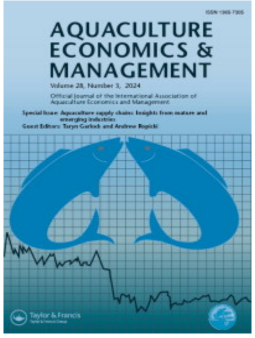

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REPORT

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Organic salmon farming – A profitable differentiation strategy

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ABSTRACT

This study examines the financial performance of six Norwegian salmon farming companies to investigate the benefits of differentiation through organic salmon production. Utilizing panel data from 2009 to 2020, the study analyses return on sales, prices, and production costs. The results show that the company that has differentiated parts of its production into organic salmon consistently achieves higher returns on sales. Notably, this company also maintains the lowest production costs despite organic farming's typically higher expenses. This efficiency is seemingly attributed to the firm's emphasis on "biological risk management," leading to reduced salmon mortality rates. Contrary to Michael Porter's differentiation versus low-cost strategy debate, this study indicates that a combined approach may be possible. The findings underscore the potential competitive edge of organic production in salmon farming and prompt questions about why it is not more common in the industry.

KEYWORDS

Salmon farming; organic food; strategy; differentiation; competitive advantage

JEL CLASSIFICATION CODES

L10; Q10; Q22

Introduction

As the world's leading producer of farmed salmon (Asche et al., 2019; Asche & Roll, 2013), Norway predominantly focuses on producing standardized salmon, i.e., a commodity (Voldnes et al., 2023). This positions Norwegian salmon farming as a commodity-driven industry (Asche & Oglend, 2016). Within the framework of strategic management theory, achieving a sustainable competitive advantage necessitates the adoption of unique and distinctive business practices (Barney, 1991; Porter, 2008). In this paper, we define sustainable competitive advantages in line with Barney et al. (2021), arguing that a firm possesses a sustained competitive advantage when it generates more economic value over time than its competitors operating in the same market.

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The seminal works of Porter (1980, 1985) advocate for product differentiation as a viable strategy to secure such an advantage. Intriguingly, only two of Norway's more than a hundred salmon farming companies have ventured into this strategic domain at the farm level by opting to produce organic salmon as a differentiated offering (Steinnes et al., 2020). We examine the business strategies of six small-scale Norwegian salmon farming companies operating in the same fjord system through a comparative study. They are considered small companies as they own less than ten farming licenses each (Nøstbakken & Selle, 2019). Notably, one of the companies has adopted a differentiation strategy by focusing on producing organic salmon. The primary motivation of our investigation is to assess this differentiation strategy's impact on the company's profitability.

Several studies have previously been carried out on various aspects related to profitability in salmon farming. For example, Asche et al. (2018) investigated the impact of firm size and price variability on firm profitability in the Norwegian salmon farming industry. Sikveland et al. (2022) studied profitability differences between public and private firms, while Sikveland and Zhang (2020) studied whether public companies have a significantly different capital structure than private companies. Zhang and Tveterås (2022) evaluated how price variability and financial ratios affect business failure in the industry. Furthermore, Asche and Sikveland (2015) investigated the economic performance of the firms in the salmon industry from an accounting data perspective. Asche et al. (2019) studied price volatility, and Andersen et al. (2008) investigated the price responsiveness of salmon supply in the short and long run. Oglend and Tveteras (2009) discussed whether geographic diversification of production could significantly reduce fluctuations in returns, and Rocha Aponte (2020) quantified the role of idiosyncratic demand and distortions on observed productivity differences across producers of farmed salmon in Norway. To our knowledge, none has previously studied how companies' differentiation strategies impact profitability.

To achieve a comprehensive analysis, we utilize panel data from 2009 to 2020 provided by the Norwegian Directorate of Fisheries and supplement this quantitative data with qualitative insights from an interview with a key informant. The theoretical underpinning of our study is grounded in strategic management theory, explicitly examining whether product differentiation offers a profitable alternative to the conventional commodity-based approach to salmon farming. Our central research question is: Does a differentiation strategy, in the form of organic salmon production, yield higher profitability over time compared to the commodity production of farmed salmon?

Operating under uniform biological, environmental, and institutional conditions, the companies we examine offer a unique lens into strategic choices in salmon farming. Additionally, we spotlight the emergent field of organic aquaculture, which has seen significant growth yet remains underrepresented in Norway (Gambelli et al., 2019; Steinnes et al., 2020). Given the increasing global popularity and demand for organic food worldwide (Demko et al., 2017; Koory et al., 2022), our study suggests a practical avenue for Norwegian salmon farmers – namely, to differentiate by farming salmon organically. We recognize that other strategies exist, such as eco-labels (Alfnes et al., 2018; Osmundsen et al., 2020), of which the Aquaculture Stewardship Council eco-label is the most credible (Bronnmann & Asche, 2017). However, we focus on organic salmon farming as this is one of the earliest differentiation strategies with the most considerable production impact. Our results indicate that such a strategic shift could yield higher profitability than conventional commodity production.

The remainder of this paper is organized as follows: We begin by laying the theoretical groundwork that underpins our study, followed by an overview of the empirical landscape. Subsequently, we present our data and methodology. We then delve into our empirical findings, comprehensively discussing their implications. The paper culminates in a conclusion that outlines the study's broader impact.

Theoretical underpinning

Distinctive strategic directions

The fundamental question in business strategy is why some firms are more profitable than others, attributed to achieving a sustainable competitive advantage (Barney, 1991; Peteraf, 1993; Porter, 1985). Porter emphasizes the importance of unique positioning rather than imitating others for strategic success (Stonehouse & Snowdon, 2007). Despite Porter's (1980, 1985) introduction of generic strategies (cost leadership, differentiation, focus), McGahan and Porter (1997) note that uniqueness doesn't ensure sustainability due to potential imitation. Moreover, firms may blend these strategies without being "stuck in the middle" (Miller, 1992; Mintzberg et al., 1995).

Contrasting Porter's emphasis on external market conditions, the resource-based view, developed in the 1980s and 1990s by scholars like Barney (1986, 1991), Prahalad and Hamel (1990), and Wernerfelt (1984), focuses on leveraging internal resources and capabilities as the source of competitive advantage (Barney, 2013, 2018; Helfat & Peteraf, 2003; Kraaijenbrink et al., 2010). This approach argues that unique, company-specific resources, both tangible and intangible, are key to a sustained competitive edge (Baden-Fuller & Stopford, 2004; Barney, 1991; Prahalad & Hamel, 1990).

