry chosen. Accordingly, it is the degree of competition as expressed by the more or less existence of five specific forces—threats from entrants and substitutes, powers of suppliers and buyers, and rivalry among competitors—that mostly influences firm performance [12,13]. Even though strategy research has for long paid attention to the impact of the business environment on firm performance, the research stream is criticized for ignoring context, history and the influence of institutions [16]. The interactions among institutions, organizations, and strategic choices have thus rarely been explored. Instead, a free market-based institutional framework has been taken for granted. Formal institutions as laws and regulations, and informal institutions as cultures and norms have been regarded as "background" only [11].

This inadequate attention to context, history, and institutions has called for new theoretical perspectives that can overcome the drawbacks. The result is the emergence of the institution-based view (IBV) of strategy [11]. It is not solely firm resources or industry characteristics that can explain performance variations. IBV argues that in addition to industry- and firm-level conditions, institutions, should also be considered when aspiring to understand firm and industry performance. Extraordinary economic performance can also be due to vital institutional forces that affect both the value of firm resources such as quotas and industry attractiveness such as an institutionally protected competition arena [17].

Furthermore, treating institutions as background conditions is insufficient for gaining a deeper understanding of strategic behavior and firms' profit making in regulated fisheries [18,19]. When fisheries are managed sustainably, the supporting institutions are almost invisible. However, when fisheries are poorly managed, the absence of strong institutions is conspicuous [6,20]. Treating institutions as background or at best control variables [21] will not significantly advance strategy research on fisheries. The profound differences in institutional frameworks between fisheries on one hand and free market industries on the other force scholars to pay more attention to institutional differences in addition to considering industry- and resource-based antecedents to performance variations [11,22].

2.1. Institution-based roots to profitability in fisheries

There are several schools of thought within the institutional literature. Economists have predominantly focused on formal laws, rules, and regulations [23], whereas sociologists have paid more attention to informal aspects, such as cultures, norms, and values [24]. The present study focuses on the role of formal institutions on fishing vessels' opportunities to make profit more in line with the view of institutional economists. Public policy and regulations can affect the overall attractiveness of an industry and the competitive forces and dynamics within it. Thus, abnormal profitability may be a result of a favorable institutionally designed competition arena of a fishery. Although Porter's five forces model did not explicitly acknowledge the role of government, he and others did note how government could influence a number of the forces by, for example, creating higher barriers to entry through

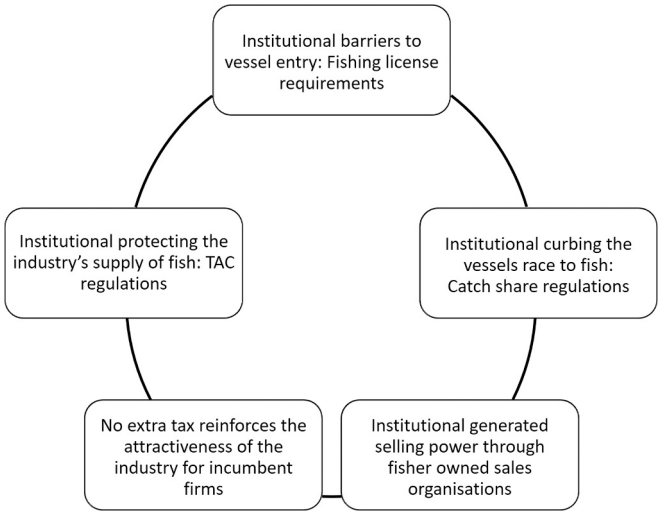

Fig. 1. Institutional influences on a fishing industry's attractiveness.

regulation or other means [17].

Fig. 1 illustrates the theoretical argument of this paper in the form of a tentative framework. The framework, which is inspired by Porter [12,13] and Peng et al. [11], indicates that formal institutions can significantly influence the competitive forces that shape the attractiveness of a fishing industry (also, see Table 1).

This paper claims that formal institutions designed to make a fishery sustainable can severely affect industry attractiveness and thereby lay the foundation for extraordinary profit making of incumbent firms. A well-regulated fishery is in this regard defined as a fishery that is biologically sustainable through TAC regulations and economically sustainable for the actors through quota share regulations such as ITQs. According to Fig. 1, profitability of incumbent vessels are influenced by the biological and institutional environment that provide exclusive rights to harvest a common, valuable, fish resource for free. The tentative theoretical framework presented is a response to Peng et al.'s [11] and Bamberger's [25] claim for a more formal inclusion of contextual factors such as institutions in existing models to further advance strategic management theories.

