

MASTER'S THESIS

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The Global Farmed Salmon Market – Industrial Structure and the Firms' Strategies

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Preface

This thesis is written as a part of my specialization in International Business and Marketing being the final work in my Master of Science in Business Program at Nord University Business School. I am born and have lived in Nordland in most of my life, and as Nordland is the region with the highest production of farmed salmon in Norway, as a citizen of this region it has been interesting to follow this industry's growth the latest years. Hence, it was a natural choice for me to study this particular industry and the global market for salmon in my thesis.

During my Bachelor Degree, I was exchange student Seinan Gakuin in Japan, and personally experienced how important Norwegian seafood was in the daily food market in a country on the other side of the globe like Japan. In my Bachelor thesis I was studying the challenges Norwegian seafood producers meet in transporting their fresh seafood to European, Asian and American markets. In this study I decided to shift my attention to the structure of the global salmon market; the numbers of salmon suppliers their market positions, and what the competition between the different firms looks like.

Before starting the work with the study, I discussed many possible angles to study with my supervisor, Professor Harald Bergland. He also gave me ideas for literature and data to read and study. I am grateful that he shared his knowledge with me. Thanks to my girlfriend for moral support. And finally, a very big thanks to my dad for solid advice and keeping me motivated! Any weaknesses in this thesis is my sole responsibility.

Bodø 1st of September 2020.

Abstract:

In this study the focus is on the global salmon farming market. The purpose is to see into the structure of the salmon farming industry's production structure regarding the number and size of the industry suppliers, in order to discuss the operating firms' strategies. In particular, I focus on whether the salmon market works like an oligopoly rather than a market with strong competition, and try to reveal the strategies that the firms follow. I have divided my research problem into 2 different research questions:

- a. What does the global market for salmon look like, and what is actually the position of Norway as a salmon farming nation?
- b. What kind of strategies do the salmon farming firms follow, and what does this mean for the future of the salmon farming industry?

Based on general market theory, industrial organization theory and strategy concepts presented in chapter 2, I shed light on these questions by looking into relevant secondary data from data aggregators like Norwegian Seafood Council and Statistics Norway, earlier empirical studies related to this industry and selected data from 3 different representing salmon farming firms' official annual reports. By confronting this data with market and industrial organization theory, I find indications that the market competition in the salmon market can be understood as an oligopoly, either as a symmetric Cournot competition or as an asymmetric competition where some producers are dominant in setting prices in the market. The restrictions given by licenses, trade policies, environmental issues and policies, supply of necessary inputs (salmon feed), production technologies, and ecological and biological conditions means that the supply is increasing less than the global demand. This means that the industry is restricted when it comes to growth, and that each firm seeks to grow by merging others. Again, this means increased market power for the operating market actors. One of the few ways to increase its future production capacity for firm, is to compete for development licenses. Here firms are invited to come up with new and more efficient and environmental friendly production technologies that also means an increase in production. By studying 3 selected firms' annual reports, the positioning for obtaining development licenses in order to gain an increase in production capacity, seems to be one of the most prominent and eye-catching single firm strategy, describing an industry that has reached its saturation point with the known production technology.

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1.0 Introduction

The salmon aquaculture industry has developed a lot since the first farms started in the 1960s. How the competition between salmon farming firms is working now on the global market, I find as an interesting and fascinating problem to look into in my thesis. This is because of all the changes that recently have been made, possibly affecting how the salmon trade from the different producing firms and countries now is distributed and meets consumers' needs and wishes around the world. The functioning of the salmon market and industry are also heavily influenced by different countries' trade policy, environmental policies, and possibly the general and specific national policies towards taxes and production licences. Additionally, happenings like changes in international trade treaties and the ongoing pandemic situation could be affecting also the possibilities for conducting transport and trade of farmed salmon. Hence, studying the production and market for farmed salmon possibly involve many reasonable theoretical and empirical angles from the business and economic literature. This means that a concrete study one has to select some perspectives to follow, and just keep in mind others that could be followed and focused, possibly resulting in other interesting findings.

How the global salmon market works, also affects Norway's exports and hereby the total economy significantly. For instance, there are interesting points in recent history for Norway, like when China shut us out of their market after the "Peace Prize incident" in 2010, and when Russia closed its market to us and the European-Union after the "Crimea incident" in 2014. Also, recently Russia have barred imports of Norwegian salmon based on claims that the fish contains damaging chemicals (NRK Date 08.31.2020)

The functioning of the world market for salmon, is also interesting to see connected to the overall growth of the industry as it has experienced, not only here in Norway, but internationally, during the last 30-40 years. Aquaculture as a whole, now encompasses the fastest growing meat-based food producing-sector in the world (Abate, et al., 2016; Marine Biology, 2017; Nadarajah & Flaaten, 2017; Ellis et al., 2016).

1.1 Global aquaculture

Salmon farming started in Norway in 1964, but did not really hit its stride until the 1980's. In this decennium salmon production started an explosive growth, and the industry spread and took root in other counties, especially Scotland had a lot of early success (Ellis et al., 2016). It has been argued that the main reasons for the rapid growth of the salmon farming-industry in the successful countries are:

1. The relative ease of cultivation aided by favourable climate-factors.
2. Much aid and flexibility by the states in accommodating the industry.
3. Lucky timing, with the growth of a cultural consumer-shift in favour of health-foods and the resulting status of salmon as a luxury-product.
4. Good and versatile product attributes, like high fillet yield and the fact that it can be sold in many forms like; fresh, frozen, sushi or other readymade meals, which gives salmon a broad market appeal.

(Ellis et al. 2016)

1.2 Norwegian aquaculture

Norway has helped spearheading this aquaculture-industry to its prominent position it holds today. Norway's contribution comes in the form of its salmon farming-industry. It has grown to become the second biggest industry behind the petroleum-sector. In only a few years in the 1980's, the salmon farming-industry has increased its production from only a few thousand tons, to over 1,2 million tons in 2012 (Sandvold, 2016).

All this is common knowledge and seems totally natural for us in Norway, but looking at the salmon farming-industry as a part of the aquaculture-industry, it sticks out. The biggest aquaculture-counties are by in large in East-Asia, with China in the lead, and the industry-growth comes mostly from Africa. There is reason to believe that success in aquaculture is linked to places with weak environmental legislation and impotent institutions and bureaucracies. Like most industries it grows with a country's gross domestic product (Nadarajah & Flaaten, 2017). Europe is generally not big on aquaculture. Research indicates this might be connected with a generally unsuitable environmental legislation combined with an inflated and hyperactive bureaucracies (Abate, et al. 2016)

1.3 The problem

I intend to study how firms compete in the farmed-salmon-industry. In particular, it is interesting to see whether this market works more like some kind of oligopoly than a market with strong competition going on between the firms. Moreover, it is interesting to see what kind of specific strategies the firms have been following the recent years and how they actually are positioning themselves regarding the future. One may divide my research problem into 2 different research questions:

- a) What does the global market for salmon look like, and what is actually the position of Norway as a salmon farming nation?
- b) What kind of strategies do the salmon farming firms follow, and what does this mean for the future of the salmon farming industry?

I intend to shed light on these questions by looking at earlier studies related to this industry. Additionally, specially related to question a) above, I will do my own empirical study, by analysing relevant secondary data from data aggregators like Norwegian Seafood Council and Statistics Norway. Particularly, confronting the data with market and industrial organization theory, I want to see whether the data shows indications on how the market competition in the salmon market fits standard oligopoly models. Related to research question b) above, I will conduct an empirical study of 3 different salmon farming firms' official annual reports in order to reveal their ongoing and future strategies, and see this data in the light of the standard theory of business strategies. In conducting such a case study of a few salmon farming firms related to their strategies, we may find a clear picture of the farming industry's way into the future. As far as I know, no one has conducted an analysis of the salmon farming industry in the way I intend to do, in particular the part related to business strategies. Hence, hopefully, the insights found in my research will add knowledge and possibly give ideas for further research.

As I already mentioned in the first paragraph, the salmon aquaculture industry is affected by many factors and events, for instance trade policies, trade unions and treaties, environmental issues and policies, supply of necessary inputs (salmon feed), production technologies, ecological and biological conditions, and general and industry specific public regulations (taxes and licences). Whenever I find such factors and events necessary to shed light in my

descriptions and analyses, I have mentioned the actual events and relevant factors. However, conducting a complete analysis of all such factors' influence on the salmon market. lies beyond the primary problem of this study.

1.4 The structure of the thesis

The further structure of the thesis follows a standard disposition. In section 2 I present relevant theory for analysing my problem and answering my two research questions. First, I describe and explain relevant concepts from the general market theory, industrial organization theory and strategy concepts that I will use when analysing the salmon industry and market as a whole, and the different salmon farming firms' strategies. Secondly, I present the theory of an industry's lifecycle that seems relevant to see the salmon farming industry in a long term development perspective.

In section 3 I describe and discuss the way I have collected and used data in order to analyse the research questions. The empirical work is all based on secondary data that is publicly available, and the main challenge methodically has been to select relevant pieces of a really overwhelming open accessed information related to the aquaculture industry, present interesting aspects in a systematic way, and confront the empirical patterns with relevant theory. Based on available secondary data and earlier empirical research literature, I present an overview of the industry in the first part of section 4. This means that I have chosen to place former empirical research literature together with the secondary data concerning the industry rather than in the theory chapter above. Secondly, in part 2 in section 4 I present some selected information from 3 salmon farming firms based on annual reports.

Section 5 consists of my discussion on the research questions based on the theory and the data presented in section 2 and 4 respectively. In section 6 I sum up my main findings, remind myself and the readers of important limitations in my research, based on the choices I have made related to research questions, theory, methods and data. I have also included a paragraph where I come up with some ideas for further research on the status and development of the salmon farming industry.

2.0 Theory

Studying the situation and development in the salmon farm industry could be conducted in many ways. Depending on what kind of aspects one is focusing on, many theoretical frameworks seem possible. For instance, if one limits the analysis to a national level, and consider all Norwegian sea farming firms as a whole, an interesting theoretical framework would be to focus on international trade opportunities and discuss trade policy issues like tariffs and other export barriers. (See for instance Chen and Garcia, 2016, and Sandersen and Malvik, 2015). Another interesting and up-to-date discussion going on, is how the Norwegian sea farming industrial actors should be taxed, see for instance NOU 2019:18, where optimal taxation policy related to welfare economic theory becomes a relevant framework. A third example on a relevant discussion going on, is the interaction sea farming and traditional fish harvesting have on each other, see for instance Bergland et al. (2019a), (2019b) and (2020). Compared to these examples, where the issues are specific and quite narrow and hence related to particular theoretical concepts, in my research I have chosen a broader and a rather explorative design, involving the market situation and strategies for a global industry that has developed a lot the recent years. Hence, in order to discuss and analyse the industry, I have chosen to use theoretical concepts from both market theory, industrial organization, and business strategies to add insight on how to describe and explain the market situation and the historical and future development of salmon farming markets.

In the following I will first shortly focus on the demand side of the market and characterize some typical forces that bring understanding to the situation and development in the farmed salmon market (section 2.1). Second, I have looked into relevant theories of competitive strategy useful for understanding the firms possibilities and limitations (section 2.2). Third, I present the concept economies of scale related to the industry, both in production and in financial means (section 2.3). Fourth, mergers and acquisitions, possibly seen as a consequence of economies of scale, are discussed (section 2.4). Fifth, I discuss the relevance of using market concentration measurements for analysing the industry (section 2.5.) Sixth, I introduce a market perspective where different oligopoly models are discussed. (section 2.6.). Seventh, I shortly comment on external factors and regulations directly impacting the market functioning (section 2.7). Finally, I bring in the long-term perspective on the industry's lifecycle as a whole (section 2.8.)

2.1 Demand side factors

Since the early days of salmon aquaculture farming the market has grown substantially. Now, farmed salmon is common food in stores and restaurants all over the world. With a steadily growing population the demand for food will increase, and the demand for farmed salmon will most reasonably also increase. With a focus on the health issues, the popularity of sea food generally, farmed salmon might be even higher demanded in the future. One way of characterizing the short and long term demand in a market, is related to the demand function in consumer theory, where the actual number demand is dependent on the price of the product, prices of complementary and substitutable products and the consumers' disposable income. (Riis & Moen 2013) In my context, analysing the actual market for farmed salmon, I will discuss the price elasticity conditions, measuring how sensible the demand is for marginal changes in the salmon price. Moreover, the income (Engel-) elasticity is measuring the sensibility on demand when the average income is changing, and cross price elasticities are measuring the marginal effect in demand as prices on other products are changing.

2.2 Strategy

Turning to the suppliers it is reasonable to assess how they should strategically face the market conditions. Strategy is a broad term with too many definitions to mention enough of them to give a meaningful understanding about its utilization in all the deferent literature. I will discuss strategy as the legal way a firm can obtain a sustainable competitive advantage or secure a sustainable market share for a product. This is an adequate description for the industry a will be investigating in my thesis.

Basic viable strategies for any market can be summarised as; 1 - product differentiation, creating a product of superior quality, resulting in being able to charge a premium per unit produced, not available to other competing firms. 2 – niche marketing, creating a product tailored specifically to a market segment to whom this is highly valued, again securing a premium charge. 3 – Cost leadership, producing the product at lower cost than the competition allowing either selling the product at a higher profit or pushing out competitors from the market, because of your cost advantage allows you to sell at lower prices without losing money. (Johnson et al. 2017)

Now, looking at these strategies, what good strategies remain when the product in question is a very homogenise product. As the ability to change the product is limited and therefore not lightly to be highly valued, the obvious choice ends up being strategy 3. If all firms have a reasonable similar technological production-process, value generation per unit input-factor, there is likely to be competition for control of input-factors and other strategic resources. I will come back to this in the section on mergers and acquisitions. There is a way of doing a kind of niche-marketing also, if one manages to service a market segment for some reason neglected by others. In this form of niche-marketing the exceptional part of the product is not an alteration to the product itself, but the fact that it is available in an otherwise neglected market.

2.3 Economies of Scale

The most important concept to understand when discussing cost leadership is economies of scale. A firm's average costs might decline-, or -returns might increase, relative to the production-scale. There are many situations that might give this result. If fixed costs, for example, do not vary much with production quantity, they will reduce per product unit, resulting in a lower cost per unit produced. Another factor pushing for Economies of scale is the fact that, it allows a higher specialization of the workforce. This means that either each worker can increase the out-put or the quality of their work as their attention is spread on a narrower range of work activities. As long as any of these effects cost-benefits of expanding production is greater than any potential drawbacks, like a additional management cost related to having a larger company organization, there is a clear cost-benefit to the larger firm in an industry. (Carlton & Perloff 2015)

With a larger firm comes a more financial tools, and a "bigger wallet". This allows bigger firms to handle volatilities in the market better than smaller firms might. A larger firm might even capitalize on situations where there are big shifts. If for example, if prices were to suddenly drop. Some smaller firms might find themselves in immediate liability trouble. Especially if a large amount of the firm's value is invested in current production runs, which's value is tied to the current market price of the finished product. This sort of situation might lure bigger firms to acquire smaller firms as they can be "bought at a discount" or below the opportunity cost. This effect is increased with the length of the production cycle and the

relative investment in that product in production, as this gives time for the price to revert; and long-term investments like; infrastructure, production-facilities, patents, licenses and so on.

