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Sustainability of a first-mover strategy in the emerging Norwegian snow crab industry

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ABSTRACT

The initial stage of the emerging Norwegian snow crab (SC) industry was characterized by excessive optimism, and this case study explores whether the early entrants have gained sustainable first-mover advantages. Unfortunately, the investments have not been profitable as the firms made a yearly average negative profit of more than 10% in the period examined. Accordingly, the early entrants have so far suffered first-mover disadvantages. Nevertheless, the modest economic start may be bad at predicting the future wealth-creating potential. This, however, will require the SC population of the Barents Sea to increase sharply. It will also require that the nations involved in fishing SC agree on the distribution of the total quota between them. Another institutional requirement is that a system of catch shares (e.g. individual tradeable quotas) is introduced in the Norwegian SC fishery to protect the strategic position of the players from outside intruders, and also efficiently block the rivalry between them. The SC fishers are engaged in an extremely risky business with a significant financial loss potential. In addition to risks related to the resource base and to national and international regulations, there are large risks associated with how SCs in the Barents Sea can be best captured, processed and sold. As a consequence, the firms participating in SC fishing need significant financial reserves to cover any future losses. Without such reserves, they must either choose to withdraw from the industry and consider the inflicted losses as sunk cost as some have already done, or they will risk bankruptcy.

1. Introduction

In the first decade of this millennium, it was found evidence for a permanent establishment of the snow crab in the Barents Sea (Alvsvåg et al., 2009), and the first commercial snow crab catch was landed in Norway in 2012 (Lorentzen et al., 2018). Thus, an unexpected opportunity arose to create a new profitable fishery. The emerging industry would eventually be based on a product, which was already well established in the world market by snow crab fishers from Alaska, Canada, Greenland, and the far East of Russia (Hardy et al., 2011; Pinfold, 2006).

The optimism in Norway was profound during the first years of the commercial fishery. A scientist at the Norwegian Institute of Food, Fisheries, and Aquaculture Research (Nofima), stated in 2015 that "snow crabs will be the Barents Sea's largest resource" (Siikavuopio and Whitaker, 2015). Other industry experts were less, but still quite, optimistic. A researcher at the Norwegian Institute of Marine Research claimed in a newspaper interview that snow crab in Norway "… can become a resource with the second largest value in the Barents Sea, after cod. So, it has a larger value than that of mackerel, herring, and capelin and so on. There is a large potential for fishery" (Fenstad, 2015). The Norwegian catch value of mackerel, herring, and capelin was NOK 4.2 billion in 2015 (Fiskeridirektoratet, d.u.). The main optimists, including industry experts and researchers, expected snow crabs to challenge the North east arctic cod as the economic driving force of wild capture Norwegian Fisheries (Whitaker and Fylling-Jensen, 2017). In 2018, 3061 tons of snow crab was caught with a first-hand value of 146 million NOK. The same year, 376,575 tons of cod was caught by Norwegian vessels at a catch value of NOK 7269 million (Fiskeridirektoratet, d.u.). The catch volume and revenue from snow crab fishing was thus far more modest than forecasts made some few years earlier.

The establishment of the Norwegian snow crab industry (NSCI) was, as indicated, based on very optimistic forecasts, which have so far proved flawed as the first-moving entrepreneurs have faced significant biological, technological, institutional, and economic challenges. In the literature, there is considerable interest in examining the financial

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returns of moving first (Lieberman and Montgomery, 2013). Thus, in this empirical case study, the aim is to investigate the following research question (RQ). Are there indications of sustainable first-mover economic advantages in the emerging NSCI?

To theoretically explore the research question raised, the resource-based view of firm strategy (RBV) is integrated with first-mover advantage theory (FMA). Thus, in the context of market entry, an first-mover can gain a competitive advantage through resources that are rare, valuable, difficult to imitate, and non-substitutable (Lieberman and Montgomery, 1998, 2013; Tey et al., 2020). According to Lieberman and Montgomery (1998), RBV and FMA have historically evolved as prominent but independent research streams. Furthermore, they claimed (p. 1112): "We see a strong potential for synergy: the first-mover literature offers empirical knowledge to fill major gaps in the resource-based view." The main focus of RBV/FMA theories is on managing competitive advantages of first movers related to critical resources such as predisposing of sufficient cash to cover any financial losses in the early stages of the (snow crab) business venture, employ new efficient (snow crab catch) technologies, and develop new (snow crab) customer relations.

Furthermore, Suarez and Lanzolla (2005) suggest that research on first-mover should take into account the industry in question, the context, and the type of product. Thus, this is a descriptive multiple-case study that follows the financial development of approximately half (5) of all first movers at the early stage of the NSCI, that is, the three-year period 2015–2017. The methodological approach chosen is in line with the work of Lieberman and Montgomery (1998) when stating that (p. 1122): "We see little to be gained from more studies demonstrating first-mover advantages based on market share. Empirical tests should increasingly be related to profit performance." Moreover, the empirical evidence relating to FMA is drawn largely from the United States. Consequently, more research is needed on the applicability of such first-mover results to other national environments (ibid.). Accordingly, the Norwegian empirical and institutional contexts, in which this study takes place, are different from the United States contexts.

