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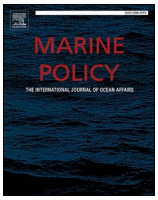

Institutional and financial entry barriers in a fishery

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ABSTRACT

Fishery policies over the past decades have mainly aimed at capacity reduction to preserve overexploited stocks. For that reason, research has focused on exploring incentives to exit fisheries rather than examining entry barriers. However, in quota-regulated fisheries, potential entrants might face substantial institutional and financial barriers, as opposed to incumbents, whose rights might have been historically secured by grandfathering or by acquiring quota shares at favorable prices. The present study first explores the institutional and financial barriers for a potential entrant in the Norwegian purse seine fleet. The findings show that there exist substantial legal entry barriers to overcome. Furthermore, a capital requirement of about 100 million USD is needed. About two-thirds of this significant amount is related to quota purchases. Second, based on empirical catch and price data, the study examines the prospects of a newcomer to make profit from a vessel and quota investment relative to an incumbent with free catch capacity. The findings show that an incumbent can achieve about 40% higher return on investing in a quota unit over an intruder. This substantial different valuation clearly demonstrates the economic disadvantage of being an outsider. Consequently, intruders are excluded from competing for quota shares and thus entering the industry. Finally, the implications of the study are discussed.

1. Introduction

As fish always has been a common property in Norway, every single citizen has historically had the privilege to enter a fishery with his/her own boat without a special permit. Over time, successful entrepreneurial fishermen established their own businesses, whereas others exited the industry voluntarily or due to bankruptcy. However, after World War II, fish stocks were overexploited primarily because of advances in fishing technology and capital applied. Accordingly, the authorities were forced to limit the fishing effort of the players to avoid the tragedy of the commons [1]. Consequently, entry for entrepreneurs to commercial Norwegian fisheries has gradually been restricted during the last five decades. For most significant commercial fisheries, special permission is now required to participate. The fisheries have thus gone from being open access to being closed.

Larger seagoing vessels in the pelagic fisheries were among the first where limited entry was introduced. A consequence of the regulatory measures that have been implemented to protect the fish from overfishing is that the industry has been closed to intruders. Through quota transfers in recent years, few actors have been tempted to leave the industry. However, the opportunity to establish oneself as a self-employed fisher has been obstructed through various institutional and financial entry barriers. Thus, to the knowledge of this study,[1] since the early 2000s, no new firm has entered the Norwegian purse seine fleet.

However, free entry is an important characteristic of a competitive market. Extensive entry barriers are bound to bolster the competitive advantages of incumbent firms as their positions are not challenged by entrepreneurs or outside industry firms [2]. Thus, the cementation of the existing market structure makes it likely that the current dominant firms will maintain their leadership in the industry and even increase it. Furthermore, there is a danger that when private sector players gain access to privileges and monopolies, competition will be weakened, innovation limited, and society's value creation lessened. A firm can get caught up in a "competency trap", which is the false belief that the same practice that led to a past success, will necessarily lead to a future one [3]. The competency trap stems from the structural and cultural inertia that arises when a firm becomes larger and older [4]. This can at worst create resistance to change among existing players so that they operate less efficiently than they would otherwise have done [5,6].

The overall problem statement of the present study is to examine

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how entry barriers can prevent new business startups in a quota-regulated fishery. Thus, the present study focuses on entry barriers and the prospects of newcomers to create values versus incumbent firms. Special attention is paid to the importance of barriers represented by government regulations, i.e., formal institutions, and the capital barrier denoted by the funding requirements of an entrant. The competitiveness of entrants versus incumbents in the quota share market will also be compared and analyzed. Accordingly, the following research questions are raised; RQ1: Which institutional entry barriers are present in quota-regulated fisheries as exemplified by the purse seine fishery in Norway? RQ2: What about capital requirement entry barriers in the same fishery? RQ3: Do intruders and incumbents have different financial prerequisites to win bidding "wars" for scarce quota shares when they are up for sale in this fishery?

The core proposition of the present study is that formal institutions do matter in terms of long-term industry attractiveness and value creation for entrants in a quota-regulated fishery. To explore the issues being raised, the paper integrates two leading theoretical perspectives within strategic management, namely, the resource-based view of strategy (RBV) (e.g., [7–9]) and the institution-based view of strategy (IBV) (e.g., [10]). The present paper contributes to the literature of strategic management in several ways. It enhances our understanding of the significance of institutions in explaining the unattractiveness of quota-regulated fisheries for entrants and their expected long-term financial performance. Furthermore, the present article attempts to accommodate the long-standing criticisms of RBV's lack of attention to institutional contexts [10]. Accordingly, the argumentation is illustrated by an analysis of empirical data of Norwegian purse seiners that operate under a modified individual transferable quotas (ITQ) system (the so-called structural quota system, SQS). In contrast to many other of the world's fisheries, this fishery is characterized by satisfactory profitability for incumbent firms [11,12] and among the best performers in Norwegian fisheries for the latter 20 years [13]. Purse seine fishing is, however, capital-intensive and imposes high fixed costs on the players.

Furthermore, to date, most research on IBV has been at the conceptual level, and empirical works are rare [10]. In fact, few studies have convincingly shown why and how institutional measures promote or inhibit industry attractiveness for new entrants in a fishery. Additionally, many papers applying IBV focus on non-developed and emerging economies, e.g., China and India [14]. Consequently, 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 the present study. Finally, the present case study demonstrates how society, by first closing a fishery administratively and next introducing quota trading so that the players themselves are given the responsibility to adapt the catch capacity to their quota basis, as an (unintended?) side effect establishes more or less insurmountable entry barriers for outside firms. The present article proceeds as follows. The theoretical framework applied is set up in Section 2. Next, the method and data are presented before empirical results. The paper ends with a discussion of the findings and implications.