2.4 Mergers and Acquisitions

Merges and acquisitions can be divided into three main types or forms; 1, vertical mergers (A firm combining with its supplier), 2, Horizontal mergers (Firms competing within the same markets combine) and 3, conglomerate mergers (Firms in unrelated lines of businesses combine). I will be talking about type 1 and 2 from here on, as they are most relevant, in looking at firms in a single industry. (See for instance Carlton & Perloff 2015 or Lipczynski et al. 2005). The push for mergers within an industry is usually quite simply explained as increasing profits through economies of scale and increasing efficiency through synergies between the combined firms. The result is also a bigger entity, with the combined resources and capabilities of both. It also reduces the number of market actors by 1 and leaves the market more concentrated afterwards.

Vertical integration is a point of special interest so I will elaborate a little on it. Firstly, it is a way to lower transactional costs. But it does also ensure the supply of a vital resource, and can in part control the production and transaction of this resource. So, in addition to defending the firm it can give the firm greater market power. It is now also able to tailor the input-factor especially to its unique needs. It also eliminates possible ill effects relying on multiple different suppliers with different standard might have on the production process (Carlton & Perloff 2015).

Alichian and Allen in Asche et. al. (2019) hypothesized that higher quality wares will be shipped a longer distance, as logistics related costs will be a smaller, compared to percentage of revenue of the goods sold. We can also see that companies in china will upgrade the quality of their products for further markets. They will also increase prices in these markets. Feenstra and Romalis in the same work, argue that average quality and price might be lower due to the larger markets attracting a larger number of actors, in order to service that bigger market. Many actors also forces these actors to deliver more heterogeneous products. Auer, Chaney and Saure, in the work I referred above, also show that prices depends on the wealth level of the market in the country exported to. In short, the smaller the market and the higher the

wealth-level, the more pricy and higher quality can be expected from goods in any given market, and vice versa.

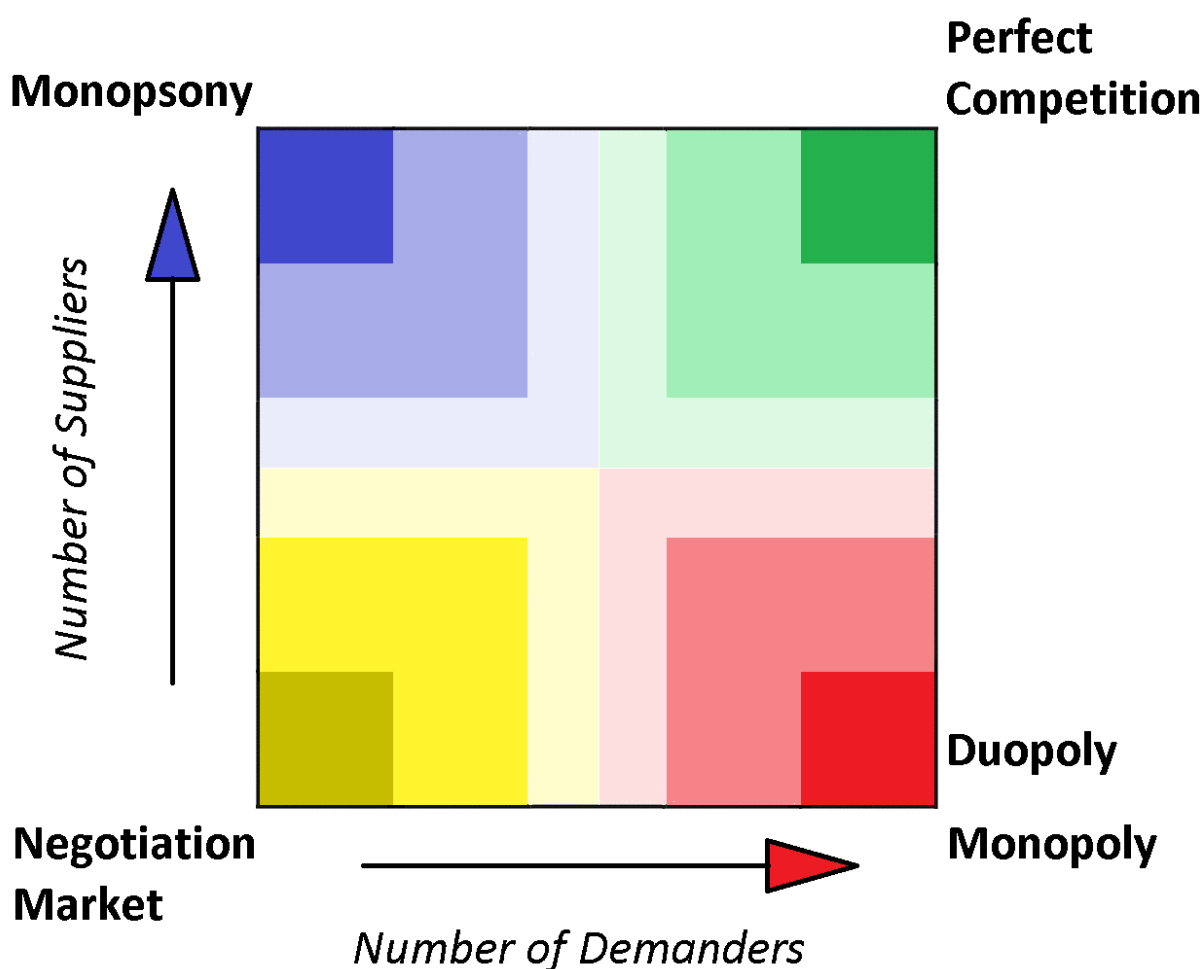
2.5 Market concentration

Industry concentration is one key indicator of the overall market structure. This is usually a measured as function of the total market share of the most dominant firms, or all the firms on the market. When looking at how concentrated the market is by analysing the biggest market actors there are two generally accepted standards the C4 and the C8 standards. The C4 is the total market-share of the four biggest and C8 is a summation of the 8 largest. The most popular measurement for market concentration which considers the entire market is the Herfindahl-Hirschman Index. The Herfindahl-Hirschman Index is the squared sums of every market actors market-share and is considered to be a good standard to when investigating markets behaving in accordance with the Cournot model (Lipczynski et al. 2005).

2.6 Different market forms

A simplified way of looking at the possible market forms is represented in the figure 2.1 below. In general market power is centralized in the same directions to the arrows indicating the number of market actors operating in the given market. And this effect is mirrored as market actors decrease along the edges from green corner. So, following the blue supplier-count arrow up from the yellow, negotiation market corner, market power is shifting to the demander, as more suppliers appear in the market, having to compete in order to sell their products to the individual demander. This ends in the blue corner, monopsony. And we can see the inverse effect if we follow a line from the green, perfect competition-, or free market model-corner. Where market power is increasingly focused in the hands of ever fewer suppliers, from whom, the customers must choose to give their patronage. (Riis & Moen 2013)

Figure 2.1: Conceptual market model



Of course, in reality, market power is a more complex topic than the relative numbers of suppliers and demanders. Where questions regarding abnormally high profit-margins, due to prices being more closely in accordance with marginal revenue; instead of what is socially efficient, marginal cost. I will explain in chapter 3, but I will not be examining the cost-structure or the demand elasticity for single firms (good ways of analysing market power), and therefore will not discuss those aspects further in my thesis.

I want to focus on the bottom right, red square, which is the domain of the monopoly, duopoly and, even though I did not write it there, oligopoly models. These are also the market forms more likely to form cartels and other unscrupulous practices. The reason for this is simple, there are fewer firms, so they have an easier time acting coordinated. And as there are few

choices for customers it might be hard to switch, and to even notice, if they are targeted with such practices.

There are many different types of oligopolies and they operate in different ways. However, there are some standard commonalities for oligopolies; 1 – consumers are price takers. 2 – the products produced in the markets are homogeneous, customers do not have strong preferences between the firms. 3 – New firms do not enter the market. 4 – The firms collectively have market-power resulting in a price above marginal cost. 5 – Each firm competes on price or output. Advertising and other marketing do not play a major role (Carlton & Perloff 2015).

One interesting aspect concerning oligopoly theory, is the strategies coming up when focusing on Research and Development (R&D) opportunities. (See for instance Sørsgard 2013). One finding from this literature is that it is easier to finance R&D for a big production actor with a strong financial position. Such a firm is more capable of funding the R&D investments and is more likely to gain potential large profits from the investment.

The Cournot model describes a market where two or more actors compete in a simultaneous game, in which the actors decide their quantities, being aware of the possible reaction from their opponents. This is a model where each individual actor has more market-power than in a price-setting models like Bertrand. Hence, acting as Cournot-competitors is advantageous to both firms compared to a price-competitive situation (Bertrand-competition). (Riis & Moen 2013)

Another oligopoly model often presented in industrial organisation is based on asymmetry between the competitors. If one actor is able to decide the quantity first, and the other has to take this quantity as given, we have a Stackelberg-situation. Another oligopoly model is characterized by a dominant firm with a competitive fringe. This describes a market where firms compete on price. In this model one firm operates with a competitive cost-advantage. This makes them the dominate firm. The dominate firm is therefore privileged with price-setting, leaving the residual market actors to be price-takers. It is also possible for a group of firms to act in concert in order to mimic a dominate firm for a market. This is a form of cartel

behaviour. If this market is to function, there are some fundamental principles that must be fulfilled, for instance high barriers to entry. The dominant group of firms must know the market demand curve and anticipate the output from the fringe-firms for any price-point. These final two are prerequisites for the dominant firm to optimise its production-output (Lipczynski et al. 2005).

The prisoner's dilemma is a good place to start in understanding how cartels work, and the governing rationale of the actors involved. The game-matrix below, in figure 2.3, is an example of a game where two actors are to make a choice regarding cutting or holding prices where they are in a simultaneous game. Both our players; Mr. Orange and Mr. Blue, know the possible outcomes of the game from the matrix. The ideal outcome for both parties is to cut prices, and for the opponent to hold. Then the person who was alone in cutting the price will get a profit of 700. The person held will only get 100. Nash found that neither player will choose to hold prices in such situations. The dominant strategy is to cut prices, and both parties will end with a profit of 300, the solution in red. This is predicated on the matrix being the sum-total of the information/communication the two firms have of each other. Even though both parties know there is a natural compromise in both holding their prices, leaving both players better off, $300 < 500$. There is no reason to believe the opponent is not hoping to end up with the 700-return, and is content avoiding ending up with only 100. Knowing exactly what the opponent is considering, in effect forces both parties to cut prices to avoid losing 200 in profit ($100 - 300 = -200$) and the competitor ending up with an advantage of 600.

This all changes if Mr Orange and Mr. Blue have the ability to communicate. Then they might just be able to agree to the blue solution, 500 each where both parties hold prices high. Both parties have an incentive of 200 additional profit to find this solution ($500 - 300 = 200$) and the industry, as a whole prospers better here too. However, they also both have the incentive to cheat, and to lure the other player to hold prices whilst they cut. The result is that they will only work together like a cartel to hold prices high if each side poses a legitimate threat to the other, in order to disincentivise one player of suddenly cheating. The threat might be in the form of a protracted price-war, see for example Sjørgard (2013).

Figure 2.2: The cartel game as a Prisoner's dilemma

	Hold prices	Cut prices
Hold prices	500	100
Cut prices	700	300

(Figure Johnson et al. 2017, page 228)

This is about the simplest rationale for a cartel. Of course, there are more complex cartels in the real world but the fundamentals come out well from this simple game. The individual company is secure from hard competition from industry-peers as long as everyone is in on the game. And the industry as a whole earns higher profits from organising in this way. Finally, as the cartel sets higher prices, the customers lose from such market-solutions, and they lose more than the firms win (see for instance Riis & Moen 2013).

2.7 Other factors and regulations directly impacting the market functioning

So far, we have looked on aspects concerning demand and supply in a market, and possible actions from the individual firms and demanders participating in the market. As we have commented on before, this industrial market for salmon is regulated in several ways. The recent years the Norwegian authorities have introduced auctions for production-licenses for the farming of salmon to the individual firms in the business. This is in order to control the scale and locations chosen for farming. For a couple of years since, also development licenses were introduced, in order to stimulate technological innovations in the industry. For all these

licenses the firms are competing in auctions to win rights to grow and develop. The authorities choice of using auction principles and competitive grant proposals in distributing both ordinary licences and development licenses affect the firms' strategies. As seen in the general literature in microeconomics, the purpose of auctions and competitive applications for production licenses is to secure that the most efficient firms obtain the right to grow, see for instance Riis & Moen (2013).

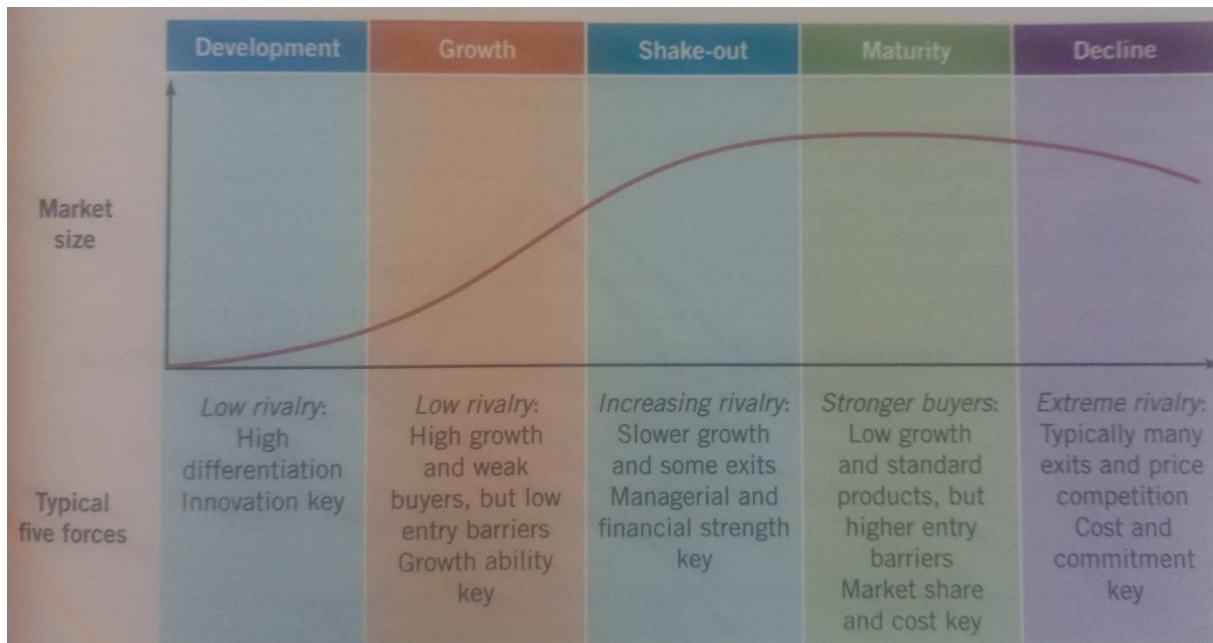
For general trade theory we know that both direct and indirect trade barriers affect the prices and quantities of product being exported and imported between nations. Moreover, trade treaties or lack there of also influence how trade patterns become and develop. As farmed salmon is produced both in Norway and in several foreign countries, and the firms might be multi-national controlled and owned, trade policy issues are important to understand how the market function (see for instance Krugman et al. 2018)

2.8 Industry lifecycle

In investigating any industry, especially when looking at it with a certain historical context it might be reasonable to take into account the industry lifecycle, see for example Johnson et al. (2017). This gives a certain perspective, enabling us to make assumptions regarding the likely market structure and the challenges typical for a particular stage in the lifecycle. The lifecycle is divided into 5 distinct phases; 1 – Development, an experimental period, few actors with little rivalry between them and low barriers to entry. 2 – Growth, market expansion, moderate to low rivalry as new firms enter the marketplace seeing the success of their peers. As firms grow into the marketplace, access to key resources and suppliers become a focus, in order to capture new market shares. But barriers to entry might still be low, as companies have yet to establish big advantages derived from long experience, large scale production and loyal customers. 3 – Shake-out, signified by a market saturation, and a slowing in the market growth. As the opportunities for grabbing new market-shares dries up, direct interaction and competition results in a volatile market and irregular profits. Increased rivalry forces the weaker firms out of business, leaving the more dominant firms. 4 – Maturity, barriers to entry starts increase and economics of scale and experience start becoming key success-factors. High market share becomes more important as it gives leverage in negotiations and a cost advantage. 5 – Decline, this is the terminal stage for an industry, and it starts becoming when

the business model is unviable. I will not discuss this phase any longer, as I think it is not applicable to the focus-industry of this thesis. People are unlikely to stop eating salmon any time soon.