Finally, biological and environmental aspects of the snow crab invasion in the Barents Sea have been studied extensively (e.g. Alvsvåg et al., 2009; Jørgensen and Spiridonov, 2013; Siikavuopio et al., 2017), whereas studies of how firms strive to exploit the arising opportunities commercially are missing. Hence, this is another contribution of the current study.

In the following sections, strategy literature is outlined relevant to the research questions raised. Next, the context of the study, method used, and results obtained are presented. Finally, findings, implications, and limitations of this study are discussed before some possible directions for future research are suggested.

2. Theory

RBV takes a firm perspective in explaining competitive advantages that may lead to subsequent superior performance (Barney, 1991; Peteraf, 1993; Wernerfelt, 1984). Hence, performance variations are explained as a result of firms (e.g. entre-preneurs) owning or controlling different strategic asset portfolios or of actors being capable at generating superior returns from their resources at varying degrees.

Lieberman and Montgomery (1988, 1998) developed the most prevalent frame-work to explain the relationship between entry timing and firm performance. Their first-mover advantages (FMAs) theory argues that a firm that enters a given market before its rivals may gain a competitive advantage. There are three main sources of FMAs. An entrepreneur can obtain a FMA by being the first to achieve control of critical resources. A first-mover also has the best opportunity to take technological leadership in the industry and get a proper foothold among customers and thus establish significant switching costs. If the advantages are long lasting, first movers can be rewarded with sustainable above-normal profits (Barney, 1991). Encouraged by Lieberman and Montgomery (1998, 2013), this study repositions theories of FMAs within the broader theoretical framework of RBV.

In an emerging industry, a first-mover may acquire critical assets, such as a catch share, at a price that is lower than that will later develop in the marketplace. In an individual vessel quota system, there is room for only a limited number of firms to share the total allowable catch (TAC) (Birkenbach et al., 2017). In Norway, when fisheries have been closed, firms that had already been operating in the industry received their quotas for free from the authorities based on their catch history (Johnsen and Jentoft, 2018). After the quotas were initially distributed, latecomers had to buy quotas in the marketplace, often at a steep price, to gain access to the fishery (Hannesson, 2013; Standal and Asche, 2018). Accordingly, late movers incurred a significant economic disadvantage on themselves relative to first movers.

Technological leadership is a second source of FMA (Lieberman and Montgomery, 1988). By developing innovative catch or processing technologies, early entrants can gain significant cost advantages. As long as the technology can be kept proprietary, firms can maintain their advantages. Moreover, practices developed to catch fish efficiently and gently treat it on board to maximize its value can provide an economic advantage for a firm (Bertheussen and Dreyer, 2019).

Customer switching costs represent a third source of FMA. These are the extra resources that late entrants must invest in to attract away customers from the first movers. As long as buyers are satisfied with the price and quality of the products they already consume, it can be rational for them to keep on using them (Wernerfelt, 1985).

The early stage of an industry is characterized by significant uncertainty (Alvarez and Barney, 2007). First movers are thus exposed to immense business risk. In the emerging NSCI, the size and spatial distribution of the stock of the crab is uncertain. So, is the optimal level of harvesting (TAC) (Kaiser et al., 2018). Moreover, there is great uncertainty related to the establishment of the institutional framework developing around an emerging industry (Peng, 2002; Peng et al., 2009). The Norwegian snow crab fishery takes place in two geographical areas of the Barents Sea, which are highly disputed, i.e., the Loophole and the Svalbard Fisheries Protection Zone (FPZ). Thus, there resides great uncertainty about the future Norwegian total allowable catch (TAC) of snow crabs (see for example Kaiser et al., 2018; Hansen, 2016; Nyman and Tiller, 2020; Østhagen and Raspotnik, 2018). Furthermore, there is national uncertainty on how the total allowable catch (TAC) should be distributed among fishers (Regjeringen, 2019). There is also uncertainty related to the most efficient catch and processing technologies and practices applied. Finally, it may be unclear for newcomers who are at the very beginning of their learning curves, how the crab should be best supplied to the market to create as much value as possible throughout the value chain (Voldnes, 2017).

Not all first movers succeed (Shankar et al., 1998). Failing actors incur first-mover disadvantages. Hence, opportunities arise for new entrants to enter the market and compete more efficiently than first movers. These entrepreneurs may have second-mover advantages (ibid.). Late movers in an industry can reap free-rider rewards as they may be able to study and imitate the strategies of pioneering firms (Lieberman and Montgomery, 1988). Imitation costs of second movers can be much lower than the innovation costs of first movers and provide a substantial cost advantage. Studies of free-rider effects indicate that great benefits can be related to less research and development costs for second movers (Spence, 1984). Furthermore, late movers can reap increased learning-based productivity (Ghemawat and Spence, 1985). Finally, first movers risk hiring and training personnel, only to experience that the competitors lure them away. This is a potential free-rider effect in relation to labor costs (Guasch and Weiss, 1980).