We aim to investigate whether the differentiating company in our comparative study has achieved a competitive advantage, the sustainability of this advantage, and the underlying factors contributing to it. In this paper, we posit that a competitive advantage may arise from two primary sources – a price advantage stemming from product differentiation or a cost advantage derived from what we term "biological risk management." This concept encapsulates the ongoing assessment and mitigation of risks to maintain low mortality rates among farmed salmon. We seek to offer a nuanced understanding of how differentiation and biological risk management can contribute to a sustainable competitive advantage in the salmon farming industry.

Product differentiation in the salmon farming industry

Differentiated products constitute a small share of the output in Norwegian salmon farming (Voldnes et al., 2023). While some producers desire to expand supply and implement more differentiation strategies, several factors act as constraints. Biological uncertainties, seasonal variations, and the cost implications of differentiation make it challenging to scale beyond a limited portion of total production (Cojocaru et al., 2021). Enhancing value creation in the salmon farming industry presents a conundrum: effectively differentiating or reducing costs in a market where the product is mainly homogeneous (Felzensztein & Gimmon, 2014; Porter, 2008). A recent overview by Cojocaru et al. (2021) underscores the challenge, noting that the uniform nature of farmed salmon restricts the scope for product differentiation and, consequently, value creation for upstream producers.

Despite the inherent control over the farming process, which theoretically allows for customization across multiple product attributes, the Norwegian industry has primarily produced salmon with minimal differentiation (Voldnes et al., 2023). However, a growing focus is on catering to consumer preferences for specific salmon attributes. These attributes may be intrinsic, e.g., salmon fat content, texture, and flesh color, but also extrinsic, e.g., country of origin, branding, and eco-labels (Cojocaru et al., 2021). This emerging attention to differentiation based on consumer preferences suggests an avenue for value creation, even within the constraints of a largely homogeneous product. Eco-labels are important in the farmed salmon markets (Asche et al., 2015). Eco-labeling is a potent tool for product differentiation, enhancing the visibility of organic production to consumers and adding value through unique attributes (Ankamah-Yeboah et al., 2016; Barney, 1991).

In the salmon industry, differentiation strategies often aim to secure a price premium, contingent on several factors such as consumer awareness, availability of substitutes, and distinguishability between organic and conventional products (Cojocaru et al., 2021). Empirical evidence supports eco-label efficacy in the seafood market, with studies showing a consumer willingness to pay a premium for organic attributes (Ankamah-Yeboah et al., 2020; Gambelli et al., 2019). Olesen et al. (2010) found that labeling and marketing salmon as organic allows producers to charge a higher price, corroborated by Ankamah-Yeboah et al. (2016), who reported a roughly 20% price premium for organic over conventional farmed salmon. However, it's worth noting that the production costs for organic salmon are estimated to be 20-30% higher than those for conventional salmon (Cojocaru et al., 2021; Steinnes et al., 2020; Voldnes et al., 2023). Therefore, the relative profitability of organic salmon hinges on the producer's ability to offset these higher costs with the price premiums they can demand in the market (Gambelli et al., 2019).

Moreover, the potential price premiums may not sufficiently offset the additional costs incurred through differentiation (Cojocaru et al., 2021). Interestingly, the Norwegian experience mirrors findings from Chile, the world's second-largest producer of farmed salmon. Felzensztein and Gimmon (2014) found that Chilean producers favored cost-reduction strategies over differentiation. This preference could be attributed to the lower risk and complexity associated with cost-cutting compared to differentiation. In recent years, high demand relative to supply has kept prices – and consequently profits – high for Norwegian salmon farmers. This favorable market condition makes the commodity approach lucrative, potentially slowing the industry's move toward increased differentiation (Cojocaru et al., 2021; Felzensztein & Gimmon, 2014). Given these dynamics, it's understandable why organic salmon farming remains a niche segment in Norway (Cojocaru et al., 2021; Steinnes et al., 2020).

Biological risk management

Industrial food production inherently carries biological risks, including mortality (Misund, 2022). Millions of farmed salmonids die annually worldwide due to high mortality rates (Oliveira et al., 2021). In Norwegian salmon farming, the mortality rate exceeds 15% (Sommerset et al., 2024). According to Misund (2022), in the realm of salmon farming, the primary biological threats emanate from various diseases and lice. Suboptimal facility operations and treatments can exacerbate these biological risks.

Over the past decade, the financial implications of these biological risks have surged (Misund, 2022). Salmon farmers witness increased mortality rates due to, e.g., salmon lice and algae blooms. Notably, the average weight of deceased salmon has risen markedly in recent years. This uptick in dead salmon weight amplifies the impact on production costs, given the escalating prices of input elements like feed. This nexus is pivotal to the rising production costs observed over the past decade. Additionally, biological challenges can precipitate premature slaughtering and reduced slaughter weights, which elevate production costs and diminish pricing potential. These biological setbacks can also hamper the optimal use of production capacity, meaning production costs are distributed across a reduced quantity (Iversen et al., 2020; Iversen et al., 2017; Misund, 2022). Thus, profitability in salmon farming is intrinsically tied to mortality rates (Ellis et al., 2012). The costs of disease outbreaks highlight the importance of disease management to salmon farmers' profits (Asche et al., 2022).

Minimizing mortality rates in aquaculture is essential for sustainable production. Elevated mortality rates not only signify substantial economic setbacks but also serve as an indicator of compromised fish welfare (Grefsrud et al., 2021). Given that higher mortality rates indicate poorer fish welfare, it is understood that improved fish welfare results in subsequent lower mortality rates. Promoting the welfare of farmed fish is a paramount concern for the contemporary aquaculture industry (Jensen et al., 2020). Indeed, good fish welfare is one of the cornerstones of organic aquaculture (Gould et al., 2019).

Organic salmon farming adheres to stringent criteria that distinguish it from conventional methods, encompassing various stages of the production cycle (Åsli & Mørkøre, 2011). High stocking density is one of the most detrimental factors to fish welfare in aquaculture (Carbonara et al., 2015). A fundamental tenet of organic aquaculture is the maintenance of lower fish stocking densities relative to traditional farming. By reducing densities, fish experience less stress, which may diminish their disease susceptibility. The preference for lower stocking densities in organic aquaculture is rooted in the principle that many diseases or parasitic infections intensify with higher host densities (Mente et al., 2011). Organic salmon farming mandates a maximum net pen density of 10 kilograms per cubic meter, significantly lower than the 25 kilograms permitted in standard salmon farming (Steinnes et al., 2020). Additionally, chemical-free cleaning methods are employed for net pens, and the feed originates from sustainable fishery byproducts. Medication and vaccinations are minimized, with a preference for biological over chemical interventions for disease control. Organic salmon farming also observes a six-month fallow period between salmon generations, double the time allocated for standard salmon farming (SalMar, 2022; Steinnes et al., 2020).