2. Theory

If incumbent firms are making substantial economic profits, new firms will likely choose to enter the industry [15,16]. The entry into a profitable industry may however be low if there are substantial entry barriers (e.g., [17–20]). The dynamics of competitive markets has its parallel in fisheries economics (see [21]). Under a simple open fishery where no entry barriers exist, and vessels are homogeneous, high profitability will signal entry incentives. Thus, entry will occur since no exclusion measures are in force. Analogous, low profitability will drive actors out of the fishery since capital and labor can be better utilized elsewhere in the economy. When newcomers enter, the level of industry competition increases. This reduces the economic performance of incumbent firms. If entry barriers are absent, new entries will continue as long as any firm in the industry is earning a superior profit [22]. Entry is expected to cease when the competitive advantages of all incumbent firms are competed away [16]. The cost of entry determines to which extent new entries threaten incumbent firms' performance [2]. If the entry costs exceed the potential profits a new entrant could obtain by entering, the entry will not be forthcoming. Consequently, new entrants will not be a threat to incumbent firms. But if the cost of entry is lower than the return from entry, entry will occur until the profits derived from entry are less than the costs [16].

The cost of entry depends on the existence and scale of entry barriers [23]. Entry barriers are attributes of an industry's structure that increases the cost of entry [18]. The greater the height of these barriers, the greater is the cost of entry. With significant entry barriers, potential entrants will not enter an industry even though incumbent firms are earning above-normal profits (ibid.).

2.1. Institutional entry barriers in a fishery

Public policy can affect the overall attractiveness of an industry and the competitive forces and dynamics within it [10]. Although Porter's five-force model did not explicitly acknowledge the role of policy, he did note how the government could influence several of the forces, for example, by creating higher entry barriers through public regulations [24]. Institutional theory views rules that are constructed by the government as most critical for firm efficiency operating in natural resource-based industries (NRBIs) such as fisheries [25]. Through establishing annual or seasonal total allowable catch (TAC) limits, the government shapes the size of the fish market in which the firms operate [26]. Furthermore, the government addresses the race to fish and thus the rivalry among the firms, by introducing catch shares in fisheries [27]. Additionally, when catch shares are made tradable, e.g., through ITQs, the responsibility for capacity adaptations in fisheries is transferred from the public to the private domain [28]. The effects from government regulations are strong in fisheries in that the government develops the rules of behavior and the pace of institutional transitions [29]. Thus, incumbent firms in an NRBI may be highly protected through institutional entry barriers. Simultaneously, the institutional entry barriers can be perceived as insurmountable for outside firms.

TACs without further regulations would create a race to fish as each fisher would maximize his/her own share of the TAC [27]. However, when the government implements catch shares, a fisher has nothing to gain by spending excessive effort to obtain the allocated catch. Thus, catch shares generally slow the "race to fish" (ibid.). By making individual catch shares transferable, divisible, and permanent (i.e., ITQs), Grafton [28] argued that it is in the quota holder's self-interest to preserve the fish stocks since larger stocks imply higher profitability for the fishers. Additionally, quota owners will experience that the market value of their quota holding depends on the biological yield of the stocks [30]. As transferable quotas significantly eliminate the common property problem of fisheries, ITQ systems have been widely adopted in various forms worldwide in the last decades [31]. However, to gain access to quotas, intruders must purchase them in strategic factor markets at the price the seller demands and within the institutional framework implemented for this market [32].

2.2. Financial entry barriers in a fishery

Economies of scale in a fishery can act as an entry barrier. Economies of scale occur when unit costs decline with an increasing volume of production. Historically, economies of scale act as an entry barrier when a significant proportion of production costs are fixed, e.g., due to substantial investments in vessel and fishing gear [33]. It is conceivable that to exploit the economics of scale in purse seine fishing, the catch capacity of the vessel must be relatively large and adjusted to the quota base. Exploiting economies of scale requires substantial investments in

assets (intangibles as quotas and tangibles as vessel and gear) and associated capital requirements [12].

Thus, capital requirements may be another entry barrier [18]. It may be the case that incumbent firms have a lower cost of capital than new entrants. This lower cost of capital for incumbents can reflect any "natural" entry barrier, for example, economies of scale or cost advantages independent of scale [32]. These factors combined can make a new entry to an industry riskier than investing in an incumbent firm's ongoing business operations. In efficient capital markets, this risk differential will be reflected in a cost-of-capital differential between incumbents and new entry firms. A very high cost of capital for potential new entrants into an industry can turn what otherwise would be a positive net-present-value investment into a negative net-present-value investment [18]. In this case, even if firms want to enter, they will not be able to obtain the capital to do so. Thus, entry is deterred by the advantages incumbent firms possess in raising the discount rates of potential entrants [2]. Nøstbakken's [34] study of the investment behavior of Norwegian purse seiners indicated that the incumbents' capital return requirements hardly considered the full opportunity costs associated with quotas they had historically received from the authorities for free. Her finding was supported by Hannesson [35] who argued that the players seemed to use a low discount rate when investing in quotas.

The capital need for a newcomer continues long after a company enters a market. Many startup firms require additional funding because they may not earn sufficient profit for some years [18]. Thornton and Marche [36] showed that several new market entrants failed because they were unable to generate sufficient funds themselves or receive additional funding from external sources during their first years of life.