3. The emerging NSCI in a global context

3.1. Snow crab industries world wide

Commercially, the snow crab is a high-value species. Snow crabs (Chionoecetes opilio) are crustaceans with a flat body and five pairs of spider-like legs. The front pair is claws (Conan and Comeau, 1986). Snow crabs may grow at variable sizes. Males can grow to a size of approximately 15 cm in carapace width (CW), almost twice the size of females (ibid.) Only male crabs that meet or exceed a minimum legal size can be harvested. In Norway, the minimum CW is this is 95 mm (Alvsvåg et al., 2009). It takes from 7 to 9 years for males to reach this size; this also coincides with maturity and a stop in molting. Snow crabs live for approximately 14–16 years (Conan and Comeau, 1986). Snow crab is naturally distributed in the North Pacific (eastern Bering Sea) and the North West Atlantic, including Canada and Greenland (Alvsvåg et al., 2009). However, in the 1990s, some few crabs were captured in the eastern part of the Barents Sea (Jørstad and Jelmert, 1997), and as time went by, more and more observations of snow crabs as bycatch were made by Norwegian and Russian fishers.

Major markets for snow crabs are the United States of America, South Korea, China, and Japan. Japanese pricing has a large impact on the international market (Pinfold, 2006). Historically, major suppliers of SC have been Canada, Alaska, and Russia. Both Canada and Alaska have been capturing snow crab since the '60s. There, the fisheries quickly developed into major industries (Pinfold, 2006). Canada developed regulations during the 1970s including fishing gear usage and a requirement of minimum legal size of the crab caught. TAC was also set (ibid). During the 1980s, the snow crab industry became one of the largest fisheries in Canada in terms of value. In 1988, the value of the snow crab caught in the Gulf of St. Lawrence was 150 million USD. The year after, the snow crab industry in Canada collapsed because of overfishing as the amount of snow crab caught was 30,000 tons instead of the allowed 5000 tons (Hare et al., 1993).

In Alaska, Japanese fishing vessels harvested snow crab from the 1960's until 1980 when the Magnuson Act prohibited foreign fishing. After the exclusion of foreign vessels, catches increased from relatively low levels in the early 1980's to historical highs in the early and mid-1990s. The Bering sea crab fisheries were challenged by strong fluctuations in stock and catches, and declared overfished in 1999, but did not close (Pinfold, 2006). A plan to rebuild the stock within ten years was implemented. However, the plan was declared a failure in 2009 (Turnock and Rugolo, 2011). The establishment of a TAC without any further regulations as i.e. individual quotas led to an Olympic/Derby fishery. High competition made every captain push their vessel and crew to the limit in order to get the largest possible share of the TAC (Herrmann and Greenberg, 2007; Petursdottir et al., 2001). A crab rationalization program was implemented in 2005. Harvester and processor ITQ's were introduced as well as measures to protect fishery-dependent communities by placing constraints on where harvested crab could be processed. As a result, access to the fishery was closed for new entrants. Furthermore, 24 vessels and 62 fishing quotas were bought out to create a more sustainable or/and more efficient, profitable fishery (ABSC, 2019), and in 2011 the stock was declared rebuilt (Szuwalski and Punt, 2013).

Russia and Greenland emerged in the mid 1990's as actors on the international snow crab market place. The Greenland fisheries never reached a substantial level with a maximum catch of 15,000 tons in 2001.Within five years, it declined with as much as 77% to 3400 tons and thus not even reached the set TAC in 2006. Management regimes were established in order to prevent the steady decline in the stock (Burmeister and Siegstad, 2008). In recent years the catches have not even reached the set TACs (see Table 1). This study failed to find the sources to the development and management of the Russian snow crab fisheries, but in recent years their quotas in the Pacific has lingered round 20,000 tons (see Table 1).

Table 1
Total catch by country based on FAO catch statistics[a].

Country/Year	2015	2016	2017
Canada	94	83	92
Alaska	37	18	10
Russia Pacific	31	35	43
Greenland	1	2	2
Latvia	4	5	N/A
Japan	4	4	4
South Korea	44	38	31
Norway Barents	3	5	3
Russia Barents	9	8	8
Total	219	211	216

[a] All figures in a thousand tons. For Russia Pacific, Japan and South Korea the species Chionoecetes Opilio (Snow crab or Queen Crab) are merged with Chionoecetes Bairdi (Tanner Crab) into Chionoecetes Spp (Tanner Crabs nei).

The two last significant global players are The Republic of Korea (South Korea) and Japan, as they are both major importers of international crabs. It is therefore a reasonable assumption that they do not export nationally caught snow crab. Catches are difficult to estimate as the FAO catch statistics merge snow crab (c.opilio) and tanner crab (c. bairdi). Thus, they are jointly referred to as Tanner crabs nei (Chionoecetes spp).

To sum up, snow crab is an international species available for catch in several countries in the northern hemisphere. Table 1 provides an overview of the total SC catch by country in the study period. According to these numbers, the Barents Sea catch was approximately 5% in 2017 (Tanner crab supply included).

3.2. The emerging NSCI

In 2011, Jan Sundet, at the Norwegian Institute of Marine Research, confirmed that the snow crab had started to establish itself in the SFPZ (Forskning.no, 2011). The year after, in 2012, the first tons of snow crab were landed in Norway (Lorentzen et al., 2018). In 2015, the Ministry of Trade, Industry, and Fisheries provided 15 vessels with a temporary license to fish snow crab (Erlandsen, 2015). The snow crab's main habitat is currently located in the northern parts of the Russian EEZ and in international waters of the Barents Sea Loophole. The crab is presently expanding into the SFPZ, and the overall area of distribution covers more than 34% of the Barents Sea (Bakanev, 2015). Thus, the species has now successfully established itself in the Barents Sea.