2.1.1. Institutionally protecting the supply of fish: TAC regulations

Ocean fish stocks have traditionally been regarded as common property resources. Gordon [1] demonstrated that unregulated fisheries lead to unprofitable overcapacity, depleted stocks and no profit for the actors. Hence, unregulated fisheries represent an inefficient adaptation. Formal institutions such as TAC regulations are needed to avoid overexploitation of the fish stocks and prevent socioeconomic waste [2,26]. Without TAC regulations, the industry's supply of fish will be at risk.

2.1.2. Institutionally curbing the race to fish: ITQ regulations

TACs without further regulations would create a race to fish as each fisherman would maximize his/her own share of the TAC [27]. However, when government implements catch shares, a fisher has nothing to gain by spending excessive effort to obtain his/her allocated catch. Catch shares generally slow the race to fish (ibid.). A slower fishing pace also promotes targeting of higher-quality fish that are sold fresh at better prices over a longer period of the season [46]. By making individual catch shares transferable, divisible, and permanent (i.e., ITQs), Grafton [28] argued that it is in the quota holders' interest to preserve the fish stocks since larger stocks mean more profitability for the fishermen. Moreover, quota owners will experience that the market value of their quota holding depends on the biological yield of the stocks [26]. As transferable quotas significantly eliminate the common property problem of fisheries, ITQ systems have been widely adopted in various forms around the world the last decades [29].

Table 1
Institution-based influences on the five competitive forces that affect the attractiveness of a fishing industry[a].

Competitive force	Institution-based influences
Bargaining power of suppliers	The supply is based on the biological production of fish. TACs are set by national governments or through international negotiations for shared stocks. TACs are distributed to domestic vessels by national authorities. Generally, vessels that could refer to a catch history were allocated quotas free of charge when quota systems were introduced. Commonly, vessels do not have to pay a resource tax on their catch. Accordingly, vessels that have not bought quotas pay nothing for the fish they catch. The bargaining power in relation to the supply of fish is in this case extremely good.
Threat of new entrants	In closed fisheries, there are normally substantial legal barriers to entry for example through requirements for fishing licenses and quotas. Entrants must also accommodate significant capital requirements related to investments in a vessel, gear, and quotas.
Bargaining power of buyers and sellers	By collaborating and organizing, economic actors can generate selling or buying power. In Norway, a processing plant is not allowed to integrate vertically toward the harvesting sector. This further strengthens the negotiating power of the vessels when selling their catch.
Threat of substitutes	Threat of substitutes is normally not influenced by formal institution-based arrangements.
Rivalry among competitors	An ITQ system provides an institutional protection of the vessels' catch shares from their rivals. Moreover, it protects the incumbent vessels from outside intruders. Accordingly, the rivalry between the players is minimal.

[a] Inspired by Porter's five forces framework (1980, 2008), and Peng et al. [11].

2.1.3. Institutionally generated selling power

By collaborating and organizing, economic actors can generate selling power [13]. The Norwegian Fishers' Sales Organization of Herring (in Norwegian: Norges Sildesalgslag) is a nationwide sales organization for pelagic fish species; primarily herring, mackerel, and blue whiting. The marketplace is owned and operated by Norwegian fishers. It is Europe's largest auction for first-hand sales of pelagic fish [30]. The organization has power to set minimum prices and delivery and payment terms for the fish being sold. It also handles domestic and international marketing. About two million tons of pelagic fish is traded annually through Norges Sildesalgslag. This represents 2–2.5% of all wild fish sold in the world (ibid.).

The Norwegian system of mandatory sales unions with monopoly power protected by law was invented during the economic crisis in the late 1930s. The unions have since survived and thrived, even in an era of increased globalization and market reforms. Experts have nevertheless questioned how effective monopolies can be in a neo-liberal world.

