Faculty of Bioscience, Fisheries, and Economics

Resource tax, Quality of Fishing Rights, and Economic Performance

A comparative study of the fishing sectors in Iceland and Norway

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Abstract

Property rights and economic performance have been highly linked concepts, where the former influence the latter. In this thesis, we seek to explore property rights as fishing rights in two large fishing nations, Norway and Iceland, and the economic performance of the fishing sectors. However, there is a fundamental difference between the fishing sector in Iceland and Norway. In Iceland, the government has implemented a resource tax on the fishing sector, while in Norway, there is no such similar resource taxation. As a matter of fact, Norway can be claimed to be an outlier by not introducing a resource tax, as opposed to three other countries located in the North-Atlantic; Greenland, the Faroe Islands, and Iceland. In these three countries, the use of resource tax has increased in the second decade of the century. Resource tax in Iceland has been formed as a mitigation tool or an answer to criticism from the public generated from increased profitability in the fishing sector. Increased profitability has been highly linked to a liberal uniform Individual transferrable quota (ITQ) system in Iceland. The ITQ system in Iceland reflects a fishing right that entails few restrictions and limitations on the operators. The objective of this thesis is twofold. Firstly, we will explore and compare the quality of fishing rights and economic performance in the two fishing nations, Iceland, and Norway. Secondly, we seek to determine whether the different resource taxation levels in Iceland and Norway can be explained by differences in the quality of fishing rights and economic performance.

Key words: property rights, fisheries, exclusivity, duration, transferability, security, flexibility, economic performance, resource tax.

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Introduction

Institutional economics has explored the notions of property rights and the linkages between economic performance and property rights (see, e.g., North (1991) and Eggertsson (1990)) both from a broad aggregate societal level to an individual level. Scholars such as Allen (2011), Libecap (1999), Eggertsson (1990), and Barzel (1997) outline that restrictions on property rights, if not trivial, can lead to lower economic performance of owners. As Libecap (ibid) and Eggertsson (ibid) refer to them, attenuations on property rights are when the state implements regulations restricting owners in their operations. Allen (2011) focused on property rights as the ability to make choices. Limitations on choices and options, or as he explains, on the owners' manner of use and behavior towards the asset, can lower economic performance. He emphasizes property rights as a multidimensional concept; property rights are not an all-or-nothing affair. The strength of property rights rests on the ability to make choices; more choices means higher strength and vice versa. Although, the multidimensional concept of property rights can be simplified into three fundamental rights: the right to use an asset, a right to sell an asset, and a right to receive an asset's monetary gain, according to Eggertsson (1990) and Libecap (1999).

Scott (1988, 2000, 2008) is another scholar that has explored property rights concerning natural resources, among those resources, fish resources. Scott (ibid) mirrors Allen (2011) in such a way that property rights are a multidimensional concept. Scott (1988, 2000, 2008) provided a valuable framework to explore property rights from six main dimensions or characteristics; exclusivity, security, duration, security, transferability, divisibility, and flexibility. The characteristics are quantifiable and dynamic:

"…we can say that the differences between the rights is in the amounts of each characteristic that comprise them" (Scott 2000 p. 5)

The quantifiable aspect of the characteristics is the strength of each characteristic.

The strength of characteristics can all be influenced by legislators via regulations, both positively and negatively. The exclusivity is how exclusive the asset is; does the operator have to compete with others for the catch. Duration refers to the time span of the property rights. Security, how secure is the operator of holding on to their fishing rights. Transferability explores the ability to transfer the property right. Flexibility explores the extent of the owner is limited in how the owner conducts the operations. Divisibility explores the ability of the owner to fraction the asset.

Arnason (2000) followed Scott's characteristics and refers to them as the quality of property rights. He developed a so-called Q-measure, an aggregated average numerical measure to assess the quality of fishing rights through the characteristics. Each characteristic is given a numerical value in the range of 0-1, and the Q-measure depends on the average strength of all the characteristics. If the Q-measure is one, then the quality of the property rights is perfect or complete. The average sum of the characteristics defines the numerical Q-measures. For instance, regulations that limit the operators to transfer the fishing rights reduce the strength of the characteristic transferability; thus, transferability will become less than one. Concerning economic performance, he outlines a close association with property rights: *"Given the close relationship between economic efficiency and property rights, it may be assumed that any deviation from a perfect property right results in a corresponding economic loss"* (Arnason 2000 p. 28). Scott provided a framework to analyze in detail in a systematic manner property rights for natural resources through his characteristics, while Arnason (2000) followed him and created an average aggregate measure to assess the overall quality of fishing rights.