2.3. Competitiveness of intruders versus incumbents in the quota share market

Based on the above theoretical discussion, a tentative theoretical framework that is guiding the present study is presented in Fig. 1.

For fishing vessel owners, wild fish represents the most critical part of their business. In limited-entry and quota-managed fisheries, fishing rights give a firm access to valuable natural resources. Therefore, fishing rights are intangible threshold resources that qualify a firm to enter the industry [33]. Accordingly, in the present study, investments in fishing rights are of strategic importance see Fig. 2.

The framework in Fig. 1 suggests that the competitiveness of an intruder versus an incumbent firm in the quota share market is significantly affected by institutional and financial barriers to industry entry. The framework is a response to Peng et al. [10] and Bamberger's [37] claim for a more formal inclusion of contextual factors such as institutions in existing models to further advance strategic management theories. The ITQ institution, for example, is designed to protect incumbent vessels from inside rivalry [27]. However, the same institution also protects incumbent vessels from outside competition by creating an effective entry barrier.

First-moving incumbent firms can have several advantages compared with new entrants [38,39], one of which is being the first to gain control of critical resources such as quotas. To take technological leadership in the industry and get a proper foothold among customers are the two others. Furthermore, incumbent firms can have cost advantages relative to intruders due to economies of scale, knowledge, learning curve cost advantages, favorable geographic location, or proprietary technology [40]. These advantages of incumbent firms can deter entry [18]. However, new entrants can engage in activities to overcome disadvantages, but this will come at a cost [16]. Consequently, the profit potential from entry is reduced.

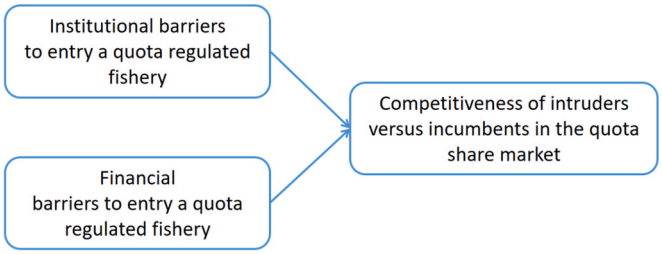

Fig. 1. Tentative theoretical framework.

For favorable access to raw materials to be a source of cost advantage, incumbent firms with this access must not have paid the full value when acquiring it [32]. If incumbent vessels historically have been allocated with free ITQs, this will give rise to a gratis institutional access to and protection of a valuable intangible asset. As it is unlikely that a similar event will occur in the future, incumbent firms will have secured a sustained competitive advantage [7]. If a firm, for example, can save a million dollars a year by not having to depreciate its quota holdings, it has gained a sustained cost advantage. A reason why incumbent firms historically received gratis quotas may be that the full value of the fishing rights was not known at the time when they were allocated by the authorities [41]. The above argument on gaining favorable access to raw materials also applies to first-moving quota buyers who had the opportunity to purchase quotas at favorable prices when only a few quota transactions occurred and there was great uncertainty as to what was the correct market price [32,35].

Generally, new entrants (i.e., late movers) are less likely to be able to acquire favorable access to raw material for a price less than the full value of that access compared with incumbent firms [42]. When incumbents earn economic profits on their favorable access to raw materials, these profits reveal the full value of that access. In the future, firms that attempt to duplicate this access will have to pay its full economic value [32]. Thus, new entrants will not be able to earn extraordinary profits from acquiring access to raw materials at market prices [32]. Quota values in fisheries are strongly influenced by changes in the institutional framework. Closing a fishery prevents new entrants from getting a share of the biological value creation that occurs. This is of course beneficial to incumbent firms. Furthermore, when catch shares are made transferable and valued in the marketplace, the extra values that accrue to incumbent firms are made visible also for intruders.

3. Method and data

3.1. Research design

The present study uses a multi-method research design implying that the responses to the different research questions are relatively complete on their own [43]. Next, the findings are synthesized to inform the overall problem statement of the study, which is how entry barriers can prevent new business startups in a quota-regulated fishery. Furthermore, the response to the research question of institutional entry barriers (RQ1) involves qualitative data analysis based on research articles, reports, and interviews with industry experts. Furthermore, the responses to the questions of capital requirement entry barriers (RQ2) and whether intruders and incumbents have different financial prerequisites to win bidding "wars" for scarce quota shares when they are up for sale (RQ3) require a quantitative approach. The quantitative research design of the empirical study outlined in this article requires in-depth knowledge of the existing institutional and financial entry barriers in the chosen empirical context [10]. As the expected performance of a potential firm that succeeds in crossing the barriers, that is, an intruder, will be compared with that of an average incumbent firm, the research design also requires valid and reliable performance measures. Finally, a set of financial data of representative incumbent firms over a specific period is required.

Strategic theory requires in-depth knowledge of the competitive arena being studied, and the environment must be as similar as possible for the companies that are compared [44]. By focusing on one single