For Norwegian salmon to be classified as organic, it must be farmed according to the organic regulations of The European Union and audited by the certification authority Debio (Debio, 2023; SalMar, 2022). Debio's approval guarantees that products are produced ecologically and sustainably. All providers of organic products in Norway are certified by Debio. The term "organic" is protected by law. Hence, salmon can only be promoted as organic if the producer has been approved by Debio (Steinnes et al., 2020).

Data and method

Our study focuses on six salmon farming companies in Northern Norway, identified as C1 through C5 and D1. All companies exclusively produce standard salmon, except for D1, which has differentiated roughly half of its production into organic salmon. To address our research question, we employ a comparative study methodology, utilizing an unbalanced firm-level set of panel data provided by the Norwegian Directorate of Fisheries upon request. The data stems from their annual survey, which collects financial and production data from companies within the Norwegian salmon and rainbow trout farming sectors. We also interviewed a key informant from company D1 to complement these quantitative data.

The selection of companies in this study is based on the fact that only one of the two companies producing organic salmon in Norway, i.e., D1, keeps all its production within a small geographical area. To ensure the validity of our comparative analysis, we seek to compare the profitability in D1 with companies that share the same biological, environmental, and institutional characteristics (Richard et al., 2009). Specifically, we want all companies in our study to be located within the same production zone to face the same regulations (Hersoug et al., 2019) and be exposed to similar biophysical factors. In addition, we want the companies to be roughly the same size regarding their licensed production capacity, further strengthening the validity of our comparisons. To maintain anonymity, we refrain from disclosing the exact number of licenses each company holds. As D1 is a well-established, locally owned company that has been farming salmon for more than 30 years, the companies to be compared with D1 should also be well-established, locally owned companies with a similar company structure as D1. We were then left with the five companies C1-C5. D1 and C1-C5 control their entire value chain with majority ownership in smolt plants and processing plants. This strategic selection allows us to control for biological, environmental, and institutional variables to the greatest extent possible, enhancing our findings' comparability. Also, a final criterion was a complete data series for the companies. However, we would accept one year of data to be missing for each of these six companies.

Our study spans the years 2009–2020. Data before 2009 were not included due to changes in the Norwegian Directorate of Fisheries data collection methods, rendering earlier data incomparable. Data for 2021 and beyond were not available at the time of our request. We utilized specific financial metrics to assess firm performance, focusing on the sales price, cost of production, and profitability. The production cost per kilogram is calculated by dividing the total production costs by the amount of salmon sold. Similarly, the sales price per kilogram is derived by dividing the total sales revenue from salmon by the quantity sold.

To measure profitability, we use return on sales (ROS), defined as the ratio of EBITDA to operating income (EBITDA %). ROS is commonly used in accounting literature to represent operational efficiency, excluding financial costs, depreciation, amortization, and taxes (Bottazzi et al., 2008; Damodaran, 2012; Feltham & Ohlson, 1995). Although return on assets (ROA) is another frequently used profitability metric, it proves unreliable in this study's context due to inconsistent valuation practices for farming licenses depending on whether they were received free of charge from the authorities or purchased at market price. A farming license is a critical asset for salmon farming companies (Hersoug, 2021). In prior research concerning the Norwegian salmon farming industry, ROS has also been favored as a determinant of profitability over ROA due to complexities associated with balance sheet calculations (Asche et al., 2018).

We include sales revenue from salmon and any insurance payouts to the salmon farming companies for our calculation of operating income. These payouts offset lost sales revenue from events like biomass loss due to algae blooms or salmon lice and are thus considered a corrective measure to normalize firms' sales revenue. However, it's worth noting that such insurance payouts are relatively rare and, when they do occur, usually constitute a minor portion of total sales revenue. Specifically, insurance payouts accounted for approximately 0.3% of total sales revenue for all Norwegian companies from 2009 to 2020. Given that insurance payouts are included in the operating income, we also incorporate insurance costs as an operating cost. We exclude the account item "other operating income" from our calculation of operating income, as it generally cannot be directly attributed to a company's core business activities, namely the production and sale of farmed salmon (Vassdal & Bertheussen, 2020). Following our use of EBITDA in our ROS metric, we derived the following measures for the analysis to determine production costs: smolt, feed, insurance, slaughter, inventory change, labor, and "other operating costs."

Some companies occasionally report poor or even negative ROS, typically due to industry-wide challenges like algae blooms or salmon lice. For instance, financial statements reveal an algae attack in the studied area in 2019, reflected in a ROS decline for most companies during 2019–2020. We argue that these years should not be excluded from the analysis, as they represent cyclical patterns in the industry (Asche & Sikveland, 2015; Asche et al., 2018). Interestingly, companies C1 and C2 received disproportionately high insurance payouts relative to their expected sales revenue in 2019 compared to other companies. The reason for this discrepancy remains unclear. While insurance payouts were rare and relatively small in magnitude before 2019, the 2019 payouts significantly impacted the average ROS for C1 and C2. Several explanations are possible – C1 and C2 may have been more severely affected by the 2019 algae bloom despite their immediate proximity to other companies, or there could be timing issues related to insurance payouts. However, a review of financial statements rules out the latter explanation.

Our dataset is nearly complete for companies C1–C5 and D1, spanning the entire 12-year period from 2009 to 2020. The only exceptions are missing data for C1 in 2018 and C4 in 2017. The average sales price and production costs for these two companies are thus based on 11 years of data. ROS is calculated for all 12 years as this figure could be measured from C1's and C4's financial statements. The dataset also includes companies that produce both salmon and rainbow trout. While sales revenue and quantities sold are reported separately for each species in the dataset, production costs are not. Given that revenue from rainbow trout accounts for only about 5% of the total revenue, we assume that most production costs are attributable to salmon.

We used aggregated data from all companies in the survey data to calculate national averages. While the Norwegian Directorate of Fisheries' annual survey is distributed to all salmon farming companies, not all are represented in the final data set for reasons such as non-response or unusable submissions. Nevertheless, the sample is robust, encompassing 70%–90% of active farming licenses yearly (Norwegian Directorate of Fisheries, 2011, 2016, 2021). Therefore, when we refer to "all" Norwegian salmon farmers, i.e., the national average (NOR), we refer to this representative sample.

To delve deeper into what might explain the underlying factors of these findings, we engaged with a representative from firm D1's management, who has over four decades of executive experience within the Norwegian salmon farming industry. Our interview followed a semi-structured format, anchored by the result tables from this study. Conducted in March 2023 at D1's headquarters by one of the authors, the interview lasted around two hours. Participation was on a voluntary basis, with the interview being recorded and subsequently transcribed.

Results

This section outlines the key findings that serve as the basis for our subsequent analysis.