Hannesson (2004) listed three types of property rights in fisheries, one of them, and the focus of this thesis, entails *the "right to catch a certain quantity of fish."* This type of fishing rights is applied in two fishing nations located in the North-Atlantic studied here, namely Iceland and Norway. In the thesis, we seek to explore property rights as fishing rights in Iceland and Norway. We will examine the fishing rights through Scott's (1988, 2000, 2008) characteristic by assessing the overall quality of the fishing rights by Arnason (2000, 2005) approach. In addition, we analyze the

economic performance of the fishing sectors in Iceland and Norway to see if the level of quality of fishing rights or the Q-measure can influence the economic outcome of the fishing sectors. Hence, if the quality of the fishing rights is high or low, will it result in the sectors' high or low economic performance?

1.1 Background

Iceland and Norway are two of the largest fishing nations in terms of catch volume in Europe. On average, over the last four-year period (2017-2020), Norway had 2.6 million tons in a total catch, while Iceland had approximately 1.1 million tons on average for the same period. Iceland and Norway target similar species such as cod, haddock, saithe, mackerel, but cod is the single and most valuable species in relation to firsthand value for both countries (Fiskeridirektoratet 2021a; Statistics Iceland 2021a). Both nations have embedded many similarities in their fisheries management system, such as total allowable catch (TAC) to control the fishing pressure. In the form of allocating a share of the TAC or quotas to vessels and private operators (Ministry of Fisheries and Coastal Affairs n.d.; Ministry of Industries and Innovation 2021). The TAC represents the total amount that can be harvested from specific species within a predefined period, such as a year or a fishing year as in Iceland. At the same time, the catch quotas represent the volume that a vessel or an operator can harvest from the TAC within the same period predefined period. Catch quotas are the volume, while the catch quota share is the fraction of the TAC. (Cochrane 2002). So-called Individual transferable quotas (ITQs) are allocated to private operators in Iceland, a type of quota share that can be transacted amongst private operators (OECD 2005b). ITQs in Iceland was first implemented in 1991 (Agnarsson 2000). There are currently two types of ITQ groups in Iceland; The Fisheries act (2006) outlines two types of general licenses; one includes restrictions on gear and vessel size, while the other one represents the bulk of the operators is without such limitations[1]. Fisheries management in Norway is more complicated than in Iceland.

[1] §4

The system in Norway is segmented into multiple vessel groups dependent on vessel size, gear type, and species targeted. In general, the system can be split into the offshore fleet and the coastal fleet. The offshore system in Norway is built on similar attributes as Iceland. Each vessel has a quota factor for the demersal species and so-called base tons for pelagic species attached to a vessel or a quota share. The quota factor represents a bundle of species or a quota package. The difference regarding allocations of quotas is that in Iceland, the quota shares are on an individual species level, while the quota shares represent a bundle of species in Norway. Norway had some experience with the transferability of quota shares before implementing a so-called Structural quota scheme (SQS) in 2005. The SQS entails the right to transfer or combine quota factors within each vessel group. The seller of the quota factors is unauthorized to participate in the vessel group. A large share of the fleet operates under the SQS scheme, including all groups operating in the offshore fleet (Anon 2016). The Fisheries management system reflects in a general term the type of fishing rights applied in fisheries. Fishing rights in Iceland and Norway entail similar attributes as Hannesson's (2004) broad descriptions: a right to catch a certain amount within the limits of the catch quota and the ability to buy and sell quota shares and receive monetary gain. Hence, fishing rights in Norway and Iceland entail these three most fundamental rights, according to Libecap (1999) and Eggertsson (1990). Nevertheless, as Hanneson (2005) pointed out, fishing rights can be restricted in several ways, and the quality of fishing rights can vary, as Arnason (2000) outlines through the characteristics by Scott (1988, 2000, 2008). Consequently, the level of transferability, security, flexibility, exclusivity, divisibility, and fishing rights duration can vary.