2.1.4. Institutional barriers to entry: fishing license requirements

Government policy can hinder entry into a fishery, e.g., by requiring a fishing license. If there are strong entry barriers in an industry, incumbent firms have a competitive advantage vis-à-vis outside firms. A new entrant will bring new catch capacity and a need for a share of the TAC, with the advantage being reflected in above economic performance for those protected by barriers [13]. If there already is overcapacity in the fishery, it will be reinforced [31]. A new entrant will also put pressure on quota prices and the rate of investment necessary to compete. The threat of entry, therefore, puts a cap on the profitability potential of a fishery.

2.1.5. No extra tax reinforces the attractiveness of the industry for incumbent vessels

The approach to capture and redistribute a fishery's rent (influence rent and resource rent) to society will affect the industry attractiveness and thus the players' prospect to reap extraordinary profit [19]. Internationally, there have been few attempts by governments to tax the rent from fisheries [29]. In 2004, Iceland introduced a fishing fee to cover management and enforcement costs [32]. However, it was soon increased to ensure that a share of the rent was being allocated to the public to encourage public support for the ITQ approach taken. New Zealand also initiated a resource rent tax, but it was abandoned [29]. Without redistribution, the rent from fisheries accrues primarily to the quota owners [33].

2.1.6. More on the relations between institutions and industry attractiveness

Porter [12,13] claims that industry structure determines firms long-run profit potential. He argues that the strength of five competitive forces influence how the economic value created by the industry is divided between different stakeholders; that is how much is retained by firms in the industry versus that bargained away by customers and suppliers, limited by substitutes, or constrained by potential new entrants. Thus, the institutions included in Fig. 1 and discussed above are directly linked to the five forces as indicated in Table 1.

In the case of renewable natural resource-based industries there may

be a much stronger need for institutions to control the competitive forces at play, as uncontrolled exploitation may result in depletion of the stocks [1,2]. This has created a need for governments to step in and provide scientific advice on how much should be harvested, and what measures should be put in place to ensure that the TAC set will not be overfished [26]. The capacity adjustment can either be organized directly by the government through buy outs and similar schemes, or indirectly by the industry through the introduction of quota systems, and the setting up of a TAC will by itself not end the race to fish, and in most cases the capacity of the fishing fleet must be decreased [27]. There is thus a fundamental difference between the need for institutions in fisheries than in many other branches of economic activity.

3. Institutional context

In this chapter, the emergence and status of the institutional framework in Norwegian pelagic fishing is described.

3.1. The pre-ITQ stage

Before 1970, there were no capacity-reducing measures in the Norwegian purse seine fleet [34]. However, the crisis led to a halt to the registration of purse seiners in 1970, the introduction of TAC for herring in 1971, and a hitherto unthinkable total ban on catching Atlantic herring in 1972 (Christensen, 2014). Moreover, during the seventies, more measures were introduced to reduce capacity through scrapping vessels, and the rules for permissible cargo volume were simultaneously liberalized, and, as a consequence, the reduction of total cargo capacity was significantly lower than indicated by the fewer vessels. Furthermore, public subsidies and natural retirement led to a decline in purse seiners from 460 vessels in 1967–115 in 1991. Finally, individual non-transferable vessel quotas (IVQ's) were introduced in 1978 for purse seiners fishing capelin and extended in the late 1980s to include mackerel and herring.

3.2. The unit quota system

The IVQ system was modified in 1996 under the unit quota (UQ scheme) [35]. The aim was to reduce the number of vessels as the catch capacity still exceeded the available quota basis [4]. Moreover, the UQ's were made tradable and a vessel owner was able to concentrate up to two quotas per vessel [34]. In 2000, the system was extended even further, allowing the merging of up to three quota factors per vessel. The measures were anchored to support a regional distribution profile since transfers from north to south resulted in a 40% quota cut while internal transfer within a region gave a reduction of 5% (north of Norway) or 15% (south).

3.3. The structural quota system

In 2005, the UQ system was converted to a system with so-called "structure quotas" (SQ's) as an additional measure to reduce catch capacity and increase efficiency. There was an effect on the number of purse seiners and in 2010 there were 84 vessels registered in the deep-sea pelagic fleet (ibid.). In this more flexible and market-oriented system [36], the limited duration for the purchase of quotas was extended from 18 years to eternal ownership [34]. However, there was a change in government in Norway in 2006, and as a result permanent quotas were cancelled. Instead, quotas with duration of 25 years were given to vessels that had already benefited from the structure system. For future transactions, quotas with 20-year duration were granted [34].