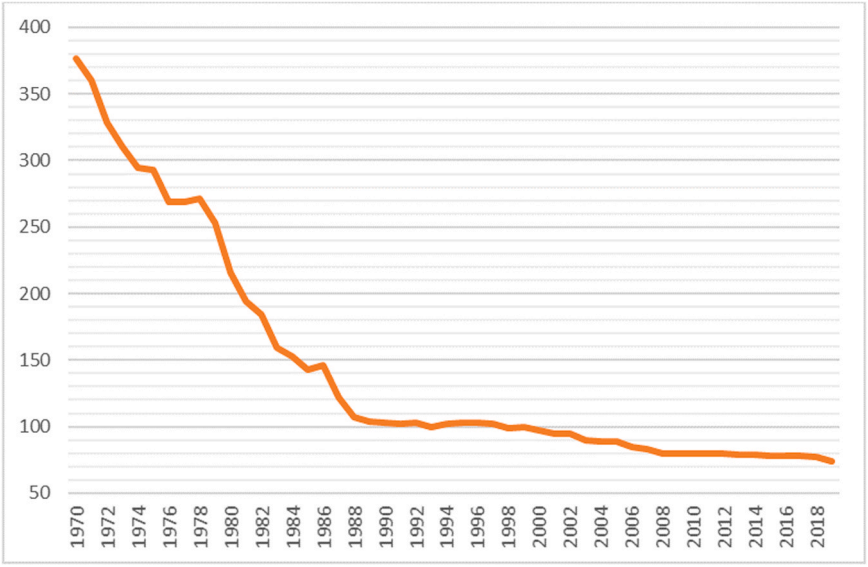

Fig. 2. Number of purse seiners in Norway (left axis) 1973–2019. 61, and the License register at the Norwegian Directorate of Fisheries.
Source: Official Norwegian Reports (NOU) 1981:3, Table 2.3, p.61, and the License register at the Norwegian Directorate of Fisheries.

industry, it is possible to control for industry impact [45] which, according to Porter [24], is crucial for firms' profitability. The resource-based view on strategy, additionally, requires good measures of firms' individual resource positions [46]. Previous empirical studies utilizing this perspective have often been of the case type [47]. However, the literature recommends a comparative design to avoid the weaknesses of case studies [48].

3.2. Unit of analysis

The vessel, which is a strategic business unit of a fishing vessel firm, is the unit of analysis in the present study. The validity of the comparison of vessel profitability is highest when vessels are similar [49]. The present study therefore chose an industry of similar vessels, which is the Norwegian purse seine fleet.

The quota holdings and catch capacity of the potential intruder were set about equal to the average vessel in the vessel group that had approached the (old) quota ceiling of 650 (so-called "base tonnage") units in the Norwegian purse seine vessel group. Alternatively, these quota units may be acquired by incumbent vessels. The validity of the comparison of the financial performance of the average incumbent vessel and the intruder is therefore regarded as high. This argument is further strengthened by the fact that the purse seine vessel group is characterized by low ownership concentration as most of the boats are owned by independent ship owners.

3.3. Sample and data collection

Fishery management objectives generally include improving economic performance. However, vessel profitability data to evaluate this is often unavailable as managers of relatively few fisheries collect such information or they collect it only sporadically [50]. However, the Norwegian Directorate of Fisheries requires most fishing companies to report income and cost data annually per vessel [13]. Furthermore, the study also presents data on labor intensity (man-years) and operating days based on self-reporting from vessel owners together with catch data from catch statistics. The present study has gained access to this unique dataset and bases all its analysis on it.

3.4. Measuring performance

Performance is a multidimensional concept and can, for example, be measured by a firm's present value creation, profitability, growth, or market share. Performance can also be measured using nonfinancial goals, such as flexibility and quality [46]. The present study applies present value as a performance measure. Koller et al. [51], Brealey et al. [52], and others stressed that the maximization of corporate value (that is, the maximization of net present value) is the fundamental financial goal of a firm. Profit is a generic term for annual surplus, and in basic accounting, annual profit is broadly similar to present value change from one year to next. In the next section, findings are presented.

4. Findings

4.1. Institutional entry barriers

This section describes formal institutional entry barriers in a quota-regulated fishery (see Tables 1 and 2) and thus provides a response to which institutional entry barriers are present in quota-regulated fisheries as, for example, the purse seine fishery in Norway (RQ1).

4.1.1. Legal entry barriers

The Participation Act contains provisions on eligibility to participate in commercial fishing and harvesting of other wildlife marine resources. The fisheries exploit limited renewable common resources. To conduct such activities, the legislation requires a special permission. The regulations provide for a general prohibition against exercising such activity. This prohibition is then supplemented with the authority to make exceptions to the prohibition by granting a permit [53].

Concession and special permits are granted to one owner for one particular vessel. The vessel is next allocated annual quotas of individual fish species. If the vessel is sold, a new owner must first obtain a concession. If changes are made to the ownership of a vessel-owned company, the ownership change must be approved by the Directorate of Fisheries (Participants Act §8). The concession and quotas are thus granted to one specific physical or legal person and to one particular vessel (ibid.). Special permits in the deep sea fishing fleet are granted without a time limit. The individual quota unit provides a relative share of the annual group quota set in the fishing in which the vessel participates.

Table 1
Legal entry barriers (LEB)[a].

No	Barrier description	Barrier justification
LEB1	*Permit requirement* A vessel cannot be used for commercial fishing without a permit, i.e., a concession (Participation Act, § 4).	The aim is to control capacity development in fishing by limiting participation.
LEB2	*Nationality requirement* The Participants Act (§5) states that a business permit can only be granted to a Norwegian citizen.	The political aim is to secure national ownership of valuable natural resources.
LEB3	*Residency requirement* At least half of the crew must reside in a coastal or a neighboring municipality for the vessel to be used for commercial fishing (Participation Act, § 5a).	The goal is to ensure that part of the value creation is distributed to coastal regions where the settlement historically has depended on fishing.
LEB4	*Activity requirement* Generally, only active fishermen can own fishing boats for commercial fishing in Norway. A concession may only be granted to a person who "has engaged in commercial fishing or fishing on or with a Norwegian vessel for at least three of the last five years and is still associated with fishing" (Participation Act, § 6). However, it is permissible to grant a company a concession if persons who fulfill the requirements of § 6, have more than 50% of the ownership interests, and, in fact, have equivalent control over the business.	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.
LEB5	*Requirement for the vessel* Besides concession, a special permit is required for each vessel to participate in a specific fishery (Participation Act, § 12 and §21).	