Høst and Christiansen (2018) wrote a paper for the Nordic Council of Ministers. The paper outlined a broad overview of the fisheries management system in the Nordic countries. In the paper, the ITQ system in Iceland is described as the most liberal system among the Nordic countries. In contrast, Norwegian fisheries management is coined as a mixed hybrid system between market mechanisms and emphasizes social aspects such as rural development. The reasoning for market mechanisms in

fisheries management, according to the paper are: *"Market-based fisheries management as a term, therefore, covers a wide range of instruments that all have introduced some kind of transferability in order for market mechanisms to facilitate the distribution of quota and fishing rights*" (Høst and Christiansen 2018 p. 11). Arnason (2000, 2005) analyzed the quality of fishing rights in Iceland, Norway, and New Zealand through the four characteristics (exclusivity, duration, security, and transferability) with his Q-measures. The quality of fishing rights in Iceland and New Zealand were ranked high above 0.9, while for Norway, the fishing rights were ranked far lower, less than 0.5, on the range from 0-1.

1.2 Resource tax

Concerning economic performance, the Icelandic fisheries management system has a reputation for being a highly economically efficient system. As is described in one policy paper by the Organization for Economic Co-operation and Development (OECD): *"The Icelandic ITQ system is seen as a success in terms of economic efficiency..."* (OECD 2017b p.2). In addition, several scholars have directly associated high profitability and productivity in the Icelandic fishing industry to the ITQ system (see, e.g., Arnason 2005, Eggertsson 2003a, Gunnlaugsson and Agnarsson 2019, Gunnlaugsson, Kristofersson, and Agnarsson 2018)[2]. According to these scholars, there is a relationship between high-quality fishing rights and economic performance, supporting the general theory outlined at the start of the introduction. However, increased profitability has met criticism concerning private operators benefiting from something that is viewed as a common resource, the public property (see, e.g., Eggertsson 2003a, 2005; Gunnlaugsson, Kristófersson, and Agnarsson 2018, Høst and Christiansen 2018, and OECD 2017b). As is outlined in the first section of the Fisheries Act (2006) in Iceland, utilized fish stocks are a common property of the Icelandic nation, and the same is outlined in the second

[2]Nevertheless, as Gunnlaugsson and Agnarsson (2019) also point out, increased profitability came late after implementing the ITQ system, mainly due to low quotas and strong currency.

section of the Marine Resource Act (2008) of Norway. Hence, in Iceland and Norway, marine resources are considered the common property of the people of the two countries.

However, there is a fundamental difference between Iceland and Norway. In Iceland, the operators are exposed to a type of volume-based resource tax while there has not been implemented similar resource tax on the fishing sector in Norway. The volume-based resource tax, or a fishing fee as is referred to in the Fishing fee act (2018), was first implemented in 2004 (Gunnlaugsson, Kristofersson, and Agnarsson 2018). Both Eggertsson (2003) and Gunnlaugsson et al. (2018) explained the resource tax as some sort of remediation or answer to the criticism of the outcome of the ITQ system, i.e., increased profitability to private operators. As Eggertsson (2003a, p.13) explained after the introduction of a resource tax: *"In an attempt to appease the critics, the government plans new levies on the fisheries…"* Mirrored by Gunnlaugsson et al. (2018, p.149): *"The introduction of a fishing fee was to capture a share of resource rents from the fishing industry and redistribute it to the public has been a key step in increasing public acceptance of the system."* Resource rent is a term used concerning excess profit generated in the utilization of natural resources after accounting for normal returns on capital and labor (Flaaten 2016; OECD 2005). The objective of implementing the resource tax is outlined clearly in the first section of the Fishing Fee act (2018). *"A fishing fee is imposed in order to cover the state's costs of research, management, administrations, and supervision of fishing and fish processing and to ensure the nation as a whole a direct and visible share in the profitability of fishing for marine resources."* Consequently, there has been public pressure to capture some of the profitability generated from the fishing sector in Iceland, while in Norway, there has not been enough criticism or pressure for the state to impose such resource tax. Can there be a connection between property rights and economic performance on the one side and the other side at different resource taxation levels? Høst and Christiansen (2018) suggest such a connection, where they outlined that the more fisheries management system develops into a market-based system, the more interest develops for applying measures such a