It has not yet been estimated how large the snow crab population is in the SFPZ. However, the spreading might cover more area than scientists initially expected, as the results of the Norwegian Institute of Marine Research's studies indicated in August 2018 (Sætra, 2018). Russian researchers have estimated the snow crab population to be ten times higher than that of the red king crab (Sandø, 2013). The Norwegian catch of male red king crabs was 1777 tons in 2017 (Fiskeridirektoratet, d.u.).

Snow crab was an open-access fishery in the first years of its opening. However, in 2015 a general ban on harvesting snow crab in Norwegian waters was adopted (Østhagen and Raspotnik, 2018). Thus, Norwegian vessels must obtain a license to be allowed to harvest Approximately 50 vessels hold a license today (winter of 2020), but only a handful are actually fishing for snow crab. In 2015, it was decided that the snow crab is a sedentary species and is thus subject to national management rather than bilateral or multilateral management (Hansen, 2016). Norway and Russia granted each other access to harvest in each other's economic zones in 2015. However, in 2017 the Russian government withdrew the mutual access agreement that was signed in 2016. This led to a considerable loss of opportunities for Norwegian vessels to harvest snow crabs as most of the continental shelves are Russian. Norwegian vessels are now limited to fish in the SFPZ and the small part of the loophole that is Norwegian (Kaiser et al., 2018). Foreign vessels were also excluded

from the fishery. For these reasons, the total numbers of vessels (including non-Norwegian, but excluding Russian vessels) participating in snow crab fishing in the Barents Sea was reduced from 34 in 2016 to 10 in 2019. Table 2 provides an overview of the supply chain of the NSCI.

In 2013, three Norwegian vessels entered the Barents Sea SC fisheries as illustrated in Table 3. According to FAO statistics the Russians entered the SC fisheries in 2014. Several of the foreign vessels (that is non-Norwegian vessels) delivered their catch live or frozen to Norwegian harbours and thus became part of the statistics provided by the Norwegian Fishers Sales Organisation (NFSO), who register all catch delivered in the North of Norway. Table 3 provides an overview of the catch and number of vessels that have delivered SC to Norwegian harbours in 2013–2019.

4. Data and method

This is a multiple-case study with the aim to gain greater insight into whether first-mover advantages (FMAs) exist in emerging industries, such as the NSCI. Accordingly, the firm is the unit of analysis. Theory created from multiple cases is considered more robust than theory based on a single case, because the arguments are more deeply grounded in varied empirical evidence (Yin, 2017). Furthermore, case studies are considered analytically generalizable, though not statistically.

Analytic generalisation does not draw inferences from a sample to a population, instead, it compares the results of a case study to a previously developed theory (ibid.)

4.1. Unit of analysis, sample and data collection

To address the theoretical research questions raised empirically, this study chose an industry of similar vessels, which is the NSCI. Hence, the vessel and not the firm or industry, is the unit of analysis. According to the Norwegian Participation Act, a fisher must have been actively fishing for at least three of the past five years to be allowed to own a fishing vessel. Consequently, all Norwegian snow crab boats are owned by active Norwegian fishers. Moreover, the vessels are not vertically integrated as this is neither allowed according to the Participation Act (1999). The Participants Act also states that a business permit can only be granted to a Norwegian citizen. None of the vessels are therefore owned by foreigners. Neither are they owned by Norwegian onshore companies as vertical integration is illegal (Isaksen, 2007). To summarize, it does not seem unreasonable to claim that, in the research context chosen, the validity of the comparison of the vessels economic performance is high as the vessels are quite similar (Richard et al., 2009).

Furthermore, the study is based on quantitative secondary data. Financial statements of a sample of all vessels participating in the study were obtained from the Norwegian Directorate of Fisheries (Profitability Survey on SC Fisheries). To prevent the participants of the study from being identified, the cases are treated as one collective unit representing the NSCI. The sample represents a significant share of the total landings in Norway; namely 68% of Norwegian catches in 2015, 85% in 2016, and 57% in 2017. In summary, this constitutes 72,5% of the total Norwegian catch for 2015 to 2017 combined.

Table 2
Supply chain of the Norwegian Snow Crab (SC) from catch to market[a].