[a] Builds on Sørgård et al. [53].

4.1.2. Barriers to quota trading

In 2005, the market-oriented SQS was introduced in Norwegian fisheries (e.g., [41,55]). At the time, SQS replaced the previous unit quota system. SQs have mainly two purposes. First is to help adapt the capacity of the fishing fleet to the resource base. This is motivated by the need to achieve sustainable utilization of marine resources. Gradually, another goal arose; the industry also should contribute to the continuous development of productivity in society at large. By reducing the number of vessels participating in the fishery, improved profitability for the remaining ones was facilitated [56]. The structural quota scheme has therefore enabled the fishing industry to compete for labor and to renew the fleet through vessel investments (ibid.). In the purse seine fleet, the institutional measures taken have, together with other factors (e.g., poor fish stock development and resulting low vessel profitability especially in the period 1970–85), reduced the number of participating vessels from 377 in 1970–74 in 2019 (see Fig. 1).

The main condition for being allocated with a structural quota is that one or more vessels are taken out of the fishery [55]. That is, a vessel is withdrawn from the register of fishing vessels and scrapped. Another (or several other) vessel(s) can then be issued with the associated fishing rights (quotas).

4.2. Capital requirement entry barriers

This section describes capital requirement entry barriers in the quota-regulated Norwegian pelagic/purse seine fishery and thus responds to RQ2. The capital required for an investment in quotas and vessels for a new entrant is summarized in Table 3. This includes the physical pelagic vessel as well as the fishing rights. The by far most important fishing right for this vessel group is the bundled catch share for herring, mackerel, and capelin. Additionally, most vessels have a fishing right for blue whiting. The catch shares vary between vessels, but for the estimation of capital requirement, the present study assumes a level of 650 quota shares in the fishery and a blue whiting permit.

A significant capital requirement for an entrant (about 100 million USD) is shown in Table 3. The requirement for equity is also considerable (30–40 million USD). The equity market in this industry is very limited partly because of legal ownership restrictions. Although vertical integration is not allowed, an industrial partner can own up to half the shares of a fishing company (see Table 1, LEB4). Thus, if the owner manages to establish such an alliance, the equity requirement of the active fisherman could be halved. The remaining capital requirement (15–20 million USD) will however exclude most Norwegian active fishers from entering the industry.

4.3. Competitiveness of intruder versus incumbent in the quota market

Fish quota shares are a threshold resource that an intruder must acquire to successfully enter the industry [33]. This section will examine whether intruders and incumbents have different financial prerequisites

Table 2
Quota transfer barriers in the purse seine vessel group (QTB)[a].

No	Barrier description	Barrier justification
QTB1	The giving vessel must be scrapped when quotas are transferred. Furthermore, 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 SQS.
QTB2	When a quota is transferred in the purse seine vessel group, 5–40%, depending on the vessels' homeports, is deducted from the transaction and reallocated 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
QTB3	If the quota is traded from the northern region to the southern region, it will be reduced by 40%. If it is traded within the northern region, the reduction is 5%, and if the trade occurs within the southern region, the reduction is 15%.	
QTB4	Each vessel has a quota ceiling on 850 tons at present, which represents approximately 2% of the vessel group's TAC share.	To prevent a too high concentration of quotas on a few vessels
QTB5	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
QTB6	Tradable quotas (structural quotas) are time limited. Upon expiration, in 2027, at the earliest, there is an anticipation among industry actors that they will be allocated to the vessels remaining in the group, although this is not formally yet determined.	To express that the fish resources are a common property
QTB7	Quota leasing is not permitted.	

[a] Adapted from Johnsen and Jentoft [54] and Standal and Asche [55]. The provisions of quota trading do not apply only to intruders but also to incumbent firms.

Table 3
Capital requirements from investing in quotas and vessel[a].

Quotas	Quota units	Market value (Mill. USD[b])	Book value (Mill. USD[b])
Quota for herring, mackerel, and capelin[c]	650	65	6.7
Quota for blue whiting[d]	1.1	N/A	N/A
Fishing vessel[e]		21	7.6
Fishing gear and other equipment[f]		11	5.1
Current assets[g]		1	5.1
Total capital requirement		98	
Equity requirement[h]		30	

[a] All numbers in the table are based on the average of n = 98 financial years (2013–2017) for 31 vessels with a quota holding between 640 and 656 units (so-called "base tons") included in the profitability survey of the Norwegian Directorate of Fisheries.

[b] Amounts in the table are converted from Norwegian Kroner (NOK) to USDs with an exchange rate of 10 NOKs for 1 USD.

[c] A quota unit for herring, mackerel, and capelin is a package with a certain quantity of each species. The market price is based on recent quota transactions within the sample. The average vessel had purchased about 30% of its quota holding and received the rest from the state for free when the vessel quota system was introduced.

[d] n = 92 financial years for base quota blue whiting (Quota Factor = 1); n = 15 for structure quota blue whiting (Quota Factor = 0.5). The quota units for blue whiting and the other species are not comparable. Furthermore, in the balance sheets, a single book value for all quotas is presented. As more than 90% of the revenues from the vessels come from herring, mackerel, and capelin, these quotas are the most valuable.

[e] The investment expenditure of the vessel is set to the book value of a new vessel of similar capacity purchased in 2017.