resource tax. The paper specifically mentions three fishing nations in that context, Faroe Islands, Greenland, and Iceland, which have notably gone down a similar path as Iceland in relation to resource tax. The second decade of this century can be described as the decade of "resource taxations in fisheries" for the three fishing nations. Through their legislative power, the governments in those three countries have increased income by subjecting special measures in the form of volume-based tax to capture income from the fishing sectors, all things equal. Execution, implementation, methodology, and the level of profit capture varies between the countries, but these special measures all have in common a so-called volume tax, i.e., taxation dependent on the amount harvested. Greenland has a long history of fishing fees. Several species are subjected to a special fee per harvested kg; the highest fee is on the shrimp, the commercially most important species in Greenland. In addition, there is a special fee on non-processed fish (Intellecon and Ministry of Finance in Greenland 2017). The Faroe Islands began special measures to extract income from the fishing industry by auctioning part of the mackerel quota in 2011, and this was later developed into auctions of other species such as blue whiting and herring and for cod fisheries in the Barents Sea. A fishing fee was implemented in 2011 on mackerel, which was later extended to herring and blue whiting. In addition, there was a special income tax on the fishing and aquaculture sector for a few years (Ministry of Fisheries in Faroe Islands 2016). Iceland has a more comprehensive approach to the fishing fee than the other two nations, in the sense that almost all species are subjected to levies. As is outlined in The Fishing fee act (2018), all species subjected to quota restrictions have a specific fee attached to them[3]. There have been several changes and reforms on the special fishing fees in the last decade, which is thoroughly described in Gunnlaugsson et al. (2018). In 2021 there were 20 species subjected to a special fishing fee (Law Gazette 2021). Fisheries play an important role in the economies of the three countries wherein the period from 2010-2019 export of fish product accounted from 90% on average of total export

[3] §3

value in Greenland[4], 50-60%[5] in the Faroe Islands, and on average 41% of total exports in Iceland (Statistics Faroe Islands 2021a, Statistics Greenland 2021a, and Statistics Iceland 2021d). In this thesis, we will use a resource tax as a synonym for a fishing fee such as is in place in Iceland, Faroe Islands, and Greenland. In addition, include the auctions of the quota in Faroe Islands in order to simplify the term. Figure 1 outlines the level of total resource tax in Iceland, Faroe Islands, and Greenland in the second decade of this century.

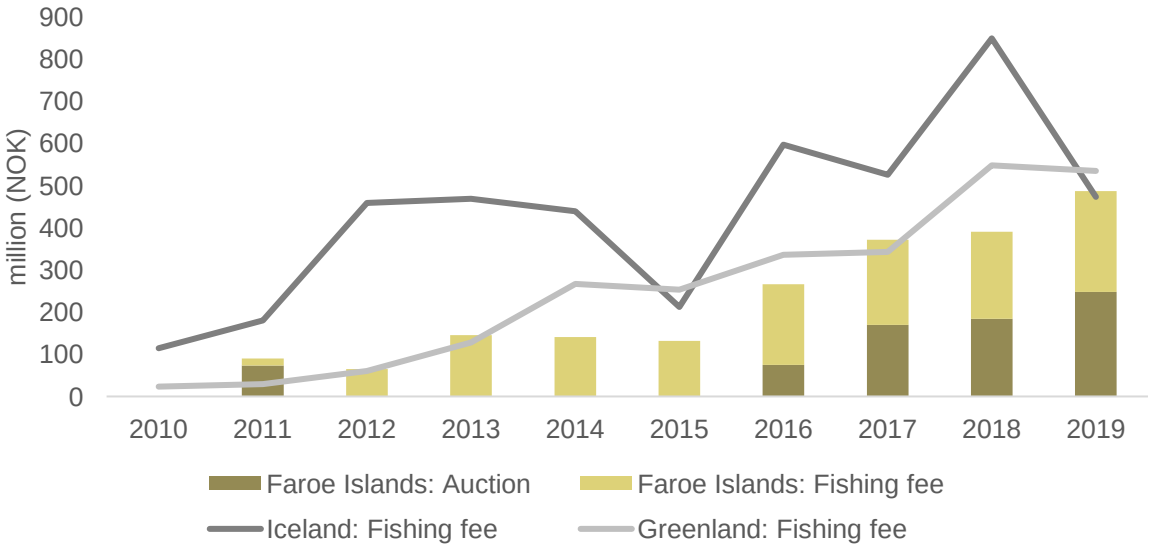

Figure 1 Resource tax in the Faroe Islands, Greenland, and Iceland 2010-2019 (Deloitte 2020, Fiskistofa 2021b, Ministry of Finance in Faroe Islands 2020, 2021, Ministry of Finance in Greenland 2021b, Ministry of Fisheries in Faroe Islands 2016, Statistics Greenland 2021b. and The National Budget of Faroe Islands 2020, 2021)

*Data is presented on current price based on average annual exchange rate extracted from the Central Bank of Iceland 2021a and Central Bank of Norway 2021

[4] Excluding products from whales, seals, and sharks.