Formally, Norway does not manage its fisheries by ITQ's, but in reality the fisheries management has many similarities with such a system (e.g. [36–38]). An ITQ-regime is based on a market logic where quota transactions act as an allocation mechanism between fishing vessels firms. Accordingly, it is the sole responsibility of the firms to adapt their quota basis to their catch capacity, as it is assumed that the firms act as rational actors that aim to maximize their profit from the given quota bases [28].

However, a profound criticism of the ITQ model is that the system leads to a strong concentration of quota ownership [39]. In addition, the system does not emphasise the importance of securing fish resources to geographical areas that are most dependent upon fisheries (ibid.) Accordingly, restrictions can be built into an ITQ regime to prevent the market from becoming the sole quota allocation mechanism. Many quota regimes, including Norway's has features aimed at protecting the social structure and division of equity e.g. geographical restrictions on trade (see Table 2). Modifications include separate markets for different geographical areas (e.g. north/south), built in restrictions in terms of quota concentration per vessel (or vessel group), separate markets to ensure that a variety of adaptations coexist, and a require-ment that a fishing vessel firm must buy another vessel (which must be scrapped) with attached fishing rights in order to increase its own total quota share [34]. Key features of the structural quota system of Norwegian purse seiners are outlined in Table 2 as they appear in 2020.

4. Data and methods

4.1. Research design

The research design of an empirical study, as outlined in this article, requires in-depth knowledge of the institutions embracing the competition arena and how these expectedly will shape the profit of the vessels. The design also requires valid and reliable profit measures. Finally, a dataset of representative vessels over a period covering the period before and after the introduction and long-term use of an ITQ-like management regime is required. In this context, a period of 34 years (1985–2018) is

Table 2
Key features of the structural quota system of Norwegian purse seiners.

No	*Modification*	*Justification*
1	The giving vessel has to be scrapped when quotas are transferred. Moreover, quotas can only be transferred between vessels in the same group.	The responsibility for removing overcapacity in the industry is left to the actors themselves through the SQ system.
2	When a quota is transferred in the purse seine vessel group, 5–40%, depending on the vessels' homeports, is deducted from the transaction and re-allocated to the vessel group.	To disincentivize quota transfers from certain geographic regions and resulting geographic concentration. Also to slow down the use of the mechanism.
3	If the quota is traded from the northern region to the southern it will be reduced by 40%. If it is traded within the northern region, the reduction is 5% and 15% if the trade takes place within the southern region.	
4	Each vessel has a quota ceiling on 850 tons at present, which represents approximately 2% of the vessel group's TAC share.	To prevent too high concentration of quotas on a few vessels.
5	Each firm has a quota ceiling, which corresponds to approximately 6.5% of the vessel group's TAC share.	To avoid overconcentration of quotas on a few firms.
6	Tradable quotas (structural quotas) are time limited. Upon expiration, in 2027 at the earliest, there is anticipation among industry actors that they will be allocated to the vessels remaining in the group, even though this is not formally yet determined.	To express that the fish resources are a common property.
7	Quota leasing is not permitted.	

*Adapted from Johnsen and Jentoft [7], and Standal and Asche [38]

considered sufficient to study how vessels have been able to make profit before and under two slightly different Norwegian ITQ systems. Focusing on one single industry makes it possible to control for industry impact, which, according to Porter [13], is crucial for firms' profitability potential.

4.2. Unit of analysis

The vessel (seagoing purse seiner) is the unit of analysis in the present study. The validity of the comparison of vessels' profitability is highest when vessels are similar. This study, therefore, chose an industry of similar vessels, which is the Norwegian purse seiner fleet. All Norwegian purse seiners are owned by active Norwegian fishers, as, according to the Norwegian Participation Act (2013, §6), a fisherman must be actively fishing for at least three of the past five years to be allowed to own a fishing vessel. Further, to prevent concentration of quotas on a few vessels, there is a quota ceiling for each vessel at 850 tons at present, which represents approximately 2% of the TAC share [7]. The quota base of the largest vessel in the sample is approximately twice the quota base of the smallest.