Return on sales

Table 1 displays the ROS for the studied companies from 2009 to 2020, highlighting notable disparities in financial performance. Most striking is D1, which outperforms the national average by 13.43 percentage points. Moreover, D1's ROS surpasses companies C1 through C5 by margins ranging from 8.99 to 16.21 percentage points. It's worth noting that the other companies, C1–C5, exhibit ROS figures that are relatively close to the national average, with variations within a narrow range of approximately 4.50 percentage points.

Sales price

Table 2 reveals notable variations in the average sales prices among companies C1-C5 and D1. Companies C1 through C5 all register average prices that fall below the national average. Specifically, C1, C2, C3, C4, and C5 have average prices that are NOK 1.79 (4.71%), NOK 2.20 (5.79%), NOK

Table 1. ROS (EBITDA %) 2009–2020.

Year	C1	C2	C3	C4	C5	D1	NOR
2020	32.66%	33.71%	0.05%	1.89%	10.27%	34.30%	15.91%
2019	10.35%	8.67%	33.29%	32.69%	14.89%	43.64%	25.01%
2018	39.11%	41.17%	31.46%	32.59%	35.29%	44.36%	32.51%
2017	35.82%	41.84%	33.66%	31.30%	44.62%	49.29%	32.07%
2016	47.95%	52.74%	43.88%	34.65%	49.27%	46.93%	34.75%
2015	26.91%	27.90%	20.27%	19.98%	11.95%	35.12%	16.69%
2014	36.40%	26.66%	28.71%	31.26%	30.85%	37.66%	23.93%
2013	27.88%	30.83%	27.78%	28.78%	32.15%	36.13%	24.33%
2012	−12.64%	−34.73%	4.39%	3.30%	15.60%	18.43%	0.70%
2011	21.55%	25.87%	19.24%	16.72%	−33.40%	25.12%	14.03%
2010	47.24%	40.86%	29.99%	8.98%	9.79%	35.72%	31.58%
2009	9.81%	16.69%	18.05%	17.98%	15.16%	24.20%	18.31%
Average	26.92%	26.02%	24.23%	21.68%	19.70%	35.91%	22.48%
SD	17.50%	22.52%	12.55%	11.97%	21.64%	9.52%	9.90%

Table 2. Sales price in NOK per kilogram 2009–2020.

Year	C1	C2	C3	C4	C5	D1	NOR
2020	41.81	42.53	40.75	46.15	54.52	58.72	47.22
2019	52.25	54.31	53.98	49.90	45.70	62.65	50.31
2018	N/A	51.43	49.44	52.84	47.94	57.10	50.28
2017	48.33	48.33	46.18	N/A	48.42	52.24	50.58
2016	53.66	51.37	42.86	53.49	53.22	53.06	51.06
2015	35.77	32.02	34.43	34.34	35.25	38.39	34.56
2014	30.39	27.90	31.20	33.19	33.58	35.34	33.21
2013	31.14	25.73	31.82	32.23	36.95	32.55	33.16
2012	19.69	15.74	22.54	21.35	21.98	23.21	22.97
2011	25.86	24.66	26.03	25.69	19.93	26.89	25.82
2010	33.20	31.87	31.14	30.63	29.22	30.27	31.43
2009	25.88	23.30	24.94	24.89	25.44	24.93	25.04
Average	36.18	35.77	36.28	36.79	37.68	41.28	37.97
SD	11.38	13.17	10.21	11.73	12.12	14.50	11.12

N/A: Not Available.

1.69 (4.45%), NOK 1.18 (3.11%), and NOK 0.29 (0.8%) lower than the national average, respectively. In stark contrast, D1 commands an average price that exceeds the national average by NOK 3.31 (8.72%). Furthermore, Table 2 shows that D1 has achieved markedly higher prices per kilogram than its competitors in 2018–2020. During this period, D1's average price per kilogram stood at NOK 59.49, substantially outpacing the national average of NOK 49.27. This translates to a premium of NOK 10.22 per kilogram, or approximately 21% higher than the national average.

Production costs

Table 3 reports the production costs per kilogram from 2009 to 2020 for the six companies studied. D1 has the lowest average costs per kilogram, which are NOK 3.42 (11.85%) below the national average. In contrast, the average costs for C1, C2, C3, C4, and C5 exceed those of D1 by NOK 3.28 (12.89%), NOK 1.85 (7.27%), NOK 1.47 (5.78%), NOK 2.54 (9.98%), and NOK 4.04 (15.87%), respectively.

Analysis

Our research objective is to investigate whether organic salmon production, as a differentiation strategy, is more profitable over time than commodity production. To do so, we compare the average ROS of the differentiating producer D1 with commodity producers C1–C5. Our findings reveal that D1 has consistently outperformed the other companies in terms of average ROS from 2009 to 2020, particularly in the latter years. Since all six companies in our study operate under similar biological, environmental, and institutional conditions, D1's strategic focus on organic salmon production appears to be the key differentiator. This could suggest that the

Table 3. Production costs in NOK per kilogram 2009–2020.

Year	C1	C2	C3	C4	C5	D1	NOR
2020	28.15	28.20	40.73	45.32	53.98	38.58	39.89
2019	75.98	77.66	36.01	34.58	39.45	35.31	38.12
2018	N/A	30.26	33.89	35.72	31.02	31.77	33.98
2017	31.07	28.15	30.64	N/A	26.81	26.49	34.41
2016	27.93	24.27	24.05	34.95	27.22	28.16	33.38
2015	26.94	23.09	27.45	27.47	31.04	24.91	28.91
2014	19.32	20.46	22.24	22.82	23.22	22.03	25.33
2013	22.46	17.80	22.98	22.96	25.07	20.79	25.14
2012	22.18	21.20	21.55	20.65	18.55	18.93	22.88
2011	20.28	18.28	21.02	21.39	26.61	20.14	22.23
2010	17.55	18.85	21.80	21.42	29.36	19.46	21.59
2009	24.20	19.41	20.72	20.56	21.59	18.89	20.53
Average	28.73	27.30	26.92	27.99	29.49	25.45	28.87
SD	16.22	16.41	6.81	8.37	9.37	6.75	6.83

N/A: Not Available.

differentiation strategy is indeed profitable, as evidenced by D1's superior ROS compared to the other companies and the national average.

That said, we cannot rule out that other factors may have an effect since our sample only includes one organic producer. The D1 cost advantage could be due to better management practices than C1–C5 and not because of their organic production. However, according to the organizational theory concept of institutional isomorphism, companies within the same industry in the same geographical area producing the same product tend to adopt the same structures, processes, and managerial practices over time (DiMaggio & Powell, 1983; Todaro et al., 2020). As such, it is reasonable to expect such companies to also perform financially the same over time. The D1 informant said there is extensive knowledge sharing and exchange of experience between the companies in the studied region. This has presumably resulted in a "best practice" implemented by all studied companies, as they have been farming salmon next to each other for decades. Considering that the main difference between D1 and the other five firms is organic production, it is not unreasonable to assume that the higher ROS found in D1 could indeed stem from their organic production strategy.