[5] Excluding farmed salmon

Clear trends are illustrated, as the governments in the three countries have extensively increased their income from establishing a type of resource tax. As Figure 1 demonstrates, the level of resource tax income from the fishing sectors in the past three years of the time series has been between 200-240 million in the Faroe Islands, between 470-850 million in Iceland, and approximately 340-550 million in Greenland. Nevertheless, these revenues are not entirely comparable since the scale of the fisheries is quite different in the three countries. Iceland is a fishing nation with a total catch of approximately 1,2 million tons on average for the period; Faroe Islands' total catch in the period is around half a million tons on average. In comparison, Greenland is the smallest fishing nation in terms of catch volume and has only approximately a quarter of a million tons in total catch. To compare the extent of the resource tax in the countries, we have to divide the total resource tax presented in Figure 1 with the total catch for each year in the time series. Figure 2 demonstrates that the level of resource tax is highest in Greenland for the period if we account for the scale of the fisheries in the countries. For the past three years of the time series, resource tax per harvested kg. is between 1-2 kroner NOK per kg. in Greenland, in Iceland, 0.4-0.7 and 0.6-0.8 in Faroe Islands.

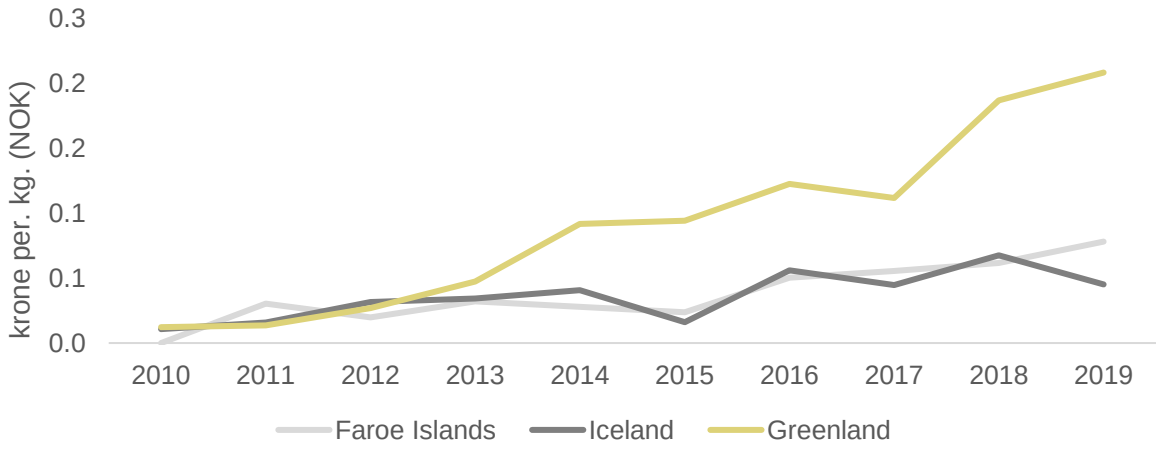

Figure 2 Resource tax per harvested kg in the Faroe Islands, Greenland, and Iceland from 2010-2019 (Ministry of Finance in Greenland 2021a, Statistics Faroe Islands 2021b, ans Statistics Iceland 2021a)

Strikingly, in this development towards an increasing trend in resource taxation, Norway has been an outlier compared to the other three fishing nations. What could

be the drivers behind this general growing trend in resources' taxes? Is it perhaps that operators under a market-oriented system expected to have higher profits become more frequently exposed to increased taxation? Or is the economic dependency of fisheries in the total economy a driver of this development? Unlike the other three countries, the export of fish products in Norway in 2019 constituted only 4% of the total export value (Norwegian Seafood Council 2021 and Statistics Norway 2021b). Hence, the Norwegian economy is less dependent on the fisheries sector than the other three nations.

Another interesting point mentioned in Gunnlaugsson et al. (2018) is that governments are more inclined to place resource taxes if the operators are foreign; thus, foreign operators are more likely to be subject to a resource tax. That could partially explain this development in Faroe Islands. In an official governmental paper from 2016, significant foreign investment in the fishing sector in Faroe Islands is addressed, and suggestions to decrease foreign investment (Ministry of Fisheries in Faroe Islands 2016). While in Greenland, the largest operator in the offshore fleets is a state-owned company, Royal Greenland (Long and Jones 2020). However, there is a limitation on foreign investments for the fishing sector in Iceland and Norway[6].