Catch	A handful of old (average age: 42 years) and large seagoing vessels (average length: 52 m) operate in the Barents Sea using a box trap to catch crabs. In 2017 the SC vessels had an average of 231 days at sea. Two of the vessels in the sample of this study had licenses to participate in other fisheries. However, these fisheries at best represent a supplement to fishing for SC. The preferred bait is squid in combination with herring. Bait is the single most expensive operating cost at around 20 NOK per pot. Because of molting season, the fisheries after SC are closed between the 15th of June and the 15th of September.
Live storage	After capture, SC are processed immediately on board or kept alive. Live storage includes storage in water tanks near processing plants and dry transportation to the destination market. Through live storage, crabs can be transported to overseas markets in good condition. The kilo price of live SC is approximately four times that of clusters. However, over the last two years, no crabs are delivered or exported live. This is due to several challenges with catch, storage and transport, and the fleet's choice to invest in on-board production.
Processing	Currently, all SCs are processed as cooked and frozen clusters on board. A cluster includes four legs plus a claw. Processing includes slaughtering, cooking, cooling, freezing, packaging, and storage. The eatable meat in SC is located in the legs only. The final product is a cluster; while oil, protein, and shells are important by-products (30% of the weight of the crab). The entire volume of clusters from Norway has been exported as frozen products.
Market	SCs are sold through retail or hotels, restaurants and cafés. Currently, EU is the main market, followed by Japan, USA and South Korea.

[a] Builds on Lorentzen et al. (2018), Directorate of Fisheries (2019) and information from official pages of the Norwegian Ministry of Trade, Industry, and Fisheries and the Norwegian Seafood Council.

Table 3
Catch in tons and number of vessels participating in snow crab fishing delivered to Norwegian harbours[a].

	Pre study period		The study period			Post study period	
	2013	2014	2015	2016	2017	2018	2019
Catch landed in Norway	189	4322	15,219	11,379	3102	2812	3199
Catch landed by Norwegian vessels	189	1882	3106	5293	3101	2812	3199
Catch landed by foreign vessels	–	2440	12,113	6086	1	–	–
Number of Norwegian vessels participating	3	8	9	10	14	11	10
Number of foreign vessels participating	–	5	18	18	1	–	–

[a] Based on statistics from the Norwegian Fishers Sales Organisation.

4.2. Definitional and measurement issues

A problem with the concept of first-mover is that it may be hard to define (Lieberman and Montgomery, 1998). Should a first-mover apply to firms entering an existing market with innovative technology, or should it apply solely to firms introducing new products? SC caught by Norwegian fishers are not an innovative product in itself. Neither is the technology used to capture the crabs nor the technology to process them. Furthermore, on a global level, an attractive market for SC meat has already been developed (Alvarez et al., 2015). So, what then describes a first-mover in the NSCI? To explore this, it is important to keep in mind that the evolving NSCI has many novel features. SC in the Barents is new, and at its entry point, there was little if any knowledge about where to locate the crab. Previous attempts of king crab fishers to copy capturing methods from other nations indicated that this is not necessarily beneficial. Thus, the most efficient methods of fishing are uncertain. The Norwegian SC fishers have no previous experience of capturing and handling of SC. Moreover, the vessel is newly fitted with technology and equipment unfamiliar and untested. Furthermore, Norwegian producers and exporters do not have experience of selling SC. Thus, they could not offer any support in regard to important quality measures. Finally, regulations and legislations are uncertain, even though these issues are out of the entrepreneur's hands.

This study applies the concept of first-mover to first entrepreneurs or firms that have established themselves and fully operate in the emerging NSCI. One significant aim of the study is to investigate the financial performance of these firms in the first, uncertain and critical years of

their operations. Furthermore, this study will examine whether being the first to move into the SC industry may have laid the foundation for these players in creating first-mover advantages. This will eventually require that properties of the first-movers accumulation process of resources and capabilities have the potential to make them valuable, rare, inimitable, and non-substitutable (VRIN resources or capabilities), and thus hard to acquire for competitors (Barney, 1991). If this is the case, it will enable the first-movers to create above-normal profits in both the short and long run.

A commonly accepted method of measuring a first-mover advantage is that of using a pioneering firm's profit as the consequence of the early entry. Such profit is an appropriate measure, since a significant objective of the entrepreneur is to maximize the value of his/her investment (Lieberman and Montgomery, 1988).

Opportunity cost of capital is defined as the risk-adjusted capital cost and can be calculated as the weighted average cost of capital (WACC) (Modigliani and Miller, 1958). Relative to this study, only book value is known as none of the firms in the study are traded on open stock markets. However, the market value of equity is unknown. Thus, the systematic risk for equity and debt cannot be easily estimated from equity markets. Accordingly, a constant discount rate of 5% during the period of analysis was used. If a first-mover has gained a competitive advantage, he/she is expected to make above-normal profit. Thus, above/-below normal profit is calculated as first movers' return on assets (ROA = Net Income/Average Total Assets) less opportunity cost of capital.

5. Results

This section provides the findings of the study. The research question raised in the introduction section was as follows: How costly has a first-mover strategy been for the players in the emerging NSCI? The analyses presented in Tables 4–6 below explore the issue.

During the three-year period being analyzed, operating income has fluctuated dramatically for the average SC vessel (Table 4). From 2015 to 2016, they doubled and were nearly halved the following year. The large fluctuations are partly a result of the Russian government who withdrew access of foreign countries to their EEZ in 2017. Operating costs have also fluctuated in the period analyzed, but to a less extent than operating income. As a result, ordinary profit before tax increased strongly in 2017 and amounted to just over 15 million NOK or 58% of revenue for the average firm.