Figure 2.3: Industry lifecycle



(Figure from Johnson et al. 2017, page 79)

There is however an alternative 5'th stage. Reinvigoration, where the industry goes into a new growth-spurt. This can be achieved if the limiting factors for increasing the industry market-share, as a whole, can be overcome. This might, for example, be as a result of technological innovation or finding new applications for the product. This can last until the new market is saturated or a new limiting factor is found for production.

3 Method

In this section I will explain how I have worked to answer my research questions. The first question a) is related to how the global market for salmon look like, and what is actually the position of Norway as a salmon farming nation. Mostly, this question is answered by looking into secondary data available from data aggregators and published scientific research. The second question b), focusing on what kind of strategies the salmon farming firms follow and the consequences for the future of the salmon farming industry, is explored by adding the information from studying annual reports from selected firm. In section 3.1 I will give a short overview concerning data acquisition, followed by a description how I chose the data sources in section 3.2. Section 3.3 contains a presentation of the way I analyzed the data, and finally in section 3.4 I discuss strengths and weaknesses of the methods used. For details regarding relevant methodology to the research problem I have looked at in my thesis, I have based my approach on the work by Jacobsen (2013).

3.1 Data acquisition

My first step was searching the university Oria search engine to have a look at all the latest research on salmon farming and aquaculture. After sifting through a load of studies I got a general idea of what the hot button issues within the industry are, and generally where the scientific consensus is. I also got a more, and more refined interests within the industry. The salmon-farming industry has vast literary and still growing research-bibliography and naturally it is largely centred in Norway. There is an abundance of great in-depth research examining almost any aspect of the industry. In addition, there are several great data aggregators like Norwegian statistics and the department of fishing, continuously publishing great static data and reports on the industry.

The salmon-farming industry is a very big industry and it would be very expensive and work-intensive to collect independent data of the sort these aggregators provide. And collecting independent data on specific firms will be even more difficult, as I would have to be granted access. In reality, there is no realistic way for me as a master student to collect such a diverse and comprehensive data of production- and export-metrics. When it comes to looking at the strategic choices, of the firms I decided to look at closer I could have requested interviews in order, not to rely on the sanitised presentations presentation in their annual reports, and get a

more unfiltered perspective of their views on competition within the industry. However, it is hard to get such access and thinking they will be willing to share such sensitive secrets with me is a little naïve. Even though annual reports are made to resemble marketing the information they contain regarding the company in question is accurate and they must be by law.

Fortunately for me there exists such an overwhelming wealth of data and established research. And that made the decision to choose to rely on this published data natural for me when looking at the research questions I was looking into. I will go through in detail the strengths and weaknesses of my methods in section 3.4. Although there is an abundant wealth of both research, data, industry reports and reports from individual firms, these are all, by in large, quite narrow in the scope of what they are trying to examine within the industry. There is little published material out there, that try to congregate the conclusions from these different studies in established market-economic or industrial organizational theoretical-frameworks in order to try to gleam insights of the kind I am attempting in this thesis.

3.2 How I selected the secondary sources

When it comes to how I selected my secondary sources, I went to the most authoritative sources I could find. Scientifically published research was my first stop to find good reliable data. I saw in many of these studies, that they used Norwegian statistics (SSB), the Fishing directory (Fiskedirektoratet) and the Norwegian Seafood Council so I had a look at what these institutions had published in regards relevant data I could use in my research. Then I picked some large firms to look at more closely. I picked firms listed on the Oslo stock exchange, just so they would all be tied to the same economic market, but that seemed to be different from each other. The thought was that by examining different firms I could perhaps see different strategies in action, and by reading their different assessments of how things were going in the industry I might get a broader perspective. Lastly as I read industry news, I refer to some news articles in this thesis. These flesh out the competitive environment, and although not scientific, do give insights sorely missed from other sources.

3.3 How I analysed the empirical data

Firstly, I use the published scientific material to describe and explain the historical development of the aquaculture industry on the national level, where Norway's position is particularly focused. In order to complete and update the material earlier published, I have used the latest salmon farming industry data available from the sources mentioned in section 3.1. As far as I understand the former research, there is general scientific consensus concerning how and why the industry has developed the way it has.

Secondly, I will look in depth at concentration measurements both historically but more interestingly, what it looks like right now. Here I will use the Herfindahl index in addition to other simpler standard measurements like C4. All empirical measurements have strengths and weaknesses. For a complete discussion of strengths and weaknesses see (industrial organization). The most relevant weakness for my study of the competitive environment is the fact that I do not look at the specific effect of varying the production-quantity of large firms in order to ascertain the price-effects. However, as I see it, related to the salmon market, production capacities and production time lags mean that the firm quantities are less flexible related to product prices than ordinary markets commented on in general textbooks in industrial organization.

Thirdly, after presenting the representative statements from the annual reports from the selected salmon farming firms, I compare key points in order to ascertain the strategies utilized in order to compete in the market. I have decided to not go into all the accounting data and profitability ratios, which could have given insights into costs and incomes. I have done this, in order to highlight the bigger strategic moves which indicate the strategic positioning of the firms, and how they might try to gain an advantage going forwards. In particular I have chosen to focus on development licenses that are the cutting edge in growth-opportunities for the industry as a whole and the individual companies in Norway today.

3.4 Strengths and weaknesses in my methods

The weaknesses of not gathering any data personally is that it is not tailored to my research. I had to be very aware what sources to utilize and to be conscious of the reason the data is available and the presentation of it. This is especially true when utilizing data published by

market actors in the industry, like the yearly reports and accompanying statistics from firms in the industry and when referring to news sources.

There is also the problem that my data is not all published at the same time, there is the distinct possibility that assumptions taken for granted in some research will have changed in some later research making combining the conclusions in order to fit a theoretical model fully.

The overwhelming amount of scientific research regarding the economic issues relating to the modern aquaculture and the enormous data resources openly available mean that I have had to make certain decisions regarding what to include in this research. This means I could never encompass the entire industry and all relevant factors. I only hope and think I have included the main factors enabling a satisfactory discussion and analysis of my research questions.

4 Data

In this chapter I will present some of the most relevant data I have been studying. First, in section 4.1 I present the salmon farming industry through scientific literature in a historical context, complemented by some up to date data from open sources, where appropriate. In the next section 4.2 I will utilize well established concentration measurements in order to give insights for further elaborations, in chapter 5, regarding the competitive situation within the salmon farming industry. In the following section 4.3 I will present my chosen firms in order to evaluate what competitive strategies they are following. Finally, in section 4.4 I will present an overview of development licences for further discussion in the next chapter 5.

4.1 Salmon farming nations

There is a limit on the suitable coastal areas for salmon farming. The suitable places are depicted on the map below. These are all located within certain latitudes in the Northern and Southern Hemispheres. It is imperative that the fish is kept at the right temperature, 0-20 degrees Celsius and if possible 8-14 degrees. They also require good waterflow through their enclosure, but not so much, that it impedes movement. Lastly there are certain biological necessities for the area for a productive and successful salmon farm. As these requirements are quite particular and with the regulations connected with the industry, the farmable areas are in the fjords and other protected coastal locals, and rules out much of the coastline.

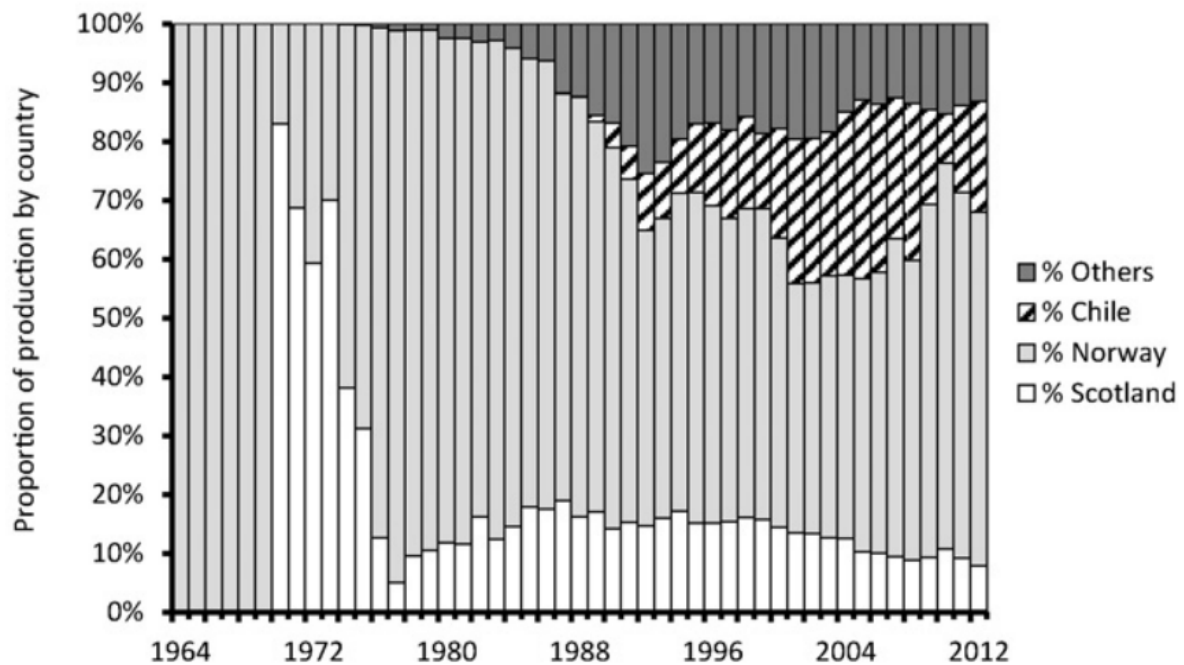
The salmon farming-industry does not seem to follow the tendency of aquaculture in general. Salmon farming is dominated by mainly western countries; the United States, Norway, Scotland and the Faroe Islands, but Chile is also among the biggest producers of arctic salmon on the world market (Nadarajah & Flaaten, 2017).

Figure 4.1 *Locations of salmon farms world wide*



(Figure: MOWI annual report 2019 Date 08.31.2020)

Figure 4.2 *Salmon market shares per nation*



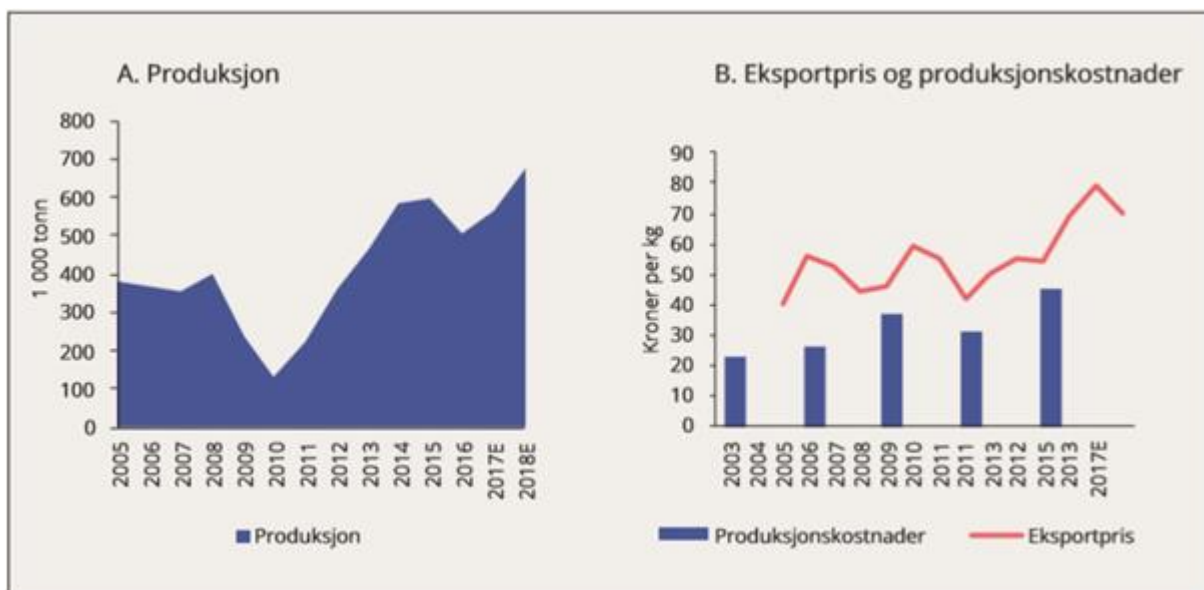
(Figure: Ellis, et.al. 2016)

As one can gleam from the picture above, the distribution-side of the farmed-salmon market seems quite narrow. Especially, given the fact we find arctic salmon in stores and restaurants almost world-wide. Although there are several environmental, technical and recourse requirements restricting the proliferation of salmon farming, there is lacking research explaining how the industry has ended up dominated by so few and by mainly rather small countries, supplying the world-market (Marine Biology, 2017).

Chile

Though the salmon farming-industry has seen a lot of quick growth, it has also experienced collapses in the industry of entire nations. The most recent dramatic example of this phenomena was in Chile. Where the salmon farming-industry quickly grew from 135.000 tons with an estimated value of 538 million US-dollars in 1996 to 397.000 tons in 2007 valued at an estimated 2.241 billion US-dollars, making the industry one of the biggest in Chile. At the time Chilean-salmon had captured around 40% of the world market, with especially dominating market shares in the US and Japan. When ISA (infectious salmon anaemia) showed up in Chile in 2007 it almost killed the entire industry, resulting in a loss on 360 tons in biomass. This crippled the industry for a long time, and was worsened when it coincided with the financial crisis (Bravo et al. 2013).