4.3. Sampling and data collection

Fisheries management objectives generally include improving economic performance. Nevertheless, vessel data to assess this are often unavailable as relatively few fisheries managers collect such information, or they collect it only sporadically [40]. Accordingly, there must be sufficiently detailed longitudinal financial information available to measure the profit making of the vessels. This information must also be available for a sufficient number of vessels to ensure statistical validity of the conclusions. The Norwegian Directorate of Fisheries requires most fish shipping companies to report income and cost data annually per vessel. This study has gained access to this unique dataset and bases all its analysis on it.

4.4. Measuring profitability

The aim of the present study is to explore the profit making of fishing vessels over time before and under ITQ-like regimes. The chosen 34-year period first covers the period before the implementation of transferable quotas in the Norwegian pelagic fisheries (1985–1995). The profitability of this pre-intervention phase is then compared to the profitability of the vessels under two different intervention phases. The first intervention phase covers the period 1996–2004 when the UQ system was in operation, while the second intervention phase covers the period 2005–2018 when the SQ system has been at work.

It is of particular interest to study vessels' profit making in a population like this, because the adaptation process to the new regimes is not necessarily rapid, and the profitability effects may not be quickly visible. In such a setting, there is a need for a long-term study as prospects of uncovering the magnitude of the profit making that has taken place will then be better. The strength of the institutional forces (see Fig. 1 and Table 1) affects prices, costs, and investments required to operate; thus, the forces are directly tied to the income statements of the industry participants [12,13]. Accordingly, it is average profit margins over this period, not profitability in any particular year, which is the focus of analysis.

The book value of assets is not available in comparable format for the total time series. Book value of assets from 2003 onwards cannot be reliably compared to values before 2003. Cost and income statements are more comparable and reliable over time and will be used in this study from 1985. This has the consequence that return figures, where assets are included in formulas, are not available. However, return figures based on cost and income statements are available, and three such measures will be presented (see Table 3). Operating margin is the most common measure. Cash flow margin is cash flow from operations divided by operating revenues. Finally, the study includes net profit margin. Net profit is operating result less net interests paid. Net profit margin is calculated relative to revenues.

Table 3
Profitability margins applied in this study.

Operating margin	Operating margin is the standard measure for return on revenue. Operating profit is normally identified by the acronym EBIT (Earnings Before Interest and Taxes). Arguments for exclusion of taxes has already been discussed. Interest are also excluded at this level, as interests paid is influenced by the amount of debt taken on, and the current interest rate of debt. Financing issues on the level of individual vessels is of all likelihood not related to differences in quota regimes. Annual depreciations and amortizations is included as a cost item in EBIT.
Cash flow margin	Cash flow margin is measured as EBITDA (an acronym for Earnings Before Interest, Taxes, Depreciations, and Amortizations). The difference between EBIT and EBITDA is thus depreciations and amortizations. As depreciations and amortizations are not cash flow items, EBITDA will measure cash flow gained from operational activity. This is a much used item for calculation of free cash flow.
Net profit margin	Net profit (before taxes) is EBIT less interest paid, and thus the effect of financing and varying interest rates on debt will influence the item. Nonetheless, it reveals profitability for owner of vessels. Negative Net profit inevitably will lead to negative rate of return on equity, and vise-versa for positive Net profit. EBIT will always be larger or equal to net profit (equal if debt or cost of debt is zero). The difference illustrates the influence of cost of debt on net profit.
Relations between the terms	All three margins calculated are relevant in comparing profitability. Operating margin indicates the size of revenues that could be distributed to all investors (debt holders and equity owners) for a firm that reinvests similar amounts over time as accumulated annual depreciations. Cash flow margin is always larger than operating margin, and may be seen as operating results where reinvestment in new assets is similar to current assets. Net profit margin represents the owner's point of view: a negative net profit margin tells that he/she is actually loosing value of his/her investment. A positive net profit margin is indicative of, but not the same as, return on equity. Net profit margin is always less than operating margin. The difference shows how the result is distributed between debt holder and equity owner. As debt holders have priority over equity holders for available cash flow, net profit margin may demonstrate the real financial variability over time for owners of purse seiners.