Table 4
Income statements in 1000 NOK. Weighted average per vessel.[a]

	2015[b]	In %	2016[c]	In %	2017[d]	In %
Operating income	20,820	100%	42,620	100%	26,887	100%
Operating costs						
Crew wages	9651	46%	13,810	32%	14,206	53%
Provision for the crew	1079	5%	1568	4%	1059	4%
Fuel	2825	14%	3213	8%	3152	12%
Bait, ice, salt, packaging	1714	8%	3473	8%	2994	11%
Maintenance of vessel	2299	11%	4753	11%	3245	12%
Maintenance of equipment	1642	8%	1573	4%	1947	7%
Depreciation of vessel	2937	14%	10,243	24%	3778	14%
Insurances	705	3%	815	2%	1147	4%
Other operating expenses	5389	26%	10,220	24%	6828	25%
Total operating costs	28,241	136%	49,668	117%	38,356	143%
Operating profit	−7421	−36%	−7048	−17%	−11,469	−43%
Financial income	145	1%	786	2%	201	1%
Financial costs	2289	11%	1716	4%	4292	16%
Net financial items	−2144	−10%	−930	−2%	−4091	−15%
Ordinary profit before tax	−9565	−46%	−7978	−19%	−15,560	−58%

[a] Norwegian Directorate of Fisheries Profitability Survey on SC Fisheries.
[b] n = 3, N = 6.
[c] n = 5, N = 7.
[d] n = 5, N = 9.

Table 5
Balance sheets in 1000 NOK. Weighted average per vessel.[a]

	2015[b]	In %	2016[c]	In %	2017[d]	In %
Fishing vessel	38,831	64%	38,554	59%	46,188	76%
Other fixed assets	3390	6%	5538	9%	4641	8%
Total fixed assets	42,221	70%	44,092	68%	50,829	83%
Total current assets	18,060	30%	20,901	32%	10,192	17%
Total Assets	60,281	100%	64,993	100%	61,021	100%
Equity	−7035	−12%	3740	6%	−21,970	−36%
Long-term debt	46,459	77%	36,584	56%	64,850	106%
Short-term debt	20,857	35%	24,670	38%	18,142	30%
Total equity and debt	60,281	100%	64,994	100%	61,022	100%

[a] Norwegian Directorate of Fisheries Profitability Survey on SC Fisheries.
[b] n = 3, N = 6.
[c] n = 5, N = 7.
[d] n = 5, N = 9.

Table 6
Financial key figures. Weighted average per vessel.[a]

	2015[b]	2016[c]	2017[d]
Return on total assets	−12.1%	−9.6%	−18.5%
Operating margin	−35.6%	−16.5%	−42.7%
Current ratio	86.6%	84.7%	56.2%
Equity ratio	−11.7%	5.8%	−36.0%
Share of long-term debt	77.1%	56.3%	106.3%
Share of short-term debt	34.6%	38.0%	29.7%
Funding ratio	107.1%	109.3%	118.5%

[a] Norwegian Directorate of Fisheries Profitability Survey on SC Fisheries.
[b] n = 3, N = 6.
[c] n = 5, N = 7.
[d] n = 5, N = 9.

Table 5 presents the balance sheet of the average vessel. The entrepreneurs have invested approximately 60 million NOK to take part in the NSCI. The vessel makes up approximately 70% of this amount. The rest are fishing gear and other equipment. The average vessel had a negative equity of 36% in 2017. This means that 136% of the investment was financed by debt that year.

Financial key figures are presented in Table 6. It is worth noting that the current ratio was only 56.2% in 2017. This means that the liquidity was very tight for the average vessel at the end of that year.

6. Discussion

The purpose of this study was to contribute to the theoretical and empirical research stream regarding FMAs in emerging industries. Accordingly, this work is theoretically grounded in business strategy literature. The aim was to investigate whether early access to a newfound natural resource can provide an entrepreneur with a first-mover advantage. If this is the case, the advantage is expected to materialize as above-normal profit in the accounts of the firm (Lieberman and Montgomery, 1988, 1998). The empirical context of the study was the NSCI. This is a new, immature, emerging industry, which has existed for only a few years as the first Norwegian commercial SC catch from the Barents Sea was landed as late as in 2012 (Lorentzen et al., 2018).

6.1. Substantial early losses indicate no FMA in the NSCI

The research question raised in this study was as follows: Are there economic indications of first-mover advantages in the emerging NSCI?

To explore the issue, the discussion will turn to the analysis of the financial statements of first movers in the NSCI. The findings quantify significant early losses in the industry (see Tables 4–6) suggesting the opposite of FMAs. The balance sheet indicates that the average firm invested approximately 60 million NOK in total assets to participate in the fisheries (Table 5). However, the investment has been very unprofitable as the average firm has incurred significant losses (between 8 and 15 million NOK) every year analyzed (2015–2017) (Table 4). Estimated return on assets was between −9.6% and −18.5% each year investigated (Table 6). The picture is even bleaker if 5% opportunity cost of invested capital is added to these numbers (Magni, 2009). The resulting below normal profit thus lies between −14.6% and −23.5% a year. Likewise, the firms had negative equity all years, except for one (2016) (see Table 5). Furthermore, the firms were debt loaded with an accumulated long- and short-term debt amounting to 136% of the assets the final year of the analysis (2017). The liquidity of the firms was severely stressed with a current ratio of only 56.2% in 2017. This is understandable as the average firm had a negative operating margin of 42.7% that year (see Table 6).