From a strategic standpoint, D1 seems to have successfully achieved the core objective of differentiation: to add unique value to a product that cannot be easily substituted (Barney, 1991). Moreover, as one of only two companies in Norway differentiating some of their salmon production to organic (Steinnes et al., 2020), D1 appears to have secured a sustainable competitive advantage. Let us explore the factors contributing to this, starting with the sales price.

Price advantage

D1 has consistently achieved the highest average sales price from 2009 to 2020, with a notable increase in recent years. This uptick correlates with the company's strategic shift toward increasing organic salmon production. According to the informant from D1, the proportion of organic salmon in D1's total production has grown from about 20% in 2009 to roughly 50% in 2020. This increase in organic production aligns with their consistently higher sale prices.

The informant from D1 stated that they can approximately claim an additional NOK 10 per kilogram for organic salmon compared to its standard counterpart. While this premium has fluctuated over the years, the general trend indicates a higher sale price for organic salmon. This finding aligns well with previous research (Ankamah-Yeboah et al., 2016; Olesen et al., 2010). If consumers are willing to pay a premium for organic salmon, it stands to reason that salmon distributors would also be willing to pay more for this differentiated product.

Cost advantage

D1 has the lowest average production costs among the six companies in the studied period. This finding is counterintuitive given that, according to our informant from D1, the production costs for organic salmon are generally higher than those for standard salmon. This is corroborated by existing literature (Cojocaru et al., 2021; Steinnes et al., 2020; Voldnes et al., 2023). Given that approximately half of D1's production is now organic, one would expect their production costs to be higher than those of the commodity producers C1–C5.

One possible explanation for D1's low production costs is its rigorous adherence to multiple certifications, including organic production standards. According to our informant from D1, this has instilled a culture of continuous focus on fish welfare and ecological sustainability within the company, which is periodically reviewed to maintain certifications. As a result, contrasting the industry average (Grefsrud et al., 2021; Sommerset et al., 2022), D1 has managed to maintain consistently low mortality rates, which, according to our D1 informant, is the cornerstone of their low production costs. The D1 informant explained that the company mitigates mortality risks by managing the entire lifecycle of their salmon – from smolt production in their own hatcheries to transporting them in well-boats that are sanitized after each delivery to the harvesting plant, minimizing disease transmission. This rigorous infection control protocol benefits not only organic production but also non-organic production. Furthermore, because D1's organically farmed salmon, which is approximately half of their production, are farmed in net-pens with less salmon per cubic meter, it facilitates easier control of salmon lice and other diseases (Mente et al., 2011), lowering costs. While lower net-pen density raises costs due to the need for more pens, it is plausible that the savings from reduced mortality could offset the additional expenses.

Low mortality rates – The key profitability driver

When salmon die prematurely, profitability is reduced (Iversen et al., 2017; Misund, 2022). According to our informant from D1, their mortality rate is only 5%. Thus, D1 maximizes the return on most of its production costs. While it is possible to insure against production losses, data from the Norwegian Directorate of Fisheries suggests that such insurance payouts are rare. Moreover, insurance will likely only partially offset the costs and not mitigate the broader economic repercussions of high mortality rates.

Hence, a relentless focus on biological risk management seems to be a profitable strategy for D1. It keeps production costs low and confers a sustainable competitive advantage over the long term – which is particularly relevant given that variations in biological risk are a significant factor in the differences in production costs across regions and companies (Misund, 2022).

Interestingly, our informant from D1 revealed that the additional costs incurred in organic production are almost entirely offset by the additional revenue generated. This suggests that D1's profitability is not primarily driven by the price premiums they can charge for organic salmon. Assuming that D1's sale price for standard salmon is comparable to that of other companies, it becomes evident that the low mortality rate is a key driver underpinning D1's economic performance.

Discussion

The findings of this study suggest that D1 has successfully carved out a sustainable competitive advantage through a dual-pronged approach, i.e., both through price and cost advantages. However, while D1's strategic focus has initially been on differentiation, enabling a price premium for their organic salmon, their lower production costs appear to be a beneficial byproduct of this differentiation strategy rather than the result of a deliberate cost-leadership strategy. Regardless, this nuanced outcome somewhat contradicts Porter's (1980, 1985) conventional view that firms must commit to a single generic strategy to avoid being "stuck in the middle," a position he argues is unsustainable and likely to fail.

D1's position seemingly supports a hybrid strategy's viability, even if the low-cost element was not a conscious strategic choice, aligning more closely with the perspectives of Miller (1992) and Mintzberg et al. (1995). They argue that a well-executed hybrid strategy can be sustainable and prosperous rather than leading to the "stuck in the middle" scenario cautioned by Porter (1980, 1985). D1's case suggests that under certain conditions and with the proper execution, firms may successfully integrate elements of both differentiation and cost leadership without diluting the effectiveness of either. Further, Stonehouse and Snowdon (2007) argue that many companies intentionally adopt a hybrid strategy, recognizing that low costs alone are insufficient for competitive advantage. They emphasize that a product must offer added value to attract customers, typically achieved through product differentiation. D1's experience seems to corroborate this view.

One could also argue that D1's operations align well with the resource-based view of strategy, which posits that sustainable competitive advantage arises from unique, company-specific resources or competencies that are difficult for competitors to imitate (Barney, 1991; Prahalad & Hamel, 1990). For D1, their excellence in maintaining low mortality rates is a unique competency that sets them apart from competitors – which is a strategic outcome of their decision to differentiate their product offering. By focusing on organic production, D1 is inherently committed to higher fish welfare standards and environmental sustainability. This commitment has led to the development of specialized skills and practices in biological risk management, which, in turn, contributes to lower mortality rates and, ultimately, lower production costs. D1 was required to excel in areas that have now become critical drivers of their competitive advantage. This is an example of what Baden-Fuller and Stopford (2004) describe as achieving competitive advantage by "doing things differently and better."

Conclusion

In light of the data and discussion presented, we conclude that a differentiation strategy, executed through producing organic farmed salmon, could yield higher profitability than commodity production. This suggests that D1's superior financial performance may be attributed to sustainable competitive advantages rooted in differentiation. Intriguingly, their financial success is seemingly not solely a direct outcome of the differentiation per se but an indirect result of the operational efficiencies it introduces, lowering overall production costs. Hence, an essential contribution of this study is highlighting how differentiation can indirectly enhance competitive advantage, a nuanced understanding that can add depth to the discourse on business strategy. The findings underscore the complexity and subtlety of how strategies can impact companies' success in ways that are not immediately apparent. It is worth reminding that the financial performance of D1 might also stem from other factors and could suggest, e.g., a sustainable competitive advantage rooted in better managerial abilities. Yet, we have advocated that it is not unreasonable to assume that it is indeed a result of their differentiation strategy.