Figure 4.3 Chilean production – costs and export prices



(Figure from: NOU, 2019)

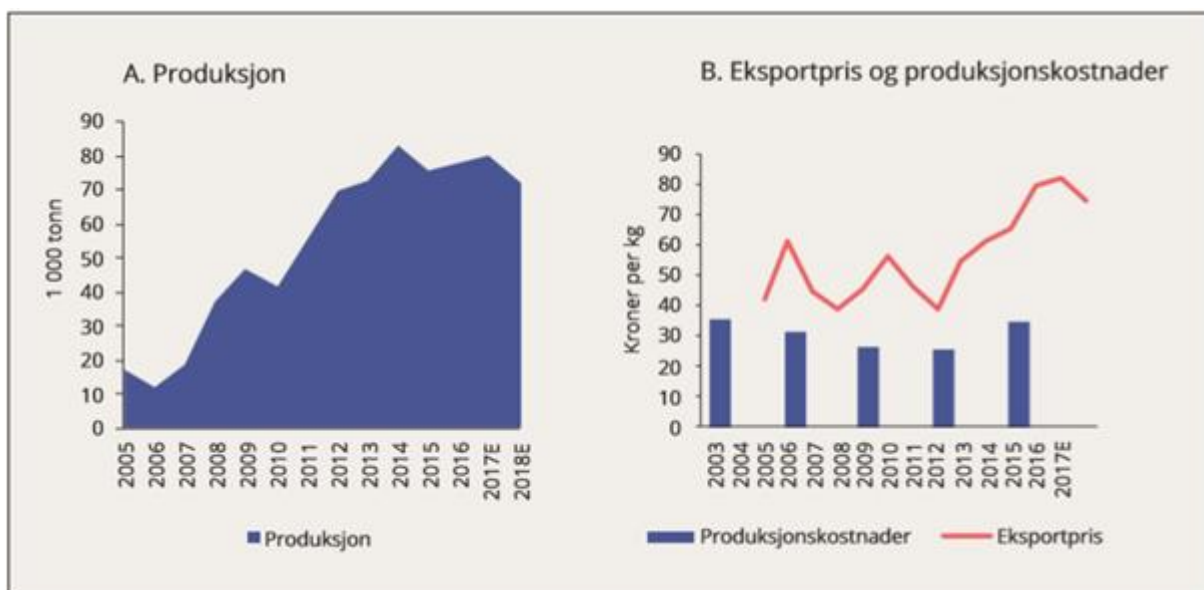
Scotland

There was a similar event in Scotland starting in the late 80s when there was a shortage of smolt followed by plagues of *aeromonas salmonicida* and later ISA, throughout the 90s, leaving the industry much worse for wear. (Ellis et al. 2016). This frightened local investors and paved the way for the big investments by the large Norwegian firms to expand their operations in Scotland.

The industry has recovered and grown in line with other salmon-farming-countries in Scotland, however legislation in Scotland have been particularly harsh. So even though laws and regulations have been stable and foreseeable a number of NGO's (some made up of hobby fishers) have caused costs to be at a higher level than in, for example Norway, lowering efficiency and limiting the benefits of economies of scale (See for example MOWI annual report 2019). Scottish officials have however, stated their goal of increasing production output by 170 000 tons. At the moment, the biggest concern for the market in Scotland is Brexit, and what possible implications this will have on toll and/or tariffs, especially for the European market.

Faroe Islands

Figure 4.4 Faroe Islands production – costs, and export prices

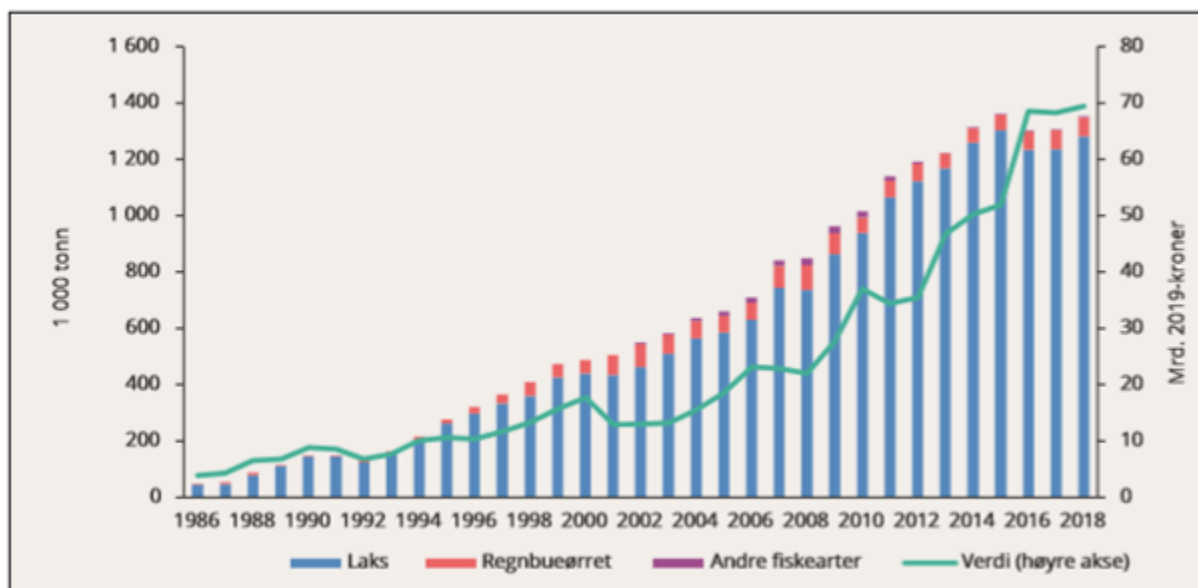


(Figure from: NOU, 2019)

The Faroe Islands has an interesting history and very unlike the major disasters Chile and Scotland. Naturally being islands in the North Sea, the industry is naturally suited for the region. The Faroe Islands also has other less obvious natural advantages. The Faroe Islands are an independent region under the Danish kingdom, but outside the European Union. (Bakkafrost annual report 2019). This is sort of a complicated arrangement, but it has put The Faroe Islands in a unique position. The definitive market leader of salmon farming in the Faroe Islands is Bakkafrost. After they acquired Havsbrun in 2012, they ended up too big for the country antitrust laws (owing 50% or more of the salmon licenses in the «country» is illegal). This forced them to sell down to 49%. As we can see in the Figure 4.4 above, the industry has seen a great amount of growth. However, the coastline is now pretty much at capacity, leaving little room for domestic expansion. The Faroe Islands has also had a special position after Russia invaded Crimea in 2014. In the aftermath of the invasion/annexation, Russia, in response to international sanctions and condemnation, instituted a ban on importing food from the US, the EU, Canada, Australia and Norway. Meaning that, among salmon-farmers, firms with a location on the Faroe Islands got much less competition for the Russian market, something they capitalised on heavily. This is also reflected in the export price increase in 2014 and thereafter.

Norway as a salmon farming country

Figure 4.5 Norwegian production – aquaculture quantities and value



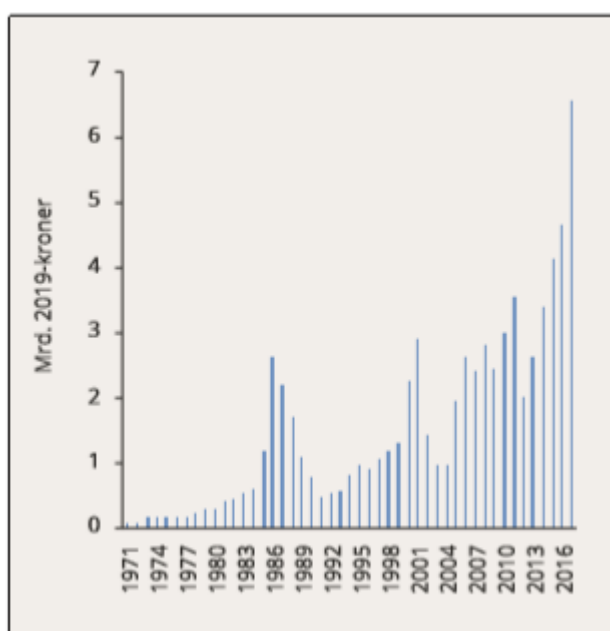
(Figure from: NOU, 2019)

The aquaculture industry in Norway as a whole, is quite well represented by the graph above. As we can plainly see, the industry is dominated by arctic salmon. And that apart from a marginal rainbow trout production, the rest of the production is insignificant and mostly for experimental purposes. The industry has also obviously grown a lot, both in regards to the biomass, and the value. Although both value and biomass has been increasing, the relationship is not perfectly correlated. From this we can conclude that there must be other major value-factors, driving the growth seen in the aquaculture industry.

Investment

Figure 4.6 Norwegian investment history in aquaculture

Another interesting dynamic we can see in the Norwegian aquaculture-story is responsiveness of investment in the industry. If we look at the green value-line in the Figure 4.5 above, we can see it spikes shapely four times after the industry kind of “really started” in the mid-to-late 80’s; the first time is around time is around 2000 then again, around 2006, then 2010, and finally 2017, and it has yet to fall again.



(Figure from: NOU, 2019)

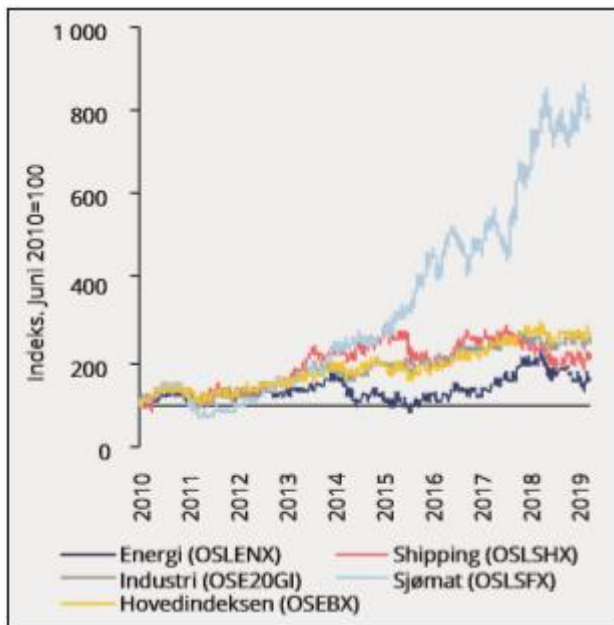
Correlating these dates with the investment-history in aquaculture we can see how the industry has grown over the years. There is another dimension look at the growth seen in the industry, the stock market.

Seafood index, OSLSFX

Looking at the relative performance of the seafood index on Oslo Børs (OSLSFX, on the graph) the index has recently been severely outperforming not only the OSEBX, but all the other industry indexes represented on the graph for reference. As represented on the left, we see the OSLSFX really seems to start relatively overperforming the market as a whole, in

2015. And as we saw on the investment graph above this also coincides with the latest round of investments in the industry.

Figure 4.7 Seafood index, OSLSFX



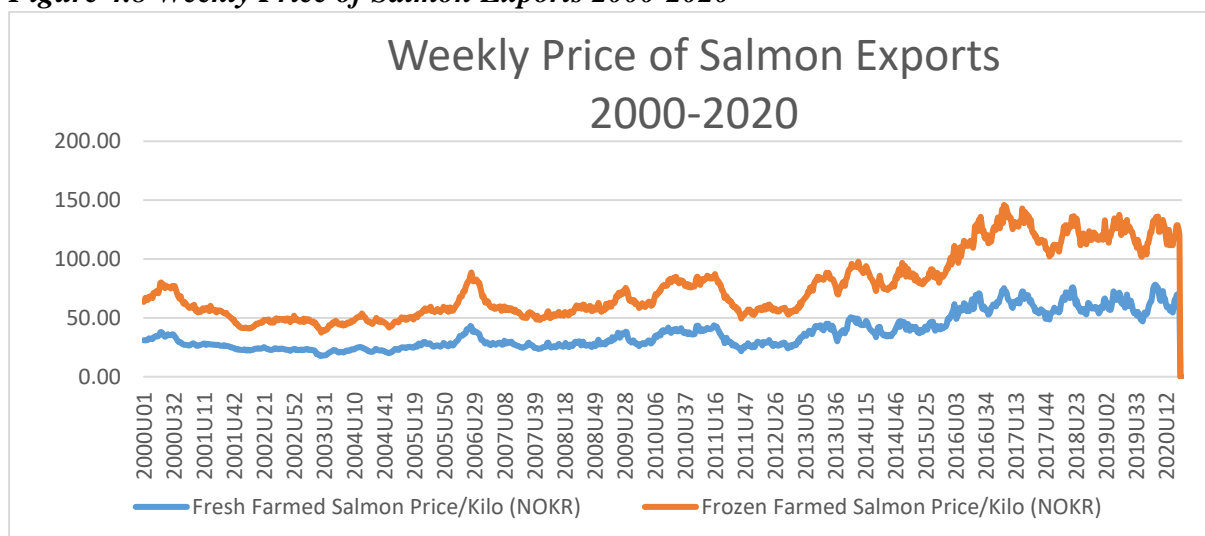
(Figure from: NOU, 2019)

This probably both incentivised active aquaculture-firms to invest in expanding their operations and actors on the financial market to seek exploits in the industry. As final note on the explosive growth in the OSLSFX index, it is important to remember that only the biggest companies on the market is accounted for when indexing the seafood index. There is another facet to this story, further explained in the chapter 4.2 “market concentration” that might also be a causal factor to the dramatic upticks in recent years.

Looking at other possible major factors for the ostensive growth spurts the salmon farming industry saw in 2000, around 2006, then again in 2010, and finally 2017 should also be seen in conjuncture with the price.