Based on the dark economic backdrop disclosed, this study finds it appropriate to conclude that the first movers in the NSCI have had a significant economic disadvantage in the period analyzed. To survive, the firms have been completely dependent on the flexibility provided by substantial financial buffers disposed of by the owners (Dreyer and Grønhaug, 2004).

A first-mover advantage may arise when a firm can acquire superior resources and capabilities because of early entry (Lieberman and Montgomery, 1988, 1998, 2013). By moving first, the Norwegian SC entrepreneurs acquired early access to a natural resource. However, for a resource to be the source of a first-mover advantage, it must be a VRIN resource, which requires it to be valuable, rare, inimitable, and non-substitutable (Barney, 1991). At the outset SC is not a VRIN resource but a threshold resource that all firms in the industry need access to in order to operate. When the biological resource is only protected through a TAC and not by a catch share as is the case of the Norwegian SC, there will be a race for fishing among the firms (Homans and Wilen, 2005). The Norwegians experienced this race when foreigners entered The Loophole in 2014 (Lorentzen et al., 2018). Without catch shares to protect the natural resource for incumbent firms, the threats from entrants are substantial (Birkenbach et al., 2017). Accordingly, the natural resource must be institutionally protected through a catch share regime to make it financially attractive for the first-moving firms. Consequently, a natural resource that is neither VRIN nor institutionally protected does not have the potential to give rise to a first-mover advantage for firms in an industry.

Some of the first-movers in the NSCI have experienced a short career as snow crab fishers as they have already exited the industry. Their ability to fund ongoing deficits may have drained. Furthermore, given the bleak economic start of the industry, these fishers may have assessed negatively the future outlook of the fishery. Either way, the initial Loophole fishing of some vessels may have been an attempt to quickly 'mine' the new resource and then exit. These first-movers entered SC fishery along with their peers with no guarantee about future property rights, and they have now left the industry with significant losses and without having acquired such potential valuable rights (Bertheussen et al., 2020). The vessels in the NSCI are old and retooled, and only two of the boats in the sample had access to other fisheries. These fisheries were, however, not an alternative, but provided a modest supplement to snow crab fishing. The vessels opportunity cost of fishing SC was therefore probably non-negligible ('idling' or 'scrapping'). Thus, the vessels were not losing more money than they had to in the hopes of entering an emerging profitable industry and of securing an uncertain but potentially valuable property right.

6.2. How are the prospects of future gains for the enduring first-movers?

The snow crab is by 2020 widespread across large parts of the Barents Sea (IMR, d.u.). The prospects for the first-moving Norwegian snow crab fishers who are still able to fund ongoing deficits, are highly correlated to the stock development in this sea area as this will impact the future catch volumes of the players. The primary distribution pattern is west of Novaya Zemlya, and snow crabs largely follows the bottom temperature as it prefers cold water. The prediction is that it will move west in the Barents Sea towards most areas around Svalbard and Franz Josef Land (ibid.). Nevertheless, the optimistic forecasts of 2015 have not come yet to fruition and a lot of uncertainty remains about the crabs future population growth in the Barents Sea. It is unclear if this is because the Barents Sea is less productive for SC than originally estimated, or if the fishery has harvested too much too early so that the population growth is delayed. The Russian closure of the Loophole for foreign vessels including the Norwegian, can at least in part be interpreted as an attempt to let the stock increase (Bakanev, 2015). If reduced TACs are necessary for Norwegian waters to reach the stock levels forecasted, then there will be even more years to come of economic losses before anything resembling sustainable profits can be expected for the fishers.

Moreover, when the species is moving West and North, it increasingly interferes with other valuable species and ecosystems (Tiller et al., 2019). The authorities may therefore prefer that the crabs are overharvested to protect other assets as with the Red King Crab to the west and north of its new Norwegian habitat. Overharvesting will, however, only benefit the Norwegian snow crab fishers in the short-term. Overall, there still is great uncertainty of how profitable (or not) the industry as a whole in fact might be in the long run based on the bioeconomic conditions in the Barents Sea.

Furthermore, it is an open question whether there is a price point for frozen crabs at which one can expect Norwegian vessels to become profitable under current catch volumes. A price increase may be likely if Canadian and Alaska snow crab fisheries continue their declines (Earl, 2019). However, SC also has a few substitutes as the estimations of demand elasticities for such species are usually quite high (Greenberg et al., 1995). There are both local supplies of fresh crabs, which are generally preferred, and the cheaper local substitute Chionoecetes Japonicus (ibid.).

The market is quite separated in value between fresh and frozen crabs. The Norwegian fishers do not yet have the technological capability to capture returns from live/fresh crab, and the boats are not outfitted for this eventuality. If this is the technological breakthrough that is awaited, then the first-movers seem unlikely to be the ones who would capitalize on it because the vessels are all outfitted for on-board processing and freezing. This again outweighs the expectations against the first-movers to becoming profitable in the long run.