[f] For market value, the amount set is twice the average book value of the vessels in the sample.

[g] The average company in the sample had accumulated more cash in the balance sheet than is necessary for normal operations (see column Book value). Penman [57] suggested an amount equivalent to 3% of revenues as required cash for ongoing transactions; however, the present study has increased this estimate to 15% to ensure that the company has sufficient cash to operate.

[h] Banks' equity requirement is estimated at 30–40% of the total capital based on personal interviews with fisheries bank managers and industry specialists. In the above example, about 30% is used.

to win bidding "wars" for scarce quota shares when they are up for sale (RQ3). It is hypothesized that economies of scale can act as an entry barrier by making the players apply different quota pricing principles when operating in the quota share market (full-cost pricing by intruders and marginal-cost pricing by incumbents). In economics, marginal-cost pricing refers to the practice of setting the price of a product equal to the added cost of producing an extra unit. By applying a marginal-cost pricing policy, a producer can charge, for each product sold, only the addition to total cost resulting from direct materials and direct labor. However, in the long run, a producer also must cover his/her fixed costs to be profitable, that is apply full-cost pricing [58].

The response to RQ3 is crafted as follows. Imagine that a quota of 650 tons is posted for sale. This quota holding can be purchased in its entirety by an intruder who must also invest in a vessel to fish it. Alternatively, the quota can be split and purchased by several incumbents with available fishing capacity. Finally, NPV of a quota unit of an incumbent buying 150 tons of the quota holding is calculated and compared with that of the intruder that buys the entire quota and a vessel.

First, in the calculation procedure, each cost item in the vessel's income statements has been subjectively separated into variable and fixed cost (see Table 4, column Variable cost share).

Wages of the crew represent a major cost component (this is the first cost item in Table 4). Remuneration is calculated as a share of the catch value less costs of provisions, insurances, various fees and other costs. This share is reduced if the vessel acquires additional quota. If the vessel has 50% of its quotas from ITQ (structural quotas), crew share is reduced by 1% point. For simplicity, it is here assumed that wages of the crew are a percentage of revenues. It is difficult to determine the variable component of the cost item Maintenance of vessel. For simplicity, it is in the present study assumed to be 25% of the reported costs and it depends on operating time. Insurance of the vessel is to a degree also dependent on operating time. Vessels are charged per month and receive a 50% discount if they are moored for the whole month. Other insurances is primarily related to crew and cargo. Hence, the study assumes this item to be fully variable and paid on a per month basis. The item Various fees represents fees to sales agency, social costs, and research. Other costs are a major cost component where the separation between fixed and variable costs to a large degree is subjectively determined with high uncertainty. The study assumes that 50% of these costs are variable and dependent on catch quantity.

Table 4
Cost assumptions for an average purse seiner[a].

Cost item	Average cost (1000 USD)	Variable cost share	Cost parameter		Cost driver
Wages of the crew	1620	100%	25.2%		Catch value
Social costs	31	100%	1.9%		Wages
Pensions	15	100%	0.3%		Catch value
Provisions	43	100%	7234	USD/ month	Operating time/crew
Fuel	666	100%	0.046	USD/ kg	Catch quantity
Bait, ice, and packaging	6	100%	0.0	USD/ kg	Catch quantity
Maintenance of vessel	480	25%	20,007	USD/ month	Operating time
Maintenance of fishing gear	210	50%	0.007	USD/ kg	Catch quantity
Depreciation of vessel	565	0%			
Depreciation fishing permits	271	0%			
Insurance of vessel	63		7023	USD/ month	Operating time
Other insurances	31		5224	USD/ month	Operating time
Various fees	215	100%	4.0%		Catch value
Other costs	484	50%	0017	USD/ kg	Catch quantity

[a] Average costs for the vessel group purse seiners in the profitability survey of the Directorate of Fisheries for 2018.

How the vessel's catches and revenues are influenced by quota purchases are of major importance. This constitutes the second step of the calculation procedure. Vessel quotas for most species in the purse seine group are allocated proportionally to each vessel's holding of

Table 5.
Average sales prices by species and assumptions regarding catch for an intruder acquiring a 650 base tons quota and an incumbent acquiring 150 tons of SQ quotas.

	First-hand price (USD)[a]	Catch entrant (tons)	Additional catch incumbent (tons)
Mackerel	1.67	1143	381
Spring-spawning herring	0.60	2223	741
Other herring	0.48	1773	591
Capelin	0.32	1500	
Norway pout	0.27	250	
Blue whiting	0.26	3500	
Other	0.52	300	
Change in catch		10,689	1713

[a] First-hand prices are average prices in USD for the vessel group purse seiners in the profitability survey of the Directorate of Fisheries for 2018.

"base tons". Instead of expressing a vessel's share of the vessel groups TAC as a percentage, this share is expressed in base tons in the Norwegian quota system. Mackerel and herring are utilized fully as they are highly profitable fisheries. Not all vessels participate in other fisheries. Quota utilization thus varies between vessels. Blue whiting requires a separate fishing permit, and in the present case, it is assumes that such a license is acquired by the entrant. The catch assumptions for the two alternatives are summed up in Table 5. The study compares catch volumes of an intruder that buys 650 base tons of quota to the changes in catch for an incumbent that already holds 650 base tons, but who now chooses to acquire 150 extra base tons to his/her existing quota holding as he/she has free fishing capacity. The latter is assumed only to be able to utilize the added quotas for mackerel and herring. These are proportional to the acquired quota units (base tons). The entrant is able to utilize a wider range of species.