While McGahan and Porter (1997) and the resource-based theory (Baden-Fuller & Stopford, 2004; Prahalad & Hamel, 1990) caution that generic strategies are susceptible to imitation, it's noteworthy that few companies have emulated D1's approach. This reluctance may stem from perceived risks and skepticism about whether the price premiums associated with organic production can offset the increased costs. Moreover, the lucrative nature of the commodity market, buoyed by high prices in recent years, has likely dissuaded Norwegian salmon farmers from venturing into differentiation (Cojocaru et al., 2021; Voldnes et al., 2023).

However, the landscape is evolving. With increasing global demand for organic products (Ankamah-Yeboah et al., 2017; Demko et al., 2017; Koory et al., 2022) and the European Union's push for organic aquaculture growth (Dybdal, 2017), Norwegian salmon farmers may need to reconsider their strategies. Technological advancements, such as land-based closed production facilities, could disrupt the current competitive dynamics, potentially eroding Norway's locational advantages (Voldnes et al., 2023). Given these shifts, diversification into organic salmon farming could serve as a proactive strategy for Norwegian salmon farming companies, allowing them to capture higher sales prices and potentially reduce production costs as the organic sector scales. This would enable them to maintain or enhance their competitive position in a changing market landscape.

Limitations

This study acknowledges several limitations. Firstly, the limited sample size is a concern, particularly since there is only one data point for organic producers. The inherent challenge lies in pinpointing multiple companies, with at least one being an organic salmon producer situated closely in the same production zone and of comparable scale. Moreover, there are merely two organic salmon producers in Norway, further constraining our sample pool. Hence, making comparisons from which we can draw generalizable conclusions is challenging. The qualitative data derived from a single interview lasting only two hours and restricted to one differentiating company might reduce the richness and diversity of these data.

Despite certain methodological limitations inherent in this study, we posit that the findings can facilitate a discussion in an area that, to our knowledge, is scantily explored in existing literature. Focusing on the specific production region in this study, our data indicates that, over the period 2009–2020, D1, on average, outperformed C1-C5 in terms of profitability. This paper proposes and evaluates several explanations to elucidate these findings. Should these explanations be valid, they represent important insights into the dynamics of organic salmon production in Norway.

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Data availability statement

Due to agreements made with the informant and the Norwegian Directorate of Fisheries, the data used to support this study's findings are unavailable.

Disclosure statement

No potential conflict of interest was reported by the author(s).

References

Alfnes, F., Chen, X., & Rickertsen, K. (2018). Labeling farmed seafood: A review. *Aquaculture Economics & Management*, *22*(1), 1–26. https://doi.org/10.1080/13657305.2017.1356398

Andersen, T. B., Roll, K. H., & Tveterås, S. (2008). The price responsiveness of salmon supply in the short and long run. *Marine Resource Economics*, *23*(4), 425–437. https://doi.org/10.1086/mre.23.4.42629673

Ankamah-Yeboah, I., Asche, F., Bronnmann, J., Nielsen, M., & Nielsen, R. (2020). Consumer preference heterogeneity and preference segmentation: The case of ecolabeled salmon in Danish retail sales. *Marine Resource Economics*, *35*(2), 159–176. https://doi.org/10.1086/708508

Ankamah-Yeboah, I., Nielsen, M., & Nielsen, R. (2016). Price premium of organic salmon in Danish retail sale. *Ecological Economics*, *122*, 54–60. https://doi.org/10.1016/j.ecolecon.2015.11.028

Ankamah-Yeboah, I., Nielsen, M., & Nielsen, R. (2017). *Market conditions for organic aquaculture: Market and price analysis* (IFRO Report 259). Department of Food and Resource Economics at The University of Copenhagen.

Asche, F., & Oglend, A. (2016). The relationship between input-factor and output prices in commodity industries: The case of Norwegian salmon aquaculture. *Journal of Commodity Markets*, *1*(1), 35–47. https://doi.org/10.1016/j.jcomm.2015.11.001

Asche, F., & Roll, K. H. (2013). Determinants of inefficiency in Norwegian salmon aquaculture. *Aquaculture Economics & Management*, *17*(3), 300–321. https://doi.org/10.1080/13657305.2013.812154

Asche, F., & Sikveland, M. (2015). The behavior of operating earnings in the Norwegian salmon farming industry. *Aquaculture Economics & Management*, *19*(3), 301–315. https://doi.org/10.1080/13657305.2015.1057880

Asche, F., Eggert, H., Oglend, A., Roheim, C. A., & Smith, M. D. (2022). Aquaculture: Externalities and policy options. *Review of Environmental Economics and Policy*, *16*(2), 282–305. https://doi.org/10.1086/721055

Asche, F., Larsen, T. A., Smith, M. D., Sogn-Grundvåg, G., & Young, J. A. (2015). Pricing of eco-labels with retailer heterogeneity. *Food Policy*, *53*, 82–93. https://doi.org/10.1016/j.foodpol.2015.04.004

Asche, F., Misund, B., & Oglend, A. (2019). The case and cause of salmon price volatility. *Marine Resource Economics*, *34*(1), 23–38. https://doi.org/10.1086/701195

Asche, F., Sikveland, M., & Zhang, D. (2018). Profitability in Norwegian salmon farming: The impact of firm size and price variability. *Aquaculture Economics & Management*, *22*(3), 306–317. https://doi.org/10.1080/13657305.2018.1385659

Baden-Fuller, C., & Stopford, J. (2004). The firm matters, not the industry. *In* B. De Wit & R. Meyer (Eds.), *Strategy: Process, content, context – An international perspective* (3rd ed.). Thomson Learning.

Barney, J. B. (1986). Strategic factor markets: Expectations, luck, and business strategy. *Management Science*, *32*(10), 1231–1241. https://doi.org/10.1287/mnsc.32.10.1231

Barney, J. B. (1991). Firm resources and sustained competitive advantage. *Journal of Management*, *17*(1), 99–120. https://doi.org/10.1177/014920639101700108

Barney, J. B. (2013). *Gaining and sustaining competitive advantage* (4th ed.). Pearson.