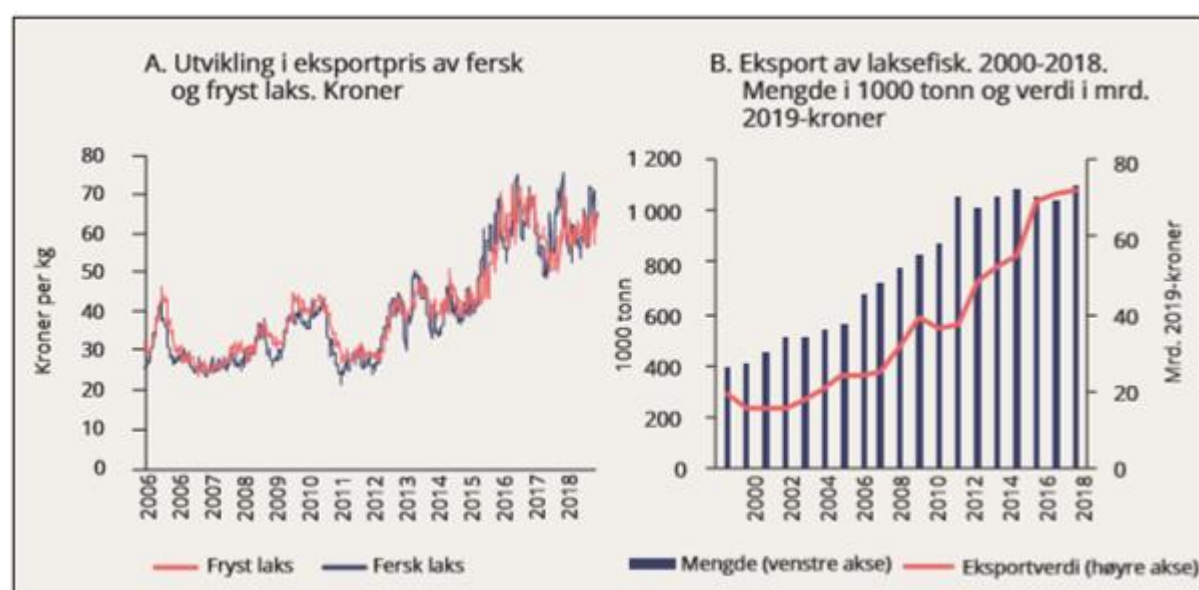
Looking at the historic salmon price-distribution as a random walk makes it difficult to explain industry-growth in the later years. Segmenting the data into periods from 1995-2000 we can see that salmon-prices are quite high with relatively low variance. In the late 1990’s the price rises towards 2000 where the clear spike. This price-increase was accompanied with stable increase in production-quantity. After 2000 prices went down, that probably contributed to production reductions in the next few years and production did not recoup until around 2005-2006. If we crop the data and look at export-prices from that time until the present, it looks more like a random-walk with a positive drift.

Figure 4.8 Weekly Price of Salmon Exports 2000-2020



Source: Norway Statistics, SSB (Numbers updated 22.01.2020)

Figure 4.9 Production – costs, and export prices



(Figure from: NOU, 2019)

Now there are good reasons not to eliminate half of the data to make it fit a different conclusion. But in this case, I would argue there are good reasons to analyse the post-2005-data independent to the previous years. Just by looking at the graph we can clearly see that there are much more dramatic price-fluctuations in recent years. This increase in variance, combined with the explosive growth in the volumes produced, which had started to stagnate in the early 2000's, indicate that there where fundamental changes in the market. In a rapidly changing market, it is natural to see faster dramatic changes in prices as business-actors try to keep up and exploit opportunities as they present themselves.

Salmon is product vulnerable to spoilage, therefore it cannot be stored, and marketed fresh. It also has a rather long production cycle of 3 years. This results in production quantities that are very difficult and expensive to adjust on short notice in order to react to changes in the demand. This is the one of the main reasons for price-volatility on the market.

Historically the Scottish salmon has traded above the price of Norwegian Salmon, and salmon from the Faroese Islands slightly below. However due to the changes in trade-policies in regards to Norway in recent years this has changed, and reversed itself for certain markets.

Table 4.1 Relative yearly supply and price changes

Year	Global supply growth	Change in avg. price FCA Oslo (EUR)
2001	15 %	-25 %
2002	8 %	-3 %
2003	7 %	-11 %
2004	6 %	7 %
2005	5 %	23 %
2006	1 %	23 %
2007	10 %	-21 %
2008	7 %	1 %
2009	2 %	12 %
2010	-4 %	35 %
2011	12 %	-17 %
2012	21 %	-10 %
2013	2 %	42 %
2014	8 %	-5 %
2015	5 %	-4 %
2016	-4 %	46 %
2017	2 %	-5 %
2018	7 %	-2 %
2019	6 %	-6 %

(Table from: Mowi 2019 Annual report)

Looking at the salmon market we can see that the global supply growth was steady and mostly high from 2000 until 2013. As we can see from the table, this changes after 2013, and the total production drops off. We can also clearly see the impact of changing the supply growth has on the price. According to the linear regression done by Mowi annual report 2019, changes in the supply increase explain 84% of the price changes in the same period. In the period depicted the total global supply increase was 198%. We can also see that in recent years after 2013, when the supply growth is lower, the annual; relative, average, price changes are much smaller, just as expected if the supply, or supply growth rates are main factor in determining market price.

The general trend might be even easier to see in the graph below. Where the observations are clustered around the 6-7 %. And we can see the 2019 observation, indicated there, right in the middle of the cluster. The outliers, are mostly from earlier years, like 2013, as indicated, when supply growth swings were more drastic.

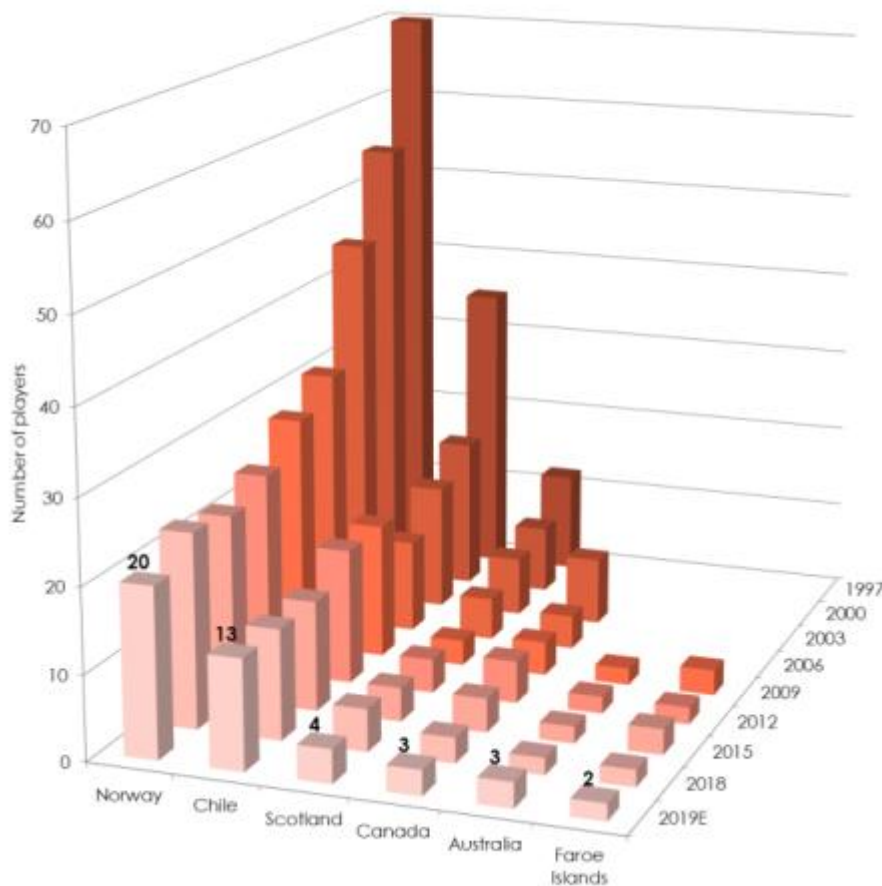
Figure 4.10 Price and Supply scatterplot with regessoinline



(Figure from: Mowi 2019 Annual report)

4.2 Market concentration

Figure 4.11 Number of firms for 80% of supply



(Figure from: Mowi 2019 Annual report)

The graph above represents the most important salmon farming countries in the world, and the number of firms responsible for 80% of the market production. As we can see there is a big drop-off in the most important markets. In Norway we can see the most drastic change from around 70 firms to under 20. There are also notable drops in Chile, where it is more than halved from ca. 35 to 13, in Scotland from 10 to 4 and North America where their market is mostly 2 firms.

There is, in short, a general trend for how all these national salmon markets have developed. The last two decades the industry has seen a lot of consolidation in every region where there is salmon production. There are also reasons to think this trend will continue (see chapter 5-6). At the moment there are approximately 120 firms who own standard commercial licences entitling them to farm salmon and trout in Norway. All the mergers and acquisitions' do

however mean that the total production is controlled by a total of 90 companies, as the remaining, license owning firms are owned by other market actors.

This sort of centralisation is reflected in the Chilean market also, where there are approximately 1360 licences for the farming of salmon, trout and coho. In Chile 90% of the countries total production comes from the top 13 aquaculture firms in the nation. And the 10 largest firms account for 83% of the total industrial aquaculture licenses.

This does not take into account to what degree the same firms are represented in multiple markets in these top firms responsible for the bulk of the product in the market. To get some further insight into how broadly the top firms are represented we can look at the Table 4.2 below.

Table 4.2 Top suppliers in the biggest salmon farming countries

Top 10 - Norway			Top 5 - United Kingdom			Top 4 - North America			Top 10 - Chile		
Company	H.Q.	HOG	Company	H.Q.	HOG	Company	H.Q.	HOG	Company	H.Q.	HOG
1 Mowi		236,900	Mowi		65,400	Cooke Aquaculture		56,500	"New Aquachile" (Agrosuper)		141,300
2 Salmar		153,100	Bakkafrost (SSC)		33,800	Mowi		54,400	Salmones Multiexport		77,600
3 Lerøy Seafood		128,700	Scottish Sea Farms		25,900	Mitsubishi / Cermaq		17,800	Mitsubishi / Cermaq		71,900
4 Mitsubishi / Cermaq		73,000	Cooke Aquaculture		23,400	Grieg Seafood		14,100	Mowi		65,700
5 Grieg Seafood		57,600	Grieg Seafood		11,300	*			Australis Seafood		53,500
6 Nova Sea		46,000							Camanchaca		48,300
7 Nordlaks		35,000							Salmones Antartica		27,100
8 Sinkaberg-Hansen		30,500							Salmones Blumar		25,700
9 Alsaker Fjordbruk		30,500							Salmones Austral		22,800
10 Norway Royal Salmon		30,500							Yadran		22,500
Top 10		821,800	Top 5		159,800	Top 4		142,800	Top 10		556,400
Others		378,300	Others		5,400	Others		5,100	Others		64,800
Total		1,200,100	Total		165,200	Total		147,900	Total		621,200

All figures in tonnes GWT

* The industry in the UK and North America are best described by the top 5 and top 4 producers, respectively.

(Table from: Mowi 2019 Annual report)

Looking at this table there are a few names that jump out at us. Mowi first of all; first, the biggest producer in two of the four big markets listed; in Norway and the United Kingdoms. And second largest in North America, only the Cooke mega conglomerate's aquaculture firm is larger in their home market. And Mowi comes in at number 4 in Chile. In general, we can see that the big Norwegian firms are represented in all the markets. Notable non-Norwegian firms are; Cooke, the North-American giant, New Aquachile, the Chilean giant and Bakkafrost, the biggest salmon farmer on the Faroe Islands who bought their way into the Scottish market in recent years. Even though these are all important firms on the world stage. There is no way around the fact that the global market is pretty much dominated and owned

by the Norwegians. This fact is only compounded when looking into the other, nationally big suppliers, for example Scottish Sea Farms, the third biggest producer in the United Kingdoms. It is owned and controlled by Lerøy Seafood and Salmar, the number two and three biggest suppliers in Norway. This is very commonplace as there as been so much buyouts in the industry, something I will discuss more in depth in the next chapter (chapter 5).

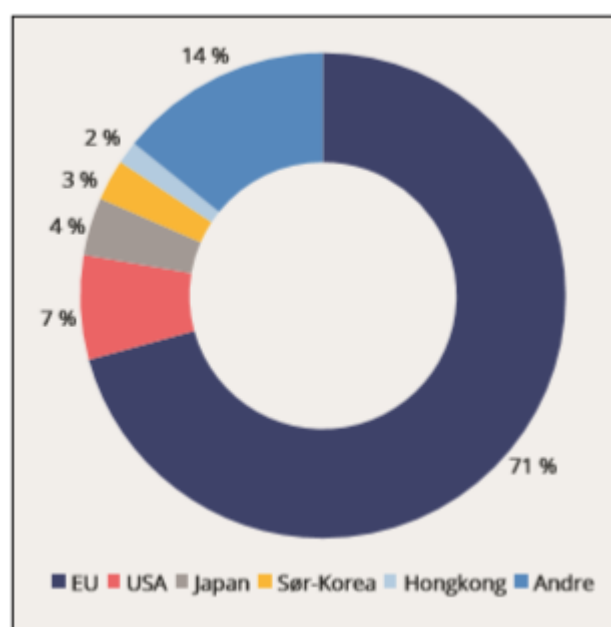
In order not to run into the problem of counting these companies; who can not reasonably be counted as independent market actors, as they might not compete against their owners, I will use Norway as a microcosm of the industry as a whole, when calculating market concentration, the C4 and C8. The Norwegian market and the firms there are a reasonable representation of the world market.

The 8 biggest salmon farmers in Norway and their approximate market shares are as follows; Mowi 19,74%, Salmar 12,76, Lerøy 10,72%, Cermaq 6%, Grieg Seafood 4,8%, Nova 3,8%, Nordlaks 2,9%, Sinkberg-Hansen 2,5%. This gives us the following concentration measurements; C4 = 49,22, C8 = 63,22. It is also worth noting that is around 20% of the market alone, this id also true if looked at as a percentage of the total world supply.

Export markets

Norway mostly sells its salmon as whole slaughtered and gutted salmon with head, totalling over 80% of the salmon export. This is because there are prohibitively high taxes on imported processed fish-products from Norway into the European Union. There are clearly also other important markets comprising around 140 countries around the world. Around 10% of the salmon exports are in the form of fresh filets, and approximately 7% as frozen whole fish. Even though Norway

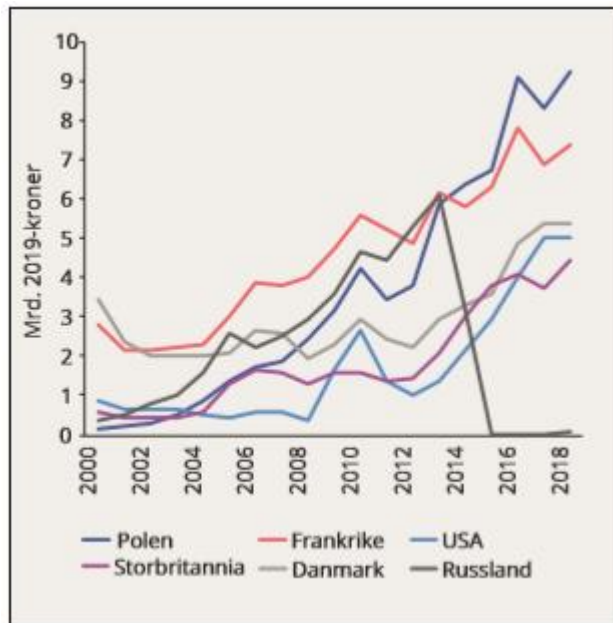
Figure 4.12 Major export markets by quantity



(Figure from: NOU, 2019)

Figure 4.13 Historic value of major export markets

has plenty of free trade agreements outside the European Union there seems to be limited



enthusiasm to engage in large scale-trade with these partners. This is probably due to troubles with shipments being stopped for veterinarian controllers, or similar technical holdups. When we look at the most important importers of Norwegian salmon, graphed on the left, we see Poland as the biggest importer and Denmark as the third biggest.