When acquiring base tons and converting these to SQs, 5% is deducted in the Norwegian system. Physical catch quotas per quota unit (base ton) are collected from the species case descriptions from the annual management discussion meeting. The new entrant case is assumed to operate for 5 months, while the additional catch for an incumbent is assumed to take one extra month of fishing.

In the third and final step of the procedure, costs (Table 4) and revenue data (Table 5) are combined to calculate the operating profit of the two quota buyers (see Table 6). Further, in Table 6, depreciation of the vessel is added to obtain estimates of cash flow needed to calculate the present value using a real cost of capital of 5% and assuming a lifespan of 30 years for the new entrant. Acquired SQ quotas have a legally defined lifespan of 20 years, although there is political uncertainty beyond this. Also, when acquiring base tons and converting these to SQs, 5% is deducted.

For the respective alternatives, the present value is 37.7 and 8.5 million USD. For the new entrant, the investment in a vessel to operate is subtracted to obtain the net present value. The investment expenditure is uncertain. A small new purse seiner is reported contracted at about 20 million USD and a very large one at 35 million USD. However, there are likely efficiency differences between new and used vessels. For simplicity and to avoid such differences, this study assumes that a similar used vessel can be acquired at the book value of vessel and other fixed assets. This yields an investment of 12,7 million USD.

Table 6
Revenues, costs, operating profit, cash flow and present values for new entrant and incumbent (1000 USD).

	Entrant using full-cost quota pricing[a]	Incumbent using marginal-cost quota pricing[b]
Revenue	6110	1107
Various fees	251	46
Wages, pensions, and social costs	1576	221
Provisions	36	7.2
Fuel	590	78
Maintenance vessel	461	20
Maintenance fishing gear	198	12
Insurance vessel	60	4
Other insurance	26	5
Other costs	462	29
Depreciation vessel	565	0
Operating profit	1885	685
Cash flow	2450	685
PV from operation	37,662	8542
Vessel investment	12,654	0
NPV total investment	25,000	8542
NPV per quota unit (thousand USD)	38.5	54.2

[a] Entrant investing in vessel and base quota 650 tons and using full-cost quota pricing.

[b] Incumbent investing only in SQS Quota 150 tons and using marginal-cost quota pricing.

Subtracting the investment and calculating NPV per quota unit, the new entrant and incumbent respectively obtain NPVs of 38,500 and 54,200 USD. Such vastly different valuations of quota units clearly illustrate the benefits achieved from an increasing scale. The scale advantage will decrease as the scale of the new entrant increases. The value for an incumbent decreases as it closes in on the capacity limits because the vessel would need to expand the fishing into periods with less marginal income. For the new entrant, the importance of fixed costs will decrease with increasing capacity utilization.

5. Discussion

Over the past decades, vital institutional arrangements have been put in place to protect fish stocks from overfishing (e.g., a TAC regime) and to prevent Olympic fishing (e.g., an ITQ regime) and thus securing the financial interests of the remaining fishers [59]. However, as (unintended?) side effects, insurmountable entry barriers have been created, particularly in quota-managed fisheries. Accordingly, some researchers have signaled concerns over the lack of industry renewal through firm entries [60]. The present study generally aimed to explore how entry barriers can prevent new business startups in a quota-regulated fishery. The Norwegian purse seine fleet was chosen as an empirical context. It was assumed that a new potential entrant would be motivated to enter the industry because of the superior performance that the average incumbent firms achieve (e.g., [11,12]).

Government policy can hinder entry into a fishery [54]. Thus, the first research question (RQ1) was raised: Which institutional entry barriers are present in quota-regulated fisheries as exemplified by the purse seine fishery in Norway? The massive legal entry barriers of Norwegian fisheries are outlined in Table 1. The findings disclose that there are numerous hurdles specified as requirements for licenses, nationality, residency, activity, and the vessel. Furthermore, the Norwegian variant of the ITQ system outlined in Table 2 is designed to prevent a race to fish and thus provides an institutional protection of the incumbent vessels' catch shares from their rivals. Conversely, this system also represents an entry barrier for intruders and thus protects incumbent vessels from outsiders [61]. To sum up, the unfavorable institutional barriers for market entrants provide incumbent firms with a competitive advantage [10,26] in a quota-regulated fishery.

If an intruder succeeds in overcoming the institutional barriers, the next obstacle is of a financial character. As disclosed in Table 3, which is a response to RQ2, the capital required to invest in quotas, vessel, gear, and current assets is substantial in the Norwegian purse seine fleet. The most significant investment is in quotas. A minimum outlay of 65 million USD is required to purchase quotas at market prices for a potential intruder with the catch capacity specified in the present study (650 quota units or so-called "base tons"). That is, it is assumed that the quotas bought are structural quotas that are priced according to the marginal cost principle (see Table 6). The market price of a complete vessel quota is unknown as such a quota has not been traded in the last 20 years. The quota outlay is of course independent of whether the catch machine utilized is new or second-hand. The total capital required for an intruder to fund the necessary investments in quotas, a new vessel, and other accessories is estimated to be 98 million USD. However, purchasing a second-hand vessel if one is available can save about 10 million USD.

The average incumbent firm in the sample had received about 70% of its quota holding for free. The book value of the bought part of the quota holding (structural quotas) was modest 6.7 million USD (see Table 3). This figure represents only approximately 10% of the outlay of a potential intruder of a similar quota base (650 quota units). The low quota investments and subsequent low depreciation costs can be a source of a sustained competitive advantage of incumbent firms [16]. This conclusion is in line with van Putten et al. [59] who argued that capital requirement barriers for market entrants constitute a competitive advantage of incumbent companies. Furthermore, barriers associated

with capital requirements are related to the resources of a firm [18]. Firm resources are primary predictors of superior performance according to RBV [9], as these resources help organizations build competitive advantages [7,8]. To do so, the resources must be rare, unique, valuable, not perfectly imitable by competitors, and competitively superior. Proponents of RBV argued that resources possessing these characteristics ultimately lead to higher firm performance through sustained competitive advantages [7].