All financial results are reported before taxes. The main reason is that income tax rate for Norway has changed over the period of study. At the start, the nominal tax rate was 27%. From around 2010 the tax rate declined, and last year of our study had a tax rate of 22%. After-tax calculations would therefore report better returns late in the period due to tax issues rather than due to changes in ITQ regimes. In addition, before-tax calculations will make the results from this study easier to compare with similar results from other countries with different tax regimes.

5. Empirical findings

This section presents the empirical findings of the study starting with the RQ raised:

RQ: Is the profitability development of the Norwegian average seagoing purse seiner related to the implementation of the original UQ system and the later more liberal SQ system?

Table 4 provides a summary of average profitability margins for the sample of seagoing vessels under study covering the period 1985–2018. The table is split into three different sub periods reflecting that the vessel quota system was implemented in two different stages. In the first sub period covering 1985–1995, non-transferable IVQs were in operation in Norway. This is the pre-intervention stage. This period is then followed by two other sub periods with consecutive institutional interventions.

Table 4
Operating margin, cash flow margin, and net profit margin before and under different quota interventions.

	Year	Population (N)	Sample (n)	Operating margin[a]	Cash flow margin[b]	Net profit margin[c]
Pre-ITQ stage: Non-transferable vessel quotas (the IVQ system)	1985	126	67	1.6%	11.9%	−9.3%
	1986	106	49	7.4%	17.0%	−5.9%
	1987	91	42	4.7%	16.5%	−11.2%
	1988	83	38	9.9%	22.1%	−3.7%
	1989	86	44	11.4%	22.7%	−2.5%
	1990	90	47	2.2%	16.0%	−13.4%
	1991	88	43	11.7%	20.6%	−2.4%
	1992	95	44	11.0%	21.3%	−3.3%
	1993	94	45	11.7%	21.8%	1.5%
	1994	96	32	10.2%	20.0%	3.1%
	1995	98	38	14.9%	24.3%	8.8%
The first ITQ variant in operation (the UQ system)	1996	95	44	21.4%	31.2%	18.0%
	1997	104	36	23.2%	31.9%	19.8%
	1998	91	78	19.9%	29.9%	16.2%
	1999	95	65	18.5%	30.4%	11.2%
	2000	95	79	13.9%	26.8%	5.2%
	2001	91	76	27.2%	37.2%	21.3%
	2002	93	81	25.7%	36.6%	18.7%
	2003	89	74	14.7%	31.0%	4.9%
	2004	86	66	20.7%	35.3%	16.6%
The second ITQ variant in operation (the SQ system)	2005	85	72	25.9%	38.2%	22.3%
	2006	84	63	22.5%	35.1%	19.0%
	2007	81	61	21.4%	32.7%	20.8%
	2008	80	70	22.7%	36.3%	9.3%
	2009	79	65	20.9%	35.9%	19.1%
	2010	78	66	27.8%	38.8%	24.3%
	2011	80	65	35.0%	44.2%	30.3%
	2012	75	58	24.3%	37.1%	19.1%
	2013	73	57	19.6%	34.0%	11.6%
	2014	73	60	18.4%	33.2%	11.6%
	2015	74	58	21.7%	36.0%	13.7%
	2016	73	61	29.8%	42.4%	27.2%
	2017	72	56	23.3%	37.5%	15.7%
	2018	71	56	26.8%	39.8%	21.9%
				Operating margin[a]	Cash flow margin[b]	Net profit margin[c]
Average[d]	Pre-intervention (1986–1995)			8.8%	19.5%	−3.5%
Average[d]	UQ intervention (1996–2004)			20.6%	32.2%	14.7%
Average[e]	SQ intervention (2005–2016)			24.3%	37.3%	19.0%

[a] EBIT/Revenue before taxes
[b] EBITDA/Revenue before taxes
[c] EBIT-Net interest/Revenue before taxes
[d] A paired *t*-test showed significant difference between period 1 and period 2 ($p < 0.000$)
[e] A paired *t*-test did not show a significant difference between period 2 and period 3 ($p = 0.068$)

The sub period 1996–2004, when the UQ system was in operation, represents the first intervention. Finally, the sub period from 2005 to 2018 when the more liberal SQ system was at work represents the second institutional intervention.