(Figure from: NOU, 2019)

These countries obviously do not have domestic markets able to consume salmon at these rates. So these countries are hotspots for processing Norwegian salmon for other markets.

4.2 Cases

Figure 4.14 Mowi industrial locations



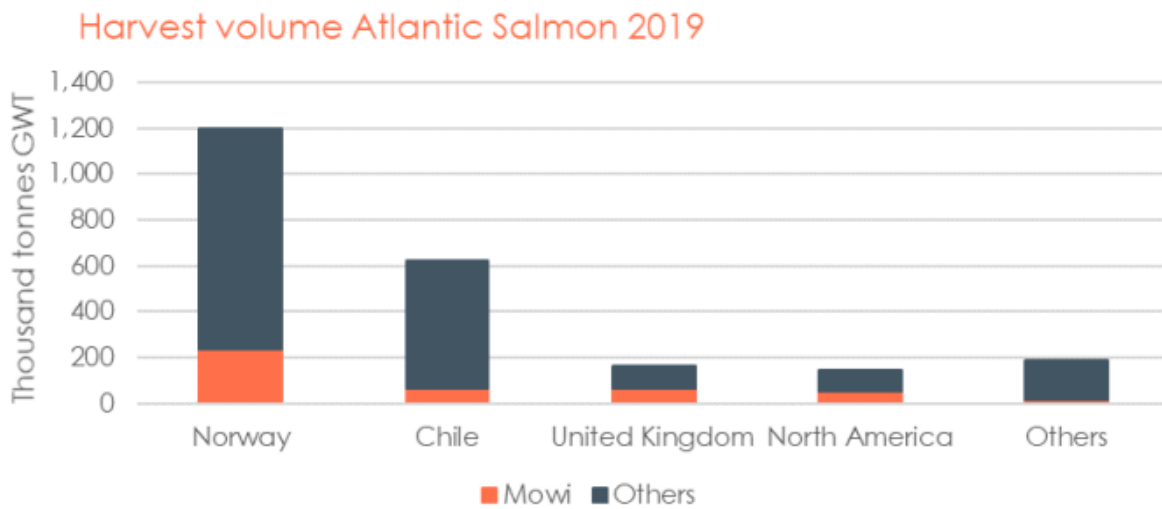
(Figure from: Mowi 2019 Annual report)

Mowi is the world's largest salmon producing company in the world, by both volume and revenue. Their products are available in around 70 countries round the world. In 2019 Mowi ended with a harvest of 435,904 tones (GWT), encompassing 19% of the total worldwide industry output.

Mowi's market dominance breaks down as follows; in Norway they harvest around one fifth in the nation's total produce, in the United Kingdom they are responsible for around two fifths and in North America Mowi Group harvests over a third of the continents total harvest, see Figure 4.14.

MOWIs' is pretty much straight forward when it comes to their strategies. They intend to be the biggest and "the best" in every market. They are huge and expanding, the newer markets they have tried to gain dominance in has been Poland and France, two of the biggest importers of salmon in the world.

Figure 4.15 Harvest volume MOWI per market



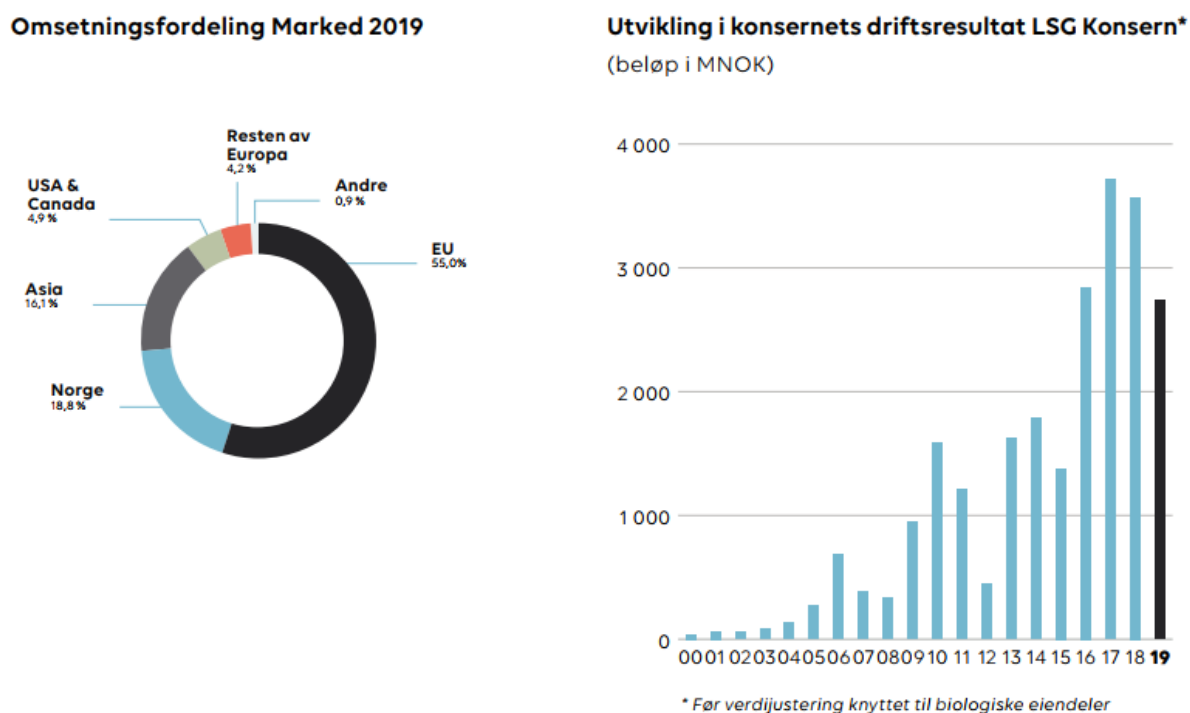
(Figure from: Mowi 2019 Annual report)

As far as investments into how they intend to meet future challenges in the market they seem to favour investment into automation and integration above all. I will comment further on this in chapter 5.4. But at the moment they are collaborating with Alphabet to improve underwater sensing and related technologies to be employed in further automating their salmon farms.

SalMar

SalMar is one of the biggest farmed salmon producers in the world. I will present a description of their business in later years, as one example of the strategies used by these mega-actors in the industry. The aim is to give some insight as to how these more, and more dominant firms in the industry operate, the strategies employed and to see what challenges they face in the market.

Figure 4.16 SalMar export markets and revenue development since 2000



(Figure from: SalMar 2019 Annual report)

The markets supplied by SalMar, they are represented above in Figure 4.15, as percentages of the total produce, sold to these markets in 2019. SalMar has a total of 100 licenses for salmon in Norway, each of which allows them a MTB (Norwegian acronym for maximum allowed biomass) normally ranging from 780 tons (in most of Norway) to 945 tons (in northern parts on Norway). They are also involved in 12 additional concessions through partnerships and the like. In addition, SalMar operate 8 so-called development-licenses for 6240 tons, through their subsidiary Ocean Farming AS for the Ocean Farm 1 project/installation for open sea farming that slaughtered its first production cycle early in 2019. And was in the same year given a further 8 development-licenses through their majority owned company MariCulture AS for the Smart Fishfarm project/installation. Smart Fishfarm will have twice the capacity of Ocean Farm 1, so the size of these new development-licenses is not representative of the expected production of these new innovative expansions. These open-sea ventures consolidated under a new subsidiary SalMar Ocean AS, to manage them.

These new open-ocean projects under are not the only development-licenses are not the only growth projects of 2019. SalMar increased its holdings of Arnarlax (Iceland's biggest salmonfarming firm) from 42% to 59,4% in February, and SalMar also owns 50% of Scottish

Sea Farms Ltd. through its subsidiary Norskott Havbruk AS. Scottish Sea Farms is the second largest salmon-producer in Brittan.

SalMar is not simply a farming company but is vertically integrated with the entire salmon value-chain. From smolt to farming to slaughter, processing-and-packaging, and sales. With manufacturing facilities at Frøya (InnovaMar), Aukra (Vikenco) and is building Northern-Norway's biggest processing plant InnovaNor in Senja, expected to open in 2021. There are also plans to build a hatchery in Tjuin to work with their existing hatchery in Follafooss in the region. In order to expand competitive competence in this crucial upstream activity.

Lerøy seafood

Figure 4.17 Product range by present sold Lerøy 2019

Lerøy is one of the biggest general seafood companies in Norway. Naturally, that also means it is among the leading salmon-farmers on the world stage. As illustrated below, salmon and salmon-products make up over 60% of the business. Lerøy delivers their products to over 80 markets around the world. Since Lerøy is a dominant firm in the industry based in Bergen Norway, I think it is a fitting example in order to gain insight into the leading strategies in the industry.



(Figure from: Lerøy 2019 Annual report)

Like all the other companies discussed Lerøy has totally integrated the entire value chain from roe production, to industrial processing, to product sales. They have production facilities, mostly salmon farms, all over Norway and in Scotland. This activity is, characteristically for the industry, organized in a myriad of firms like; Lerøy Aurora, Lerøy Midt og Lerøy Sjøtroll. In addition to this, Lerøy has factories and distribution centres in; Sweden, Denmark, Finland, France, the Netherlands, Portugal, Spain, Turkey and Norway of course.

Bakkafrost

Bakkafrost is the premiere salmon producer in the Faroe Islands. The company was listed on the Oslo Børs in 2010. And is now one of the biggest salmon farming companies on the stock market, valued at 36 128 120 000 Nokr at the time of writing. Bakkafrost produces a range of salmon products from; whole salmon, frozen salmon portions, salmon heads, backbones, belly flaps, and salmon skin. It is also involved in breeding, processing, sales and distribution of its products.

There are a few other salmon farming companies on the Faroe Islands, but they are too small to be a good for comparatives with Bakkafrost. It makes more sense comparing it to the other big salmon farming companies listed on the Oslo Børs stock exchange like: Mowi, Lerøy Seafood and SalMar. They have all pretty much integrated all the value adding processes and produce their own fish food. As far as positioning Bakkafrost seems to have been satisfied with their position as the biggest salmon farmer in the Faroe Islands since they acquired Havsbrun in 2012 making them too big (owning 50% or more of the salmon licenses in the «country»). This forced them to sell down to 49%. They have seen good and steady growth ever since, but there is now very little room for Bakkafrost to expand into, the coastline is pretty much at capacity. This has probably prompted their recent move into Scotland. Bakkafrost has also had a special position after Russia invaded Crimea in 2014. In the aftermath of the invasion/annexation, Russia, in response to international sanctions and condemnation, instituted a ban on importing food from the US, the EU, Canada, Australia and Norway. Bakkafrost's location on the Faroe Islands gave them much less competition for the Russian market, something they capitalised on heavily. Bakkafrost plan going forward seems to be focused on continuing to buy their way into the Scottish market in order to increase its production output and securing and expanding their own integrated value chain.

4.3 Development licences

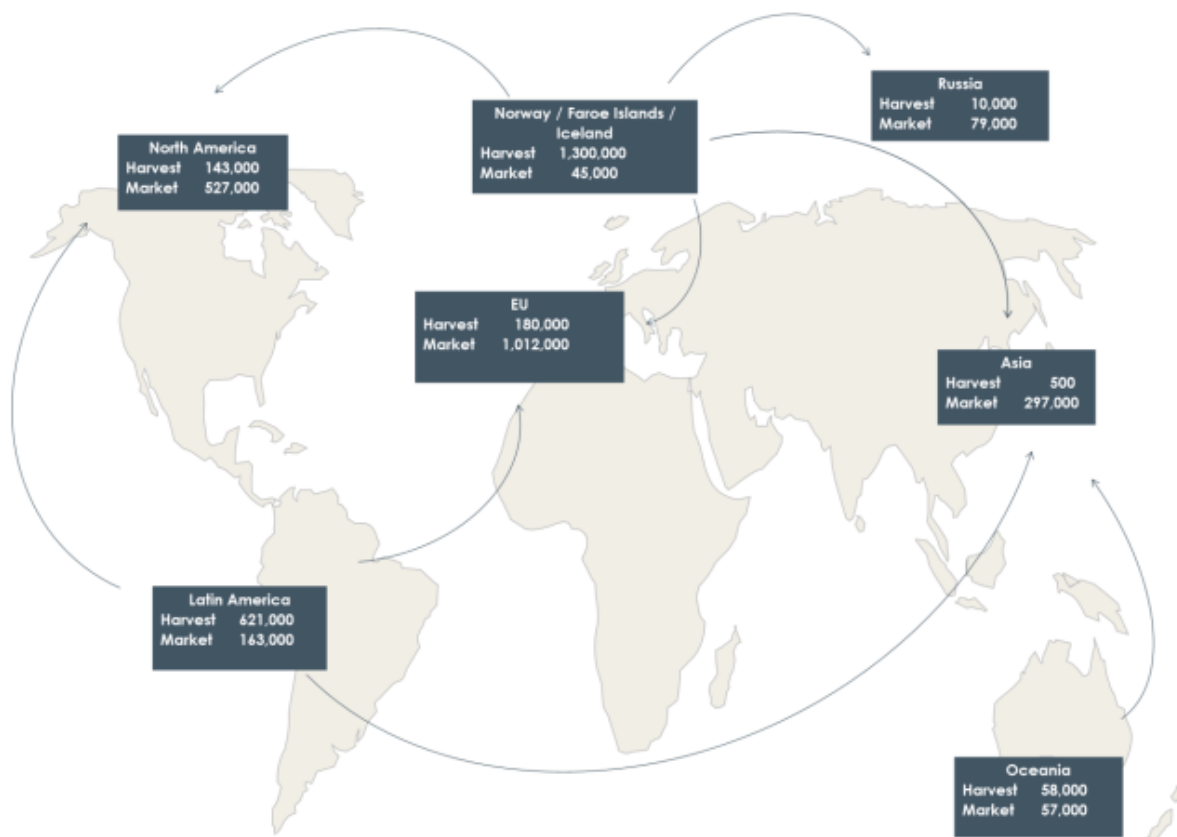
Development licences are a brand new state initiative by the Norwegian state to spur innovation and new growth in the salmon farming industry. They are basically especial dispensations for salmon farming projects in addition to the ordinary commercial licenses. In order to win these licences the projects has to be cutting edge, and directly challenging the limiting factors holding the industry grow back in a way that if successful will benefit not only the firm who initiated and runs the project, but the industry as a whole. At the time of writing the Directorate of Fisheries (Data from: Fiskeridirektoratet Date 08.31.2020) has received 104 applications, resulting in; 82 declined, 20 approved and 2 pending further review.

5 Analyses and discussion

In section 5.1 I give a brief discussion of the global market for farmed salmon. Section 5.2 contains an analysis of market concentration of suppliers in the salmon market. In section 5.3 I discuss the firms' strategies, while in 5.4 I look on the positioning the firms do in order to obtain development licenses. Finally, in section 5.5 I discuss the industry long term development in the light of the lifecycle model.