Given that the intruder succeeds in overcoming both the institutional (RQ1) and capital requirement barriers (RQ2) to entry, the third research question (RQ3) raised in the present study was whether intruders and incumbents have different financial prerequisites for success when battling for scarce quota shares as they are up for sale. The calculation of the values created, i.e., NPV per quota unit (see Table 6) of the intruder (38,500 USD based on full-cost quota pricing) is only 70% of the value created by the incumbent (54,200 USD based on marginal-cost quota pricing). Such substantial different valuation of quota units clearly illustrates the benefits achieved from being an incumbent with excess catch capacity. There is therefore little doubt as to who are best financially positioned to win bidding "wars" for quota shares. When also considering that an incumbent has large hidden quota values in the vessel's balance sheet [62], he/she will also have the best odds of getting favorable loan financing of any quota purchases if this should be necessary. With the observable competitive disadvantages of an intruder relative to an incumbent, it is understandable that no startup firms have entered this industry for the last 20 years.

5.1. Implications

RBV points out that sustained competitive advantages can arise because of historical developments (e.g., [7]). The present study indicates that being inside when an open fishery is closed is such a moment. If actors, additionally, are active in an early stage of a market for transfer of quotas, they seem to achieve an early mover advantage [38].

FAOs code of conduct has been an inspiration for the development of sustainable fisheries management (FAO, 1995). The guide emphasizes two stages. First, establish a knowledge-based TAC to avoid devastating overfishing. The second stage is to reduce the capacity to make the fishery economic sustainable. In many countries, this has been achieved by closing the fishery and establishing a market arena to buy out excess capacity. Through these two stages, several fishing nations have been able to establish sustainable management regimes. The management regime analyzed in the present study has followed FAO's recipe.

However, in a third stage, when overcapacity is under control, another challenge arises: How should such a regime open for new players to bring in new business models that can contribute to innovations? In modern fisheries management, market arenas have been established to exchange licenses and quotas to provide an opportunity for new actors to enter the industry. The findings of the present study show that this is a mechanism that does not work within the institutional framework studied.

This is illustrated by the fact that established players have both the ability and willingness to outperform new players who wish to enter. This is in line with what Margaret Peteraf referred to as the four cornerstones of competitive advantage [63]: "In sum, four conditions must be met for a firm to enjoy sustained above-normal returns. Resource heterogeneity creates Ricardian or monopoly rents. Ex post limits to prevent rents from being competed away. Imperfect factor mobility ensures that valuable factors remain with the firm and that the rents are shared. Ex ante limits to competitions keep costs from offsetting the rents" (p. 185).

The findings of the present study indicate that benefits gained in an early stage of a modern regulatory regime have sustained by the fact that actors, together with institutional frameworks, have established financial barriers that have prevented new entrants from establishing themselves in the industry.

An opportunity to reduce barriers for entrants may be to use the market to let them exclusively compete in a public auction system. This market should only be open to entrants for a limited number of licenses. The willingness to pay for such a license will be lower than what the incumbents would pay. As TAC is kept unchanged, such a new player will represent a reduced profit for the incumbents. The price for such a permit can therefore be looked upon as resource rent taxation that draws today's super profit out of the fleet group while opening a new channel for innovation from new players. However, such a regime faces a difficult challenge on how to balance the problems related to overcapacity and the need for innovation.

The direction of needed innovations will depend on weaknesses in the value system studied. To succeed in this setting, the incumbents need to be willing to share profit and coordinate their harvest strategies with post-harvest stages. Thus, the barriers revealed in this study indicate a need for new actors in the harvest stage that are committed to focus on post-harvest innovations like product developments and coordination between different stages of the value system. This study indicates that such new actors are not likely to enter this fleet with the significant institutional and financial barriers to entry that must be overcome.

The present study indicates that first mover advantages in ITQ regimes are important both to understand success and pricing in markets for licenses and quotas. However, the external validity of this conclusion must be tested in other studies. The present study predicts that barriers in the Norwegian institutional framework strongly affect the findings. Especially, will former activity requirements among entrants limit the number of potential new actors? In order to test this impact, to study ITQ in regimes that do not have such requirements can be a fruitful avenue to follow.

The external validity of this study must be confirmed in further studies in other comparable quota markets. The present study is in a market with several restrictions that are not present in other markets. To study entry barriers in markets with less or other restriction would be necessary to test the external validity of this study. Accordingly, to further study how different restrictions in this kind of markets impact innovations in the entire value system, would be valuable.

6. Conclusion

The findings in this study (e.g., see Table 6) clearly demonstrate how institutional and financial entry barriers altogether make it economically unattractive to enter a quota-regulated fishery such as the Norwegian pelagic fishery. However, the findings also reveal the economic value of the entry barriers for incumbent firms in the empirical context chosen. This advantage is reflected in above-normal economic performance for those protected by the barriers (e.g. [11,12]). The substantial institutional and financial entry barriers indicate that the industry is closed to intruders and operates like a cartel. Combining the theoretical perspectives of IBV and RBV for explaining the relationship between entry barriers and firm performance is a theoretical contribution of the present study.

Conflicts of interest

The authors declare no conflict of interest.

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