1.3 Cost recovery charges

Norway has not been entirely immune to this development. A cost recovery charge was implemented in 2014 to meet the cost of research and surveillance cost (The Norwegian Fishermen's Sales Organization 2021a). Cost recovery charges are, by OECD definitions, a payment from the fishing sector to the financial budget, and these types of levies are supposed to meet or partially meet the cost of management such as research, surveillance, infrastructure, and other costs generate by fisheries (OECD 2015). The fishing fee in Iceland is a mix of a resource tax as well as cost recovery charges, as is outlined in the objective of the Fishing Fee act (2018). New

[6] Act on fishing and processing of foreign vessels in Iceland's exclusive economic fishing zone §1, and Participation Act §5.

Zealand is another fishing nation that is often associated with the ITQs in Iceland. These two nations are often presented as the pioneers in the implementation of comprehensive ITQ systems (see, e.g., Eggertsson 2003b and Flaaten, Heen, and Matthíasson 2017). In addition, according to Arnason (2000, 2005), the operators in New Zealand enjoy a high quality of fishing rights, such as the operators in Iceland. New Zealand is a nation with a long history of cost-recovery charges, but these types of levies were first implemented in 1994 (Stokes, Gibbs, and Holland 2006). Another way to view the extent and the level of the resource taxes and cost recovery charges is to explore the Fisheries Support Estimate (FSE) database conducted and published by the OECD (OECD 2021a, 2021b). The FSE measures the extent of fisheries support from the state to the fisheries sector among the member states. Total fisheries support is the annual monetary value of *"gross transfers to fisheries from taxpayers"* (OECD 2021a). In addition to estimating the total support to the fishing sectors, the FSE also accounts for any cost recovery charges. These cost recovery charges can come in several forms of levies such as for resource access rights, infrastructure access, management, research, and enforcement charges, in addition to a resource tax (OECD 2017a). To sum up, the FSE for each country represents the positive or negative net revenues that taxpayers receive from the fishing sector. In the FSE database, there are three main variables with other subsets of variables that list more detailed support. I. Direct support to individuals and companies, II. Support for services to the sector III. Payment made by the fisheries sector. The net FSE is thus the sum of the variables I and II subtracted from variable III. In the FSE database, there is an estimated FSE for Iceland, Norway, and New Zealand. Figure 3 demonstrates the level of FSE in the period 2010-2018 for the three countries. In order to adjust for different scales of the fisheries, we divided the net FSE by the total catch for each year in the time series. The lower the FSE value, the higher the share of the support is financed through cost-recovery charges or resource taxes. Negative values mean that cost-recovery charges are higher than the support from the state. The data presented in Figure 3 demonstrates that the Icelandic fisheries sector does not receive any net support six out of nine years in the period presented. Thus, all services that the state provides in Iceland are financed

through resource taxes in these years. For the past three years, the net FSE has been -85 to -380 kroner per ton harvested in Iceland. On the contrary, the net FSE is positive for New Zealand and Norway, meaning that the fishing sectors are receivers over the state budget based on the premises found in FSE. The net FSE for Norway was positive from 630 to 800 NOK per ton. While for New Zealand 680 – 900 NOK per ton. Appendix 1 demonstrates in more detail the variables and subset of variables regarding each country. Nevertheless, the data from Figure 3 demonstrates that net FSE for Norway has decreased considerably since 2014, after the implementation of the cost recovery charges. After 2014 the net FSE per ton is at a similar level to that of New Zealand. Above all, Figure 3 demonstrates that the fishing sector in Iceland is a contributor to the financial budget while the sectors in Norway and New Zealand are receivers, based on the premises found in the FSE database.