In the industry, there seems to be an expectation that future gains will come from exclusion of entrants through catch shares (Bertheussen et al., 2020). However, if there are already too many vessels involved, and they all get quotas, this will not increase their catches because there are too few crabs. No one are likely to buy expensive permits to enter the fishery if the stock prospects are poor. Moreover, anyone viable will already have the rights and one might expect little market for the quotas created.

6.3. Sustainability implications

With all the business risks that lie beneath the surface of an emerging fishery, this study clearly demonstrates the need for large financial resources of private firms to develop a new fishery (e.g. see Tables 4–6). There is substantial uncertainty about the stock size and how it will develop in the future. There is also considerable risk associated with how the TAC in the Barents Sea will be distributed between different nations. Furthermore, there is uncertainty as to how the national

Norwegian TAC will be distributed between the vessels that wish to participate in SC fishing. In addition to significant risks related to the resource base and to national and international regulations, there are large risks associated with how SCs can be best captured, processed and sold to provide the greatest possible value creation for the firms. As a result, the Norwegian SC fishers are engaged in an extremely risky business that creates a significant financial loss potential for the firms moving first. As a consequence, the firms should have a significant financial reserve when establishing themselves, to cover any annual losses that may come. Institutional processes related to the allocation of TACs between nations and catch shares within a nation can take years. If the Norwegian SC firms continue to lose approximately 10 million NOK a year (Table 4), the affordable catch shares that they may eventually be allocated by the government may nonetheless become very expensive.

In an effort to reduce the firms' financial exposure, all vessels in the study were old vessels that were rebuilt and then specially equipped for SC fishing and onboard production. Thus, the shipping firms managed to push the investment costs as low as possible. Additionally, it was necessary to restrict the amount invested as it is very difficult to obtain external financing of fishing boats, which do not possess individual vessel quotas. By contrast, old vessels can limit the future development of the industry. They are less efficient than new ones, and with old vessels, it can be more difficult to explore other catching methods or deliver live crab to the market. Furthermore, as the vessels have invested in onboard production, the labor costs are high for each trip. If the processing methods are made less labor intensive and more mechanized, a less crew onboard is required, which saves costs. All firms in the study had established a limited liability company for each vessel. In this way they protected the rest of their business activities against an eventual failure in the crab fishery, which seems to be a wise strategy of risk diversification. Furthermore, the study indicates that hitting the timing of ground-breaking institutional changes may be more about luck than skill (Barney, 1986). Thus, it is not recommended for a business to engage in emerging capital-intensive fishing without either being rooted in a larger financially solid group or without holding a significant amount of risk-seeking surplus capital.

Finally, this study has empirically indicated that FMA theory can improve the understanding of how a firm can get access to strategic resources, which RBV describes as necessary to gain a competitive advantage. In line with the fact that climate change shifts natural conditions, one might see increased migration of species, and thus the rise of new industries. Merging FMA and RBV in this paper has given a framework that improves the insight of the business risk, financial strength and long-term perspectives that might be required for firms, management and research in and of emerging industries.

6.4. Conclusive remarks

This study concludes that the early entrants of the NSCI have so far experienced a first-mover disadvantage. However, the modest economic start of the firms may nevertheless be a bad predictor of the future wealth-creating potential of the industry. This will, however, first require that the SC population in Norwegian territorial waters is increasing sharply in the years to come (Lorentzen et al., 2018). Second, the uncertainty associated with the international institutional framework governing the SC fishery in the Barents Sea must be reduced and thus create a better basis for wealth creation for Norwegian firms (Østhagen and Raspotnik, 2018; Sundet and Hoel, 2016; Tiller and Nyman, 2018). Third, it will require that a system of catch shares (e.g. ITQs) is introduced in the snow crab fishery to protect the strategic position of the players from outside intruders, and also efficiently block the rivalry between them (Bertheussen et al., 2020). Thus, should the three aforementioned significant future events occur, it can turn out that the first-mover economic disadvantage experienced by the early entrants is turned into a sustained first-mover competitive advantage. The major challenge for the firms is that they risk having spent all their financial resources and left the SC fishery before these potential major value-creating incidents occur.

6.5. Future studies

This study classified the firms in NSCI into first movers and late movers, but the study was limited only to investigating first movers. Thus, an issue less deeply explored, relates to the selection of pioneers vs. followers: How does the initial uncertainty of an emerging industry affect a firm's timing of entry? Another relevant question to explore further is the first movers' timing of their eventual exit from the industry, i.e., their exit-timing dilemma. Do the players feel strategically locked into the industry after having spent so much money to secure a historical basis for eventually being allocated future vessel quotas and to build up the necessary capabilities to operate an efficient SC fishery? No simple managerial prescriptions apply with regard to FMAs and the optimal timing of entry and exit (Lieberman and Montgomery, 1988, 1998). Accordingly, more research is needed on strategic choices that pioneers and followers could make under different environmental and institutional conditions.

Finally, each vessel in this study is organized as a corporation due to actions owners have taken to isolate the risks from the endeavor. Nevertheless, the study has not investigated what are owners tolerance for losses in the long run. Are long-term above normal profits eventually expected to compensate and 'pay back' for the added costs of a first-mover strategy? Or are normal (zero) profits tolerable, with these initial investments written off as sunk costs of for example a business diversification strategy?

Declaration of competing interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

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