Barney, J. B. (2018). Why resource-based theory's model of profit appropriation must incorporate a stakeholder perspective. *Strategic Management Journal*, *39*(13), 3305–3325. https://doi.org/10.1002/smj.2949

Barney, J. B., Ketchen, D. J., & Wright, M. (2021). Resource-based theory and the value creation framework. *Journal of Management*, *47*(7), 1936–1955. https://doi.org/10.1177/01492063211021655

Bottazzi, G., Secchi, A., & Tamagni, F. (2008). Productivity, profitability and financial performance. *Industrial and Corporate Change*, *17*(4), 711–751. https://doi.org/10.1093/icc/dtn027

Bronnmann, J., & Asche, F. (2017). Sustainable seafood from aquaculture and wild fisheries: Insights from a discrete choice experiment in Germany. *Ecological Economics*, *142*, 113–119. https://doi.org/10.1016/j.ecolecon.2017.06.005

Carbonara, P., Scolamacchia, M., Spedicato, M. T., Zupa, W., McKinley, R. S., & Lembo, G. (2015). Muscle activity as a key indicator of welfare in farmed European sea bass (*Dicentrarchus labrax* L. 1758). *Aquaculture Research*, *46*(9), 2133–2146. https://doi.org/10.1111/are.12369

Cojocaru, A. L., Iversen, A., & Tveterås, R. (2021). Differentiation in the Atlantic salmon industry: A synopsis. *Aquaculture Economics & Management*, *25*(2), 177–201. https://doi.org/10.1080/13657305.2020.1840664

Damodaran, A. (2012). *Investment valuation – Tools and techniques for determining the value of any asset* (3rd ed.). John Wiley & Sons, Inc.

Debio. (2023). *Information in English*. Retrieved August 15, 2023, from https://debio.no/english/

Demko, I., Dinterman, R., Marez, M., & Jaenicke, E. (2017). *U.S. organic trade data: 2011 to 2016*. Organic Trade Association.

DiMaggio, P. J., & Powell, W. W. (1983). The iron cage revisited: Institutional isomorphism and collective rationality in organizational fields. *American Sociological Review*, *48*(2), 147–160. https://doi.org/10.2307/2095101

Dybdal, S. E. (2017). *Vil ha mer økologisk laks i norske butikker [More organic salmon wanted in Norwegian stores]*. Retrieved August 30, 2023, from https://forskning.no/nofima-okologi-fisk/vil-ha-mer-okologisk-laks-i-norske-butikker/342921

Ellis, T., Berrill, I., Lines, J., Turnbull, J. F., & Knowles, T. G. (2012). Mortality and fish welfare. *Fish Physiology and Biochemistry*, *38*(1), 189–199. https://doi.org/10.1007/s10695-011-9547-3

Feltham, G. A., & Ohlson, J. A. (1995). Valuation and clean surplus accounting for operating and financial activities. *Contemporary Accounting Research*, *11*(2), 689–731. https://doi.org/10.1111/j.1911-3846.1995.tb00462.x

Felzensztein, C., & Gimmon, E. (2014). Competitive advantage in global markets: the case of the salmon industry in Chile. *European Business Review*, *26*(6), 568–587. https://doi.org/10.1108/EBR-04-2013-0071

Gambelli, D., Vairo, D., Solfanelli, F., & Zanoli, R. (2019). Economic performance of organic aquaculture: A systematic review. *Marine Policy*, *108*, 103542. https://doi.org/10.1016/j.marpol.2019.103542

Gould, D., Compagnoni, A., & Lembo, G. (2019). Organic aquaculture: Principles, standards and certification. *In* G. Lembo & E. Mente (Eds.), *Organic aquaculture – Impacts and future developments*. Springer. https://doi.org/10.1007/978-3-030-05603-2

Grefsrud, E. S., Karlsen, Ø., Kvamme, B. O., Glover, K., Husa, V., Hansen, P. K., Grøsvik, B. E., Samuelsen, O., Sandlund, N., Stien, L. H., & Svåsand, T. (2021). *Risikorapport norsk fiskeoppdrett 2021 – risikovurdering [Risk report Norwegian aquaculture 2021 – risk assessment]* (2021–8). The Norwegian Institute of Marine Research.

Helfat, C. E., & Peteraf, M. A. (2003). The dynamic resource-based view: capability lifecycles. *Strategic Management Journal*, *24*(10), 997–1010. https://doi.org/10.1002/smj.332

Hersoug, B. (2021). Why and how to regulate Norwegian salmon production? – The history of Maximum Allowable Biomass (MAB). *Aquaculture*, *545*, 737144. https://doi.org/10.1016/j.aquaculture.2021.737144

Hersoug, B., Mikkelsen, E., & Karlsen, K. M. (2019). "Great expectations" – Allocating licenses with special requirements in Norwegian salmon farming. *Marine Policy*, *100*, 152–162. https://doi.org/10.1016/j.marpol.2018.11.019

Iversen, A., Asche, F., Hermansen, Ø., & Nystøyl, R. (2020). Production cost and competitiveness in major salmon farming countries 2003–2018. *Aquaculture*, *522*, 735089. https://doi.org/10.1016/j.aquaculture.2020.735089

Iversen, A., Hermansen, Ø., Nystøyl, R., & Hess, E. J. (2017). *Kostnadsutvikling i lakseoppdrett: Med fokus på fôr- og lusekostnader [Cost development in salmon farming: With a focus on feed- and lice costs]*. The Norwegian Institute of Food, Fisheries and Aquaculture Research.

Jensen, B. B., Qviller, L., & Toft, N. (2020). Spatio-temporal variations in mortality during the seawater production phase of Atlantic salmon (*Salmo salar*) in Norway. *Journal of Fish Diseases*, *43*(4), 445–457. https://doi.org/10.1111/jfd.13142

Koory, R., James, K., Klieger, M., & Deelo, J. (2022). *U.S. organic trade: Data and trends 2016–2020*. Organic Trade Association.

Kraaijenbrink, J., Spender, J.-C., & Groen, A. J. (2010). The resource-based view: A review and assessment of its critiques. *Journal of Management*, *36*(1), 349–372. https://doi.org/10.1177/0149206309350775

McGahan, A. M., & Porter, M. E. (1997). How much does industry matter, really? *Strategic Management Journal*, *18*(S1), 15–30. https://doi.org/10.1002/(SICI)1097-0266(199707)18:1+<15::AID-SMJ916>3.0.CO;2-1

Mente, E., Karalazos, V., Karapanagiotidis, I. T., & Pita, C. (2011). Nutrition in organic aquaculture: an inquiry and a discourse. *Aquaculture Nutrition*, *17*(4), e798–e817. https://doi.org/10.1111/j.1365-2095.2010.00846.x

Miller, D. (1992). The Icarus Paradox: How exceptional companies bring about their own downfall. *Business Horizons*, *35*(1), 24–35. https://doi.org/10.1016/0007-6813(92)90112-M

Mintzberg, H., Lampel, J., Quinn, J. B., & Ghosal, S. (1995). *The strategy process: Concepts, contexts and cases*. Prentice Hall.

Misund, B. (2022). *Kostnadsutvikling i oppdrett av laks og ørret: Hva koster biologisk risiko? [Cost development in salmon and trout farming: What is the cost of biological risk?]* (41–2022). NORCE Norwegian Research Centre AS.