5.1 The Global market

Figure 5.1 The Global Salmon Market



(Figure from: Mowi 2019 Annual report)

Figure 5.1 shows the size of the different market supplies and demands in the world. We can see there are some key market areas where there are big differences between the two. Mainly Norway and Faeroe Islands as the biggest supplier in the world, and the European Union as having the biggest supply deficit of any market in the world. This supply deficit is about to get much worse for the European Union when The United Kingdom leaves taking Scotland,

the biggest salmon producing country in the union with it, out. This means that if there were to be a national debate regarding renegotiation with the European Union allowing manufacturing or processing of the Norwegian salmon exported to the Union, this would be the time. Especially since Merckel's Germany, probably the most important political entity in the European Union, is in the process of abolishing the nation's nuclear power program in favour of gas and coal-power, for some kind of environmental reasons best known to themselves. This has left Germany, as many other European states, more than ever before relying on Norwegian gas, strengthening the Norwegian negotiation position. There is also the fact that the biggest importer of Norwegian salmon is Poland, not because they eat that much salmon but, because this is one of a few industrial hubs for processing Norwegian salmon. With the political split between the Poland and the rest of the Union, particularly since the last election in Poland, see Table 5.1 below. The fact that there is so many workplaces dependent on the continuous supply of salmon from Norway, the European Union probably has good reasons not to exacerbate dissenting opinions from the Poles, which might happen if that supply was threatened. There are many smaller coastal towns in Norway who would appreciate some more industrial jobs of the sort prohibited by the EU tariffs.

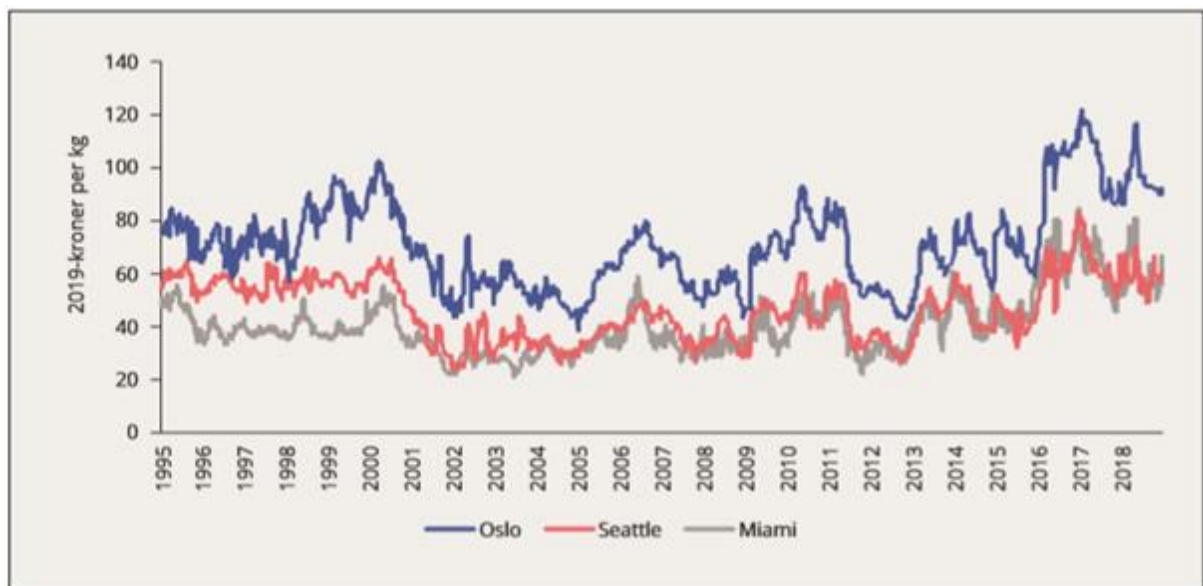
As general rule there is an incentive to transport the salmon as little as possible. Not only to limit transport costs but to avoid depreciation due to spoilage in transit. This means that the American market, mostly supplies itself, and the European markets are supplied from the continent, the Oceania region is pretty much self-sufficient, and the Asian markets are split between the major suppliers, with European/Norway supplying the bulk. But even though this is a general trend for the flow of salmon around the world with continents kind of separated, there is every reason to believe that the individual prices of salmon around the world are highly positively correlated. This is depicted below in Figure 5.2. And even though Norway is not the most important supplier in America the United States of America is still the fourth biggest national export market for Norwegian salmon (see Table 5.1 below).

Tabel 5.1 20 biggest markets for norwegian salmon 2019-2020

	January - December 2019 - Amount in tons and value in 1000 NOKR			Januar - mai 2020 - Amount in tons and value in 1000 NOKR	
Market	Amount	Value	Market	Amount	Value
TOTALT	1.280.315	72.378.379	TOTALT	479.196	29.198.966
EU27	942.736	50.751.590	EU27	352.783	20.459.777
Polen	179.783	9.203.900	Polen	70.243	3.753.437
Frankrike	116.266	6.443.418	Frankrike	43.507	2.659.369
Danmark	113.961	5.794.927	Danmark	41.878	2.290.637
U S A	67.923	5.078.611	U S A	27.959	2.279.066
Spania	81.936	4.519.031	Spania	32.429	1.947.289
Nederland	76.086	4.163.203	Nederland	30.227	1.813.530
Storbritannia	72.602	3.980.089	Storbritannia	29.803	1.770.371
Italia	68.832	3.834.238	Italia	20.351	1.245.723
Sverige	47.722	2.825.006	Tyskland	18.584	1.159.084
Japan	43.154	2.809.620	Japan	16.596	1.111.052
Tyskland	49.199	2.795.584	Sverige	17.556	1.061.939
Litauen	46.524	2.400.521	Sør-Korea	13.751	948.35
Sør-Korea	32.322	2.157.016	Litauen	14.751	843.974
Finland	32.461	1.635.111	Finland	11.951	641.753
Kina	26.154	1.598.653	Kina	10.533	638.431
Israel	21.798	1.264.792	Israel	8.457	532.894
Hong Kong	16.671	1.043.044	Hong Kong	6.428	423.209
Thailand	17.367	1.016.611	Taiwan	5.838	375.016
Belgia	14.054	857.159	Thailand	5.345	363.578

(Data from: Sjømatrådet Date 08.31.2020)

Figure 5.2 World salmon price covariance



(Figure from: NOU 2019)

Looking at the spot price index chart above there is a few things that seems obvious. Firstly, salmon prices in Oslo, Seattle and Miami are highly correlated. This is not unexpected if we assume salmon is a product sold on a global market. We see also that the prices within the United States not only match up better with each other, as they trade on more even terms, but are also lower. This is congruent with what we would expect based on the trade theory introduced in chapter 3 and the price data seen in chapter 4. We can also see that the price data set looks like a random walk with price-peaks in the exact years discussed in chapter 4.1. This is expected as the demand overall is increasing (see Tabel 4.1 & Figure 4.9), and supply growth is effectively capped at present levels and is expected to fall in years to come.

Another major development potentially impacting Norway's position as a salmon farming nation is the allegations and following investigations into alleged cartel collusion, anticompetitive practises, and price-fixing between the major Norwegian firms in the industry. There are now launched investigations into this first by the European Union in early February 2019 (see SeafoodSource 1, Date 31.08.2020) followed by the United States (see SeafoodSource 2, Date 31.08.2020) who followed suite by November the same year. This situation has also given rise to a bunch of class action lawsuits most notable the Canadian suit for half a billion Canadian dollars, (see CBC, Date 31.08.2020) filed in January 2020. Not to make light of a possibly serious allegations, but this is not the first time the industry was

under this type of scrutiny. After the crash in the early 2000-nds there where similar allegations, not of keeping prices too high, but rather price dumping. Those did not go anywhere. And looking at which firms are mentioned in the European commission's allegations there are some strange omissions. They are investigating and have raided the Scottish installations of, among others, SalMar and Lerøy Seafood, but not the company Scottish Sea Farms. Scottish Sea Farms is owned by SalMar and Lerøy Seafood and would be a natural target for this sort of investigation, if there was some collusion between the two owners. There are other suspicious oversights also, but in general the investigation targets Norwegian firms exclusively, and does not care about other large European firms even if they are owned and controlled by the suspected colluders.

We can see from the table 5.1 above, several Asiatic markets in the top 20, notably Japan, South-Korea, China and Hong Kong. These are the markets suppling the work to Norwegians as there are no prohibiting tariffs stopping trade of processed salmon-products to these countries. The Chinese market was just opened last year after all the political od trade restrictions China issued on Norway after the Nobel Peace-Price went to Liu Xiaobo in 2010. There has been much written about the Chinees salmon market in the years since the time it was closed in 2010. Of course the manner and reason for the market closing is going to attract attention. But some attention has somewhat inflated the relative importance of this market.

As we can see form Table 5.1 China is the 15 biggest national market. And as I have indicated earlier, as it is not limited by EU tariffs, with regards to the types of salmon products, how processed the salmon we export can be. I think it is of extra interest from a Norwegian perspective, as this industry gives jobs and other positive ripple effects for the Norwegian national economy. The Chinese market is in many ways very reminiscent of the situation of the Russian market. They are both two of the biggest countries in the world, by any standard, and they are both difficult countries to have stable and foreseeable trade relations with. Norway has exported significant amounts of salmon to both markets, at one time or another. They are both BRIC counties, which carries some expectations of a developing national economic welfare, making them increasingly attractive markets to sell to, in general. This is due to the effect from the Engel elasticity described in chapter 2. Even though China comes in as number 15, makes the Chinese market significant, we can clearly see that there are more

important Asian markets, like Japan and South-Korea, both of which have higher standard of living, probably making them less susceptible to cross-price elasticity issues that might come from steadily rising salmon prices (see Tabel 4.1 & Figure 4.9).

Just like the Chinese closed their markets in response to a preserved political slight, so did Russia, in response to the condemnation of their annexation/occupation of Crimea. I will just disregard the unsubstantiated Russian claims of finding dangerous chemicals in Norwegian salmon also sighted for not wishing to import Norwegian salmon. The fact of the matter is that if market access to Russia could be attained, this would probably be worth much more than the Chinese market. Looking at the historical data (see Figure 4.12). Russia was one of the biggest national markets, and with an impressive growth rate. But the biggest advantage of the Russian market would be having a big non-European Union market so close. This market could be supplied without airplanes, cutting logistic costs significantly. Access to Russia would also limit the Norwegian independence on the EU-markets.

5.2 Market concentration

As we saw in chapter 4.2 the concentration measurements for the Norwegian Salmon aquaculture market are $C4 = 49,22$, $C8 = 63,22$. For reference I have included Table 5.2 in order gauge whether the salmon farming industry is concentrated. Even these number are a little out of date, being from 1997, they are from mature industries.

Table 5.2 Concentration Ratios in Selected Manufacturing Industries

TABLE 8.3 1997 Concentration Ratios in Selected Manufacturing Industries			
Product Grouping	C4	C8	HHI*
Meat products	35	48	393
Breakfast cereal	83	94	2,446
Distilleries	60	77	1,076
Cigarettes	99	NR	NR
Men's and boy's suits and coats	42	56	846
Sawmills	15	20	87
Folding paperboard boxes	25	38	246
Book printing	32	45	364
Petroleum refining	29	49	422
Tires and inner tubes	68	86	1,518
Blast iron and steel mills	33	53	445
Household refrigerators and freezers	82	97	2,025
Motor vehicles and car bodies	87	94	NR
Computers	40	68	658

*Herfindahl-Hirschman Index for the 50 largest companies. NR indicates that the index is not reported.

Source: Census of Manufactures: Concentration Ratios in Manufacturing (2001, Table 2).

(Table from: Carlton & Perloff 2015 page 280)

The best analogue for the salmon farming industry in the table, might be the meat industry as it is also an industrial food producer with a relatively long production cycle. It is also an industry where marketing is not a major factor in competition between the market actors. As we see the salmon market is much more concentrated with, C4 49 > 35, and C8 63 > 48. And if we look at how the industry ranks overall, there are 6 industries out of the 14 listed that are more concentrated in both C4 and C8. From this I would extrapolate that the salmon farming industry is more concentrated than production industries in general. Another important thing to evaluate is what type industries ranked above the salmon farming industry, and the fact that they are all much older industries. So looking at the expected progression from the industry lifecycle point of view, they have had a longer time for market to conglomerate, in the same way the salmon farming industry is continuing to do.

5.3 Firm strategies

A good way of starting to evaluate firm strategies is to look at industry through Porters' 5 forces. It summarises the most important factors for strategies employed by market actors in the industry.

Power of buyers:

Salmon is an inherently homogenous product, and differentiation is quite difficult. There is really no way of differentiation in the salmon market. The only real example I could find in my research was from Bakkafrost. Bakkafrost has focused on delivering salmon of 6-7+ kg. Farming the salmon to this size, which is around 1-2 kilos heavier than the industry average. This practice might explain how they achieved a price, above average spot price ever since 2010. This price premium indicates that they have managed to create some differentiation and additional value in their product. Bigger salmon is also harder produce. There is added risk in letting the fish continue growing for the added time necessary, and the production yield per unit food is reduced as the fish gets bigger. There is no real hindrance for a customer in changing suppliers, so buyers do have some potential negotiation power.

Power of suppliers:

The biggest expense for salmon farming-firms is often the feed for the salmon. So for firms who do not make their own, they can be at the mercy of suppliers and the changing market prices for the fish-feed they need. There has also been an ongoing problem producing sufficient quantities of fish feed for many years. I have not discussed this aspect of the industry, as it is kind of a sideshow to the main parts of the industry I discuss in this thesis. The important aspect of the feed industry is, as an example of how firms have vertically integrated this key input factor. Even though the importance of having a secured personal supply of fish-feed has been downplayed after the introduction of plant-based protein from for example soy, most major firms have integrated this into their value chains. Bakkafrost, as an example been producing their own fish-feed now since they acquired Havsbrúnhar in 2012. They do however buy roe on occasion, but there is a much larger international market for roe. There is however a trend among the major salmon farming firms, not to be reliant on outside suppliers for roe or other key inputs. The other way of gaining an advantage as a supplier, that is though having advantages position as a supplier is through international trade treaties. The

best example of this is Bakkafrost, as Faeroese supplier, they do have an inherent advantage in being able to supply the Russian market.