In the pre-intervention phase, average profit margin was 8.8%, average cash flow margin was 19.5%, and average net profit margin was −3.5%. It is worth noting that the net profit margin was negative in the first eight years of this period, which marks the end of the subsidization of Norwegian fisheries [5].

In the first intervention phase, the UQ system was introduced. Average profit margin, cash flow margin, and net profit margin then make a significant leap to 20.6%, 32.2%, and 14.7% ($p < 0.000$), respectively.

The average profitability margins continue to increase also after the SQ system is introduced (intervention 2), to 24.3%, 37.3%, and 19.0%, respectively, but these increases are not significant compared to similar values in the previous period ($p = 0.068$).

In the pre-intervention phase, all three margins show a growing trend, while they are surprisingly stable within each of the two intervention phases. The best years in financial terms were 2011 and 2016.

6. Discussion

Institutions are commonly known as the "rules of the game" [9], and, in the literature, there is a remarkable consensus that institutions matter [11]. How they matter and to what extent they matter when it comes to profitability in fisheries is, however, underreported [19]. Norwegian fisheries are managed by and through institutions [5–7]. This paper initially explored theoretically how institutions such as TAC and ITQ regulations together with legal barriers to entry have the potential to influence the economic attractiveness of fishing industries for incumbent firms and thus their profitability prospects (see Fig. 1 and Table 1). Next, the paper empirically examined the long-term relationship between profitability of fishing vessels before and under different quota interventions such as the Norwegian ITQ variants represented by the UQ and SQ systems. The sample investigated constituted more than half of the population of Norwegian seagoing pelagic fishing vessels, which were followed from 1985 to 2018 (see Table 4).

The RQ raised in the introduction section of the paper was: "Is the profitability development of the Norwegian average seagoing purse seiner related to the implementation of the original UQ system and the later more liberal SQ system?" Table 4 summarizes the average

profitability margins of the vessels during the 34-year study period. Moreover, the table is split into three different sub periods reflecting a pre-intervention phase (1985–1995), the first intervention phase when the UQ system was in operation (1996–2004), and finally the second intervention phase represented by the SQ system (2005–2018).

The figures draw a picture of an industry where the profit margins improve considerably over time. However, the average vessel made a loss in the period before the quota systems were introduced with a net profit margin of −3.5%. This negative financial outcome is in stark contrast to both quota intervention periods that provided profit margins of plus 14.7% and plus 19.0%, respectively. The profitability between the pre-intervention phase and the UQ intervention and the pre-intervention phase and the SQ intervention was significantly different ($p < 0.000$). However, there was no significant difference in profitability between the UQ intervention and the SQ intervention ($p = 0.068$). Accordingly, the findings of this study support the claim made in the theoretical framework developed that the economic attractiveness of a fishing industry is influenced by its institutional environment. Institutions that provide exclusive rights to vessels to harvest a valuable and common fish resource for free have established a very good foundation for profitable operations of the players, as illustrated by Table 4. These results are also supportive of the findings of Bertheussen and Vassdal [19] and Flaaten et al. [33].

An interesting question is, which institution is the most important and why? In order to fully understand the impacts on profitability, it is desirable to have data before and after the introduction of each of the institutions discussed in this paper (see Section 2.1). However, time series that extend over many decades are hard to obtain. This study argues that TAC is the most important institution in a commercial fishery as it ensures that there is a biological production to distribute among the business actors [2]. Without TAC regulations, a stock is at risk of collapsing, and Norwegian herring fishing in the 1950s and 1960s before the introduction of TAC is an example of this (see Section 3.1).

To maximize the economic value of the biological production that takes place, the pelagic fishers in Norway have established their own sales organization to prevent the buyers from seizing a disproportionately large share of the values being created [30]. The purpose of a TAC and institutionally generated selling power is therefore the same; to maximize the value creation for the catch sector all together. Eventually, the players can cooperate politically to prevent part of the value creation from being seized by society in the form of a resource rent tax [29].

However, even if large aggregate economic values are created, there is a risk that the players will invest so much in overcapacity to secure the largest possible share of the value creation taking place that fishing will be unprofitable for each individual vessel [27]. One purpose of introducing ITQs and barriers to entry is precisely to protect the profitability of incumbent vessels against destructive rivalry.