Norwegian Directorate of Fisheries. (2011). *Lønnsomhetsundersøkelse for produksjon av laks og regnbueørret 2010 [Profitability survey on the production of Atlantic salmon and rainbow trout 2010]*. Norwegian Directorate of Fisheries.

Norwegian Directorate of Fisheries. (2016). *Lønnsomhetsundersøkelse for produksjon av laks og regnbueørret 2015 [Profitability survey on the production of Atlantic salmon and rainbow trout 2015]*. Norwegian Directorate of Fisheries.

Norwegian Directorate of Fisheries. (2021). *Lønnsomhetsundersøkelse for produksjon av laks og regnbueørret 2020 [Profitability survey on the production of Atlantic salmon and rainbow trout 2020]*. Norwegian Directorate of Fisheries.

Nøstbakken, L., & Selle, S. F. (2019). *Eierskap i norsk oppdrettsnæring – arbeidsnotat [Ownership in Norwegian fishfarming – Working paper]*. Norwegian Centre for Applied Research.

Oglend, A., & Tveteras, R. (2009). Spatial diversification in Norwegian aquaculture. *Aquaculture Economics & Management*, *13*(2), 94–111. https://doi.org/10.1080/13657300902881674

Olesen, I., Alfnes, F., Røra, M. B., & Kolstad, K. (2010). Eliciting consumers' willingness to pay for organic and welfare-labelled salmon in a non-hypothetical choice experiment. *Livestock Science*, *127*(2-3), 218–226. https://doi.org/10.1016/j.livsci.2009.10.001

Oliveira, V. H. S., Dean, K. R., Qviller, L., Kirkeby, C., & Bang Jensen, B. (2021). Factors associated with baseline mortality in Norwegian Atlantic salmon farming. *Scientific Reports*, *11*(1), 14702. https://doi.org/10.1038/s41598-021-93874-6

Osmundsen, T. C., Amundsen, V. S., Alexander, K. A., Asche, F., Bailey, J., Finstad, B., Olsen, M. S., Hernández, K., & Salgado, H. (2020). The operationalisation of sustainability: Sustainable aquaculture production as defined by certification schemes. *Global Environmental Change*, *60*, 102025. https://doi.org/10.1016/j.gloenvcha.2019.102025

Peteraf, M. A. (1993). The cornerstones of competitive advantage: A resource-based view. *Strategic Management Journal*, *14*(3), 179–191. https://doi.org/10.1002/smj.4250140303

Porter, M. E. (1980). *Competitive strategy: Techniques for analyzing industries and competitors*. Free Press.

Porter, M. E. (1985). *Competitive advantage: Creating and sustaining superior performance*. Free Press.

Porter, M. E. (2008). The five competitive forces that shape strategy. *Harvard Business Review*, *86*(1), 78–93, 137.

Prahalad, C. K., & Hamel, G. (1990). The core competence of the corporation. *Harvard Business Review*, *68*(3), 78–91.

Richard, P. J., Devinney, T. M., Yip, G. S., & Johnson, G. (2009). Measuring organizational performance: Towards methodological best practice. *Journal of Management*, *35*(3), 718–804. https://doi.org/10.1177/0149206308330560

Rocha Aponte, F. (2020). Firm dispersion and total factor productivity: Are Norwegian salmon producers less efficient over time? *Aquaculture Economics & Management*, *24*(2), 161–180. https://doi.org/10.1080/13657305.2019.1677803

SalMar. (2022). *Norwegian Organic Salmon - Farmed, Processed and Sold by SalMar*. Retrieved July 31, 2023, from https://www.salmar.no/en/norwegian-organic-salmon-farmed-processed-and-sold-by-salmar/

Sikveland, M., & Zhang, D. (2020). Determinants of capital structure in the Norwegian salmon aquaculture industry. *Marine Policy*, *119*, 104061. https://doi.org/10.1016/j.marpol.2020.104061

Sikveland, M., Tveterås, R., & Zhang, D. (2022). Profitability differences between public and private firms: The case of Norwegian salmon aquaculture. *Aquaculture Economics & Management*, *26*(4), 414–438. https://doi.org/10.1080/13657305.2021.1970856

Sommerset, I., Walde, C. S., Jensen, B. B., Wiik-Nielsen, J., Bornø, G., De Oliveira, V. H. S., Haukaas, A., & Brun, E. (2022). *Fiskehelserapporten 2021 [Fishhealth Report 2021]*. (2a/2022). Norwegian Veterinary Institute.

Sommerset, I., Wiik-Nielsen, J., Moldal, T., De Oliveira, V. H. S., Svendsen, J. C., Haukaas, A., & Brun, E. (2024). *Fiskehelserapporten 2023 [Fishhealth Report 2023]*. (8a/2024). Norwegian Veterinary Institute.

Steinnes, K. K., Amilien, V., & Vittersø, G. (2020). Organic salmon in Norway. *In* F. Arfini & V. Bellassen (Eds.), *Sustainability of European food quality schemes: Multi-performance, structure, and governance of PDO, PGI, and organic agri-food systems*. Springer. https://doi.org/10.1007/978-3-030-27508-2_27

Stonehouse, G., & Snowdon, B. (2007). Competitive advantage revisited: Michael Porter on strategy and competitiveness. *Journal of Management Inquiry*, *16*(3), 256–273. https://doi.org/10.1177/1056492607306333

Todaro, N. M., Daddi, T., Testa, F., & Iraldo, F. (2020). Organization and management theories in environmental management systems research: A systematic literature review. *Business Strategy & Development*, *3*(1), 39–54. https://doi.org/10.1002/bsd2.77

Vassdal, T., & Bertheussen, B. A. (2020). Methodological issues in estimating the profit of the core catch business unit of a fishing vessel firm. *MethodsX*, *7*, 100990. https://doi.org/10.1016/j.mex.2020.100990

Voldnes, G., Sogn-Grundvåg, G., & Young, J. A. (2023). Norwegian farmed salmon: A commodity in need of differentiation? *Journal of International Food & Agribusiness Marketing*, 1–31. https://doi.org/10.1080/08974438.2023.2220320

Wernerfelt, B. (1984). A resource-based view of the firm. *Strategic Management Journal*, *5*(2), 171–180. https://doi.org/10.1002/smj.4250050207

Zhang, D., & Tveterås, R. (2022). Influence of price variability and financial ratios on business failure in the Atlantic salmon industry. *Marine Resource Economics*, *37*(2), 183–200. https://doi.org/10.1086/718380

Åsli, M., & Mørkøre, T. (2011). *Dokumentasjon av råstoffegenskaper hos økologisk laks [Documentation of raw material properties of organic salmon]* (51/2011). The Norwegian Institute of Food, Fisheries and Aquaculture Research.