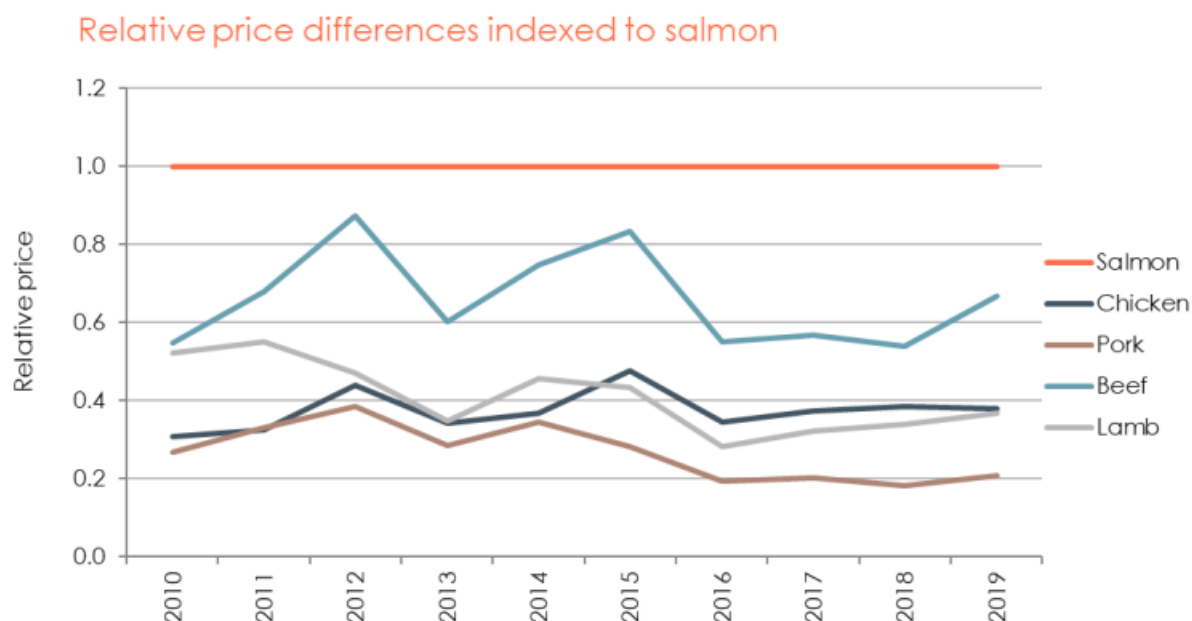
Threat of entries

If it is easy for new companies to establish themselves on the market, this is an obvious threat to the incumbents. However, when it comes to salmon-farming there are quite few suitable countries for production. The major salmon-farming countries Norway, Chile, Brittany, North America, New Zealand and Tasmania. This is because of the salmon is coldblooded and needs a very particular climate to flourish. In all the regions, the industry is active, the industry is strictly controlled though state laws and regulations. These state licenses are quite expensive (prohibitively so), one sanction in Norway on 2017 would cost 20-70 million NOK and there is no reason for those prices to have dropped. Not to mention the incentive of every incumbent firm to hinder new firms establishing themselves, and when factoring in fish-feed, production facilities and ships, needed to get started, it is safe to say that these big companies have no problem defending against new entries. It would be way to easy too keep new companies from entering the industry, this is exemplified by the lack of new entries.

Substitutes

There are of course other good edible proteins on the market. Salmon has always charged a premium compared to other popular choices like; chicken, beef, pork and even lamb. But prices are unpredictable, so nobody really knows. There is no direct substitute for salmon but it would be wrong not to think relative price changes plays a part in the purchasing process for consumers. Historical data illustrating some key price relationships is illustrated below in Figure 5.4.

Figure 5.3 Relative price differences indexed to salmon price



Source: Mowi (2019) Yearly report

Competition in the industry

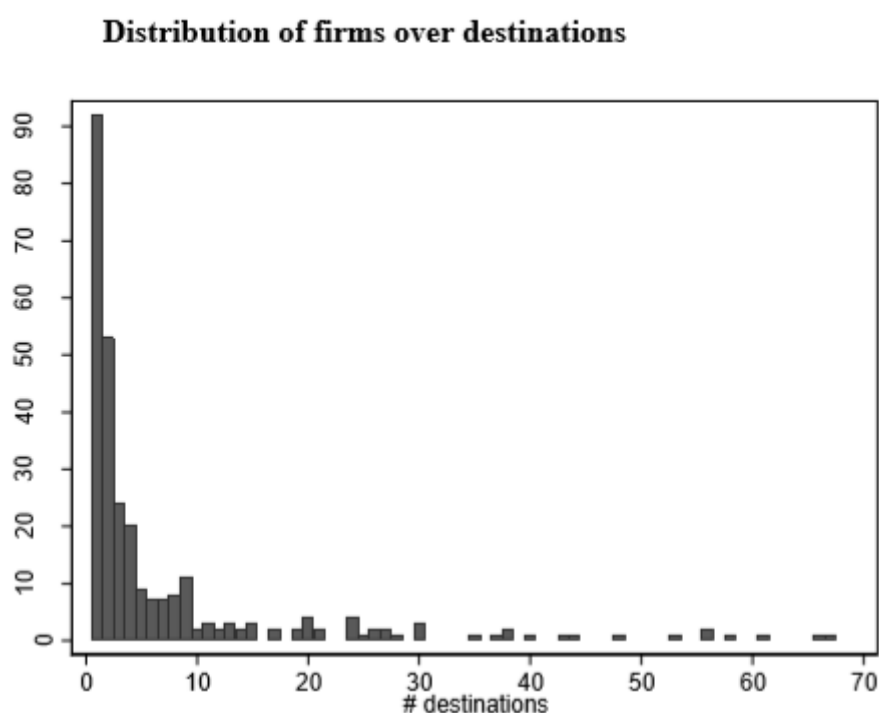
Competition in the industry mainly revolves around two main points. Securing and expanding the individual each firms value-chain. This involves securing key input factors, as not too rely on an unstable market, probably run at the mercy of competitors. And securing good facilities for processing and sales of salmon products worldwide. The main thing driving interaction between the competitors is legislations limiting production and the limited amount of key input factors, namely fish feed.

The large costs and demanding learning curve of establishing worldwide salmon processing factories and sales offices combined with the limited numbers of licenses for salmon aquaculture industry makes buying up smaller competitors the dominating strategy in the industry. This leads to ever fewer companies supplying a growing worldwide demand for salmon. As I discussed in chapter 2.6 and illustrated in Figure 2.1, the market incentives line up with the market trajectory, from somewhere in the light green area and towards the “bottom right red square”.

As I discussed, these market forms often do not have as much direct price competition and have higher than average returns. There are good reasons to believe that the salmon farming market operates similar to a Cournot model. But with the caveat that the overall market quantity is an external known variable for every market actor, as it the total aloud production from every salmon farming nation summed. And that the manner in which every company sets its production quantity, is a combination between buying licenses as they are up for sale, and buying each other in order to gain those licenses. We also know that the price of salmon in the market is largely explained by the volume or quantity of salmon in the market see Figure 4.9 for the regression and the above Table 4.1 where it is discussed.

There is also no direct incentive for multiple companies to sell and compete on price in individual foreign distant markets. As it makes much more sense to sell to a national market not yet exploited heavily by competitors. This is supported by Asche, et.al. (2019) and is depicted in Figure 5.3 below.

Figure 5.4 Distribution of firms over destinations



(Figure: Asche, et.al. 2019)

If there is another model that might explain how the market for salmon works it would be the leader follower model. With MOWI as the leader, or if the allegations by the European Union (discussed in section 5.1) has merit a cabal of Norwegian salmon companies colluding, acting together as an industry leader, leaving the rest of the world to be the competitive fringe. There is undoubtedly an incentive to work together in such a way, however I don't really see the credible threat needed to keep the individual firms from cheating. It is probably impossible to go into a protracted price war when the production quantity of salmon is set by 3rd parties. The first actor to lower prices would just sell out and miss out on profits. (See figure 2.2. for an example of cartel behaviour)

5.4 Development licenses

Table 5.3 Development Licenses

Nr .	Søker	Vedtaksdato	Avgrensning	Konsept	Område
1	Ocean Farming AS (SalMar)	26.02.2016	8 tillatelser (6240 tonn)	"Havmerd" basert på offshoreteknologi	Sør-Trøndelag
5	Marine Harvest Norway AS	01.03.2018	6 tillatelser (3120 tonn)	"Egget" - lukket merdteknologi	Hordaland/Sogn og Fjordane
9	Mariculture AS	22.02.2019	8 tillatelser (6240 tonn)	"Smart Fishfarm" - helhetlig løsning for åpent hav	Ikke oppgitt
11	Mowi Norway AS	05.04.2019	2 tillatelser (1100 tonn)	"Marine Donut" heldekkende, lukkede enheter	Nordland
17	Lerøy Seafood Group AS	25.02.2020	2 tillatelser (1350 tonn)	"Pipefarm" lukket flytende lengdestrømsanlegg	Hordaland/Trøndelag/Troms

(Data from: Fiskeridirektoratet Date 08.31.2020)

Above are the approved development licenses I could find for the companies I studied. Projects approved through development licenses are of three main types. Open ocean farming, land based farming or closed system farming.

SalMar has already started up its first open ocean farm Ocean Farming 1 and seems to be satisfied with its first production run. So much so, in fact that they have already ordered up their next open ocean farm “Smart Fishfarm”.

Lerøy Seafood is not jumping in with both feet just, but has gotten approval for a closed system project called “pipefarm”. But it has not been built yet.

Mowi seems to be very underrepresented, when taking into account their size. They have two approved small closed system projects, but they do not look very serious about actually doing them. They were probably more excited about the giant project submitted under the name Aqua Storm (the biggest proposal ever sent for approval under a development licence). But this project was rejected outright, as it was essentially a standard salmon farm with more automated systems.

81	Mowi AS	30.04.2019	36 tillatelser (28 080 tonn)	"Aqua Storm" offshore subsea production	Trøndelag
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(Data from: Fiskeridirektoratet Date 08.31.2020)

It is too soon to know what the impact of these project and the technologies will bring to the industry. But exiting thing are happening. And there is hope of growing substantially if this development license scheme bears fruit.

5.5 Industry lifecycle

There is really no realistic way of increasing the output to match the ambition of the major suppliers, production or the market demand for salmon. At least not through conventional licences in the fjords, under the current regulations. What capacity any one coastal-area or fjord has without adverse effects on the natural ecology is an evolving field of research. (Bergland et. al, 2020). The obvious facts are that salmon-farming like any other industry can get overcentralised, polluting the environment adversely impacting the local environment. There are many factors at play in determining the maximal sustainable productivity of any, one area. This prompted a policy based on the precautional principle, limiting the growth of the industry. This is exemplified by lack of the relative lack of increase in salmon-licenses and therefore production slowed significantly around 2010 (Table 4.1). As we know the limited increase in production quantity did not stunt growth the overall industry (Figure 4.5). I do however believe this growth can be largely contributed to demand-side factors driving up demand, and supply was not keeping up with the growth-rate, this resulted in higher prices (See Table 4.1).

After the explosive growth of the salmon market started to slow-down markedly around 2010, this trend has only intensified. Annual growth was at 8% annually since the mid-90's but has dropped to 7% in the last decade. (MOWI 2019) Expectations are that this decline is just the beginning and projections are at a 3% annual growth to 2023. This is due to biological limits of salmon farming and increased regulations in order to limit the biological footprint of the industry.

This stark slowing in the growth rates of the industry is typical for an industry in the shake-out or maturity stages of the industry lifecycle. These stages are also typified by market consolidation. I think the main reason the salmon market has centralised so quickly is the fact that the industry demand was never truly satisfied, in a way that pushed prices significantly down towards marginal cost. The global demand for salmon is just too great. This greatly incentivises production expansion, normally there would come a point where marginal willingness to pay decreases, but in the case of salmon, it seems that the industry hit other restrictions before this effect became very evident. As the industry started to hit the restrictions to expand production by just building more farms, and even before this, it became

evident to all involved that the only way to keep growing as an individual firm was buying out the competition.

This has resulting in the industry, if looked at like it is presented in Figure 4.5, with production quantity and value both resembling the classing industry lifecycle in Figure 2.3. Only the quantity peaking first, and in response to production quantity growth rates slowing as we saw in Table 4.1 the prices go up. Profits increase, and this makes it even easier for bigger firms to buy up the competition.

The big question is what the potential of the new technologies being tested/developed though the new development licenses will do to the industry. There is the possibility of the industry hitting a new growth phase if these new methods poove reliable, eco-friendly, and profitable. What is not a given however is that these new methods will lour new entries to the market, even if they are viable. The incumbent giants of the industry will have such a marked head start.

6 Conclusion

Since the 1960s until for some years ago, the demand for farmed salmon was growing, partly as a consequence of spreading salmon to new countries and partly as a consequence of an increase in average income as salmon is characterized as a luxury good. This means that there has been and still is a strong incentive for increasing production, either by new firms and production locations and new countries entering the market, or that existing firms increase their production capacity by taking up new locations. However, the restrictions following from increasing regulations regulating the industry and the instituting of production licenses from authorities due to environmental concerns, the limitation in the supply of suitable salmon feed and tariffs and other trade barriers, sometimes complemented by closure of trade due to conflicts between an export country and an import country, has impeded production growth. These factors have all to some degree shaped and limited the growth of the salmon supply, resulting in insufficient growth to keep track with demand increases in the latest years. Hence, we have seen an increase in the prices of salmon worldwide, at least since 2014, although the prices are volatile due to seasonal fluctuations in demand.

At the same time, a growth strategy for the existing firms will be to take control of other smaller operating firms. Again, this means that the number of operating firms decreases over time, and the average firm size increases. In addition, to the mergers and acquisitions going on, the regulatory tool development licenses has been introduced, in order to stimulate new and more environmental friendly production technologies into the industry. The competition to obtain development licenses seems further to stimulate strong and big sized firms, as the research and development costs connected to new and more efficient and environmentally friendly production technology might be enormous, and bring uncertainty into the firm. For instance, a firm winning a development license does not know the exact costs of developing the new production technology, it will be unknown what is the operating costs when implementing the new technology, it is unclear when the new technology can be introduced, and finally, the firm which has financed the research and development of this technology might see that a competitor gains the knowledge and equipment afterwards, having no extra research and development costs. Hence, becoming a large and dominant firm becomes even more advantageous as a consequence of economies of scale when new production technology is on the agenda.

Related to my research question a), this study indicates that the global salmon market can be divided into 3 continent markets; the European market, the Asian market and the American market, and that the supply to the American market is mainly from American locations, while the Asian and European markets are served by European producers. The position of Norway as a salmon producing market is strong, being the biggest supplier in the world. The two biggest problems with the position is lack of access the potentially very strategically important and valuable Russian market, and a trade-deal with the EU prohibiting processing of Norwegian salmon pre-export.

My research question b) was related to the firms' actual strategies in the farmed salmon market. Here we have seen that even though there seems to be a growth in the demand for farmed salmon worldwide, the salmon farming industry's possible increase in supply is limited due to national regulations, trade barriers and lack of salmon feed, implying that each operating firm is looking for other growth strategies. The competition going on in the industry seems like a Cournot oligopoly resulting in relatively high profit margins. For instance, mergers and acquisitions is seen to be the dominating strategy in the market, as the strongest firms try to seize market shares and better their market positions. Another example of how this limited numbers of operating firms compete, is found by studying their positioning regarding obtaining possible development licenses which seems to be one of few ways to increase production in the future.

As I already has commented on in the introduction, the salmon aquaculture industry is affected by many factors and events, for instance trade policies, trade unions and treaties, environmental issues and policies, supply of necessary inputs (salmon feed), production technologies, ecological and biological conditions, and general and industry specific public regulations (taxes and licences). All such factors affect the actual competition going on, but the different factors actual influence on competition need to be further elaborated in studies to come. Such future studies, based on either primary or secondary data concerning the salmon farming industry, might widen and nuance our understanding of the national position of Norway as a aquaculture country, the industrial structure of the industry and the strategies the firms follow.

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