It is methodologically challenging to determine how much each individual institution contributes to the profitability of the players and accordingly determine which is most important, with variations in profitability also being a result of the fact that the various business actors are not evenly skilled when it comes to utilizing the biological, institutional, and other environmental opportunities offered in a fishery (Bertheusssen and Vassdal, 2019). The bottom line of the firms' accounts only uncovers the overall effect of the various institutions on profitability.

6.1. Implications

To prevent fisheries policy decisions creating arbitrary and unintended consequences, the decision making should be based on a knowledge base where the connections between causes and effects are known. In their recent evaluation of the quota system, The Norwegian National Audit Office [41] emphasizes that it is highly reprehensible that the consequences of various fisheries policy changes in Norway have not been sufficiently studied and known before the measures have been implemented. Accordingly, the National Audit Office recommends the Ministry of Trade and Industry to ensure that future changes in the quota system are thoroughly assessed before being implemented. The National Audit Office therefore demands that future fisheries policy decisions should be based on known causal relationships.

The liberalization of the Norwegian quota system that took place in 2005 has led to further a quota concentration both geographically and in terms of ownership, according to the Norwegian National Audit Office [41]. This is an outcome which is not in line with official Norwegian fisheries policy ([41]). According to this study, the non-significant profitability improvement that has taken place at vessel level since 2005 (see Table 4) may therefore have been a high price to pay to challenge the aforementioned established fisheries policy objectives.

The present study contributes theoretically to the strategy field by not only embracing the proposition that "institutions matter" but also by pushing forward to explore how much institutions matter in a business economic sense. Accordingly, the tentative theoretical framework depicted in Fig. 1 and further outlined in Table 1 indicates how related institutional variables have the potential to affect the economic attractiveness of natural resource-based industries, such as the Norwegian pelagic fishing industry. Moreover, this study demonstrates that under the aforementioned institutional environment, fishing vessels have been able to operate profitably in the long-term (1996–2018). A second contribution is that the study illustrates clearly how rapidly firms' profitability improved after the implementation of institutional changes and regulatory shifts by comparing the profitability margins in the pre-intervention phase with the margins of the first intervention phase in Table 4. The present study argues that the competitive forces in a fishing industry can be influenced by underlying institutions (see Fig. 1 and Table 1) and thus substantially affect profitability (see Table 4) of the vessels over time, with defending against threats imposed by competitive forces in an industry and exploiting opportunities arising when the forces are at play being crucial to business strategy [13]. Understanding the institutional influence of the industry structure is also essential for a firm to position itself favorably in a quota market such as the Norwegian one.

Industry profitability has been remarkably persistent in the cohort of the present study after the introduction of the first transferable vessel quota system in 1996. However, the industry structure is constantly undergoing modest adjustment, and it can occasionally change abruptly [13]. Shifts in the structure may originate from outside or within an industry. The shifts can boost or reduce the industry's profit potential. Shifts may be caused by institutional changes, changes in technology or customer needs, or other unforeseen events such as the ongoing coronavirus pandemic crisis that suddenly paralyzed many businesses all over the world. To reduce unsystematic business risk, a fishing vessel firm can develop into other industries by means of funds earned in the core industry [42].

6.2. Limitations and future studies

To verify the causality between financial performance of the vessels and ITQ regulations, a comparative future study could be applied. For example, a study can investigate whether there are differences in the ITQ regulation for purse seiners and other types of vessels in Norway. If the answer is yes, the study may compare the financial performance of the different vessel groups. Another study could compare the ITQ regulation for Norway and other countries. In the end, the studies could derive policy implications, e.g., how to enhance financial performance by improving the ITQ regulation and the underlying institutional features in Norway and other countries.

Furthermore, a future study that measure the adaptation process of the ITQ regulation, for example changes in the vessel capacity as a result of quota transferred, could probably separate the contribution of ITQ to financial performance after controlling for other factors such as total quotas and exchange rates.

Finally, in 1990, a uniform system of ITQs covering almost all fisheries in Iceland was established. Over time, the ITQ system leads to increased profitability, especially in the processing component [43]. As a result, the Icelandic fishing industry is now paying a significant fishing fee [32,44,45]. The present study focused on pelagic vessels only. A future study may discuss how institutional features affect the profitability of the pelagic processing industry.

Conflicts of interest

The authors declare no conflict of interest.

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