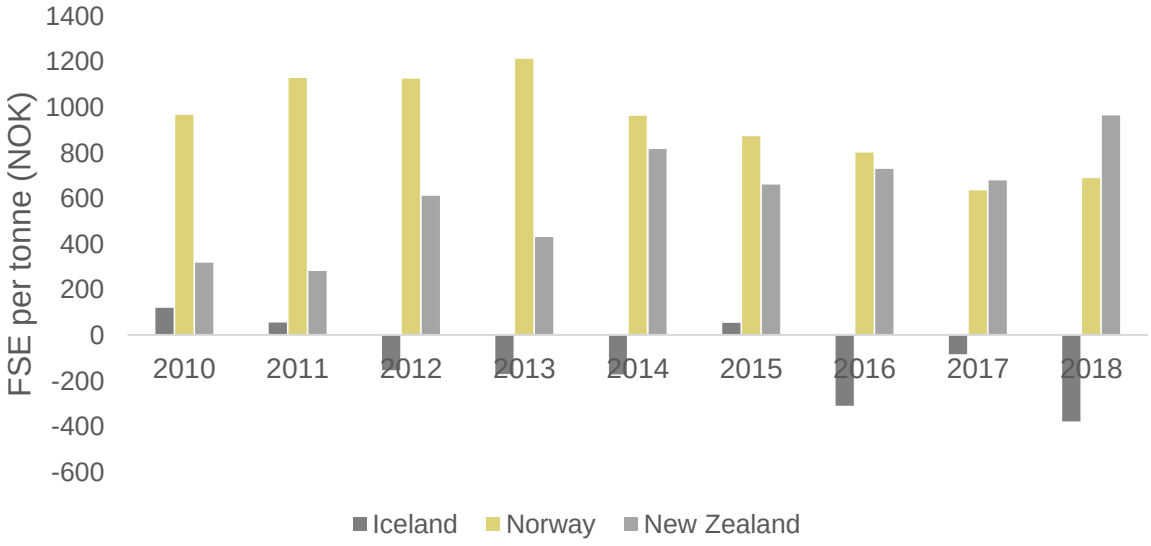

Figure 3 Fisheries Support Estimate (FSE) per harvested ton 2010-2018 for Iceland, New Zealand, and Norway (Fiskeridirektoratet 2021, OECD 2021c, 2021a, and Statistics Iceland 2021a)*

**Data is presented on current price based on the average exchange rate extracted from the Central Bank of Norway (2021)*

Unfortunately, the FSE database does not provide statistical data for Greenland and Faroe Islands, but we would expect that it would show a similar result as the FSE in Iceland, meaning negative support since the resource tax level is similar or even

higher in the case of Greenland than Iceland. This assumes that management costs in these countries are at a similar level.

1.4 Research questions

In this chapter, we have outlined two key points. Firstly, according to the theory on property rights, if attenuations on property rights are not trivial, it can affect the economic performance of the owners. Secondly, we have presented is that the level of resource tax is higher in Iceland than in Norway. We demonstrated that Norway had been an outlier compared to three other fishing nations in the North-Atlantic in implementing a resource tax. In addition, we have demonstrated that Eggertsson (2003a) and Gunnlaugsson et al. (2018) suggested that resource tax is an attempt to capture the sectors' profitability. The scholar suggests that the resource tax is a type of mitigation tool for the government in Iceland to increase public acceptance of the fisheries management system in Iceland. In light of that, we seek to explore the quality of fishing rights in Norway and Iceland and the economic performance and potentially find some explanation why Norway has not implemented resource tax through three research question:

1. **How is the quality of fishing rights in Iceland and Norway, and what is the key difference between the quality of fishing rights in the two fishing nations?**
2. **How is the level of the economic performance of the fishing sectors in Iceland and Norway?**
3. **Can the difference in the quality of fishing rights and economic performance potentially explain high resource taxation levels in Iceland compared to Norway?**

We have an underlying hypothesis that a "*Resource tax is a form of payment for high-quality fishing rights."* Could it be that there is some sort of trade-off for the operators in Iceland where they potentially enjoy a high quality of fishing rights, but these high quality come with a price from the state in the form of resource tax.

The objective of the first research question is to update Arnason (2000, 2005) findings. Hence, we will apply a similar approach as Arnason (2005) followed, mainly

using qualitative data. The primary data is legal sources from the two countries used to explore the level of restrictions through the quality of fishing rights by assessing the strength of characteristics as determined by Scott (1988, 2000, 2008). Key legal sources will be extracted from the legal database in Norway (lovdata.no) and the laws published on the parliamentary website of Iceland (althingi.is), and other secondary sources. We will evaluate each characteristic and assess the strength to determine the overall quality of the fishing rights. In the second research question, we want to explore the economic performance of the two sectors. The second research question explores and compares the economic performance of the fishing sector in Iceland and Norway. Thus, if the fishing rights have high quality, we expect high economic performance and vice versa. We will compare the economic performance between the two sectors. We will mainly use quantitative data and explore three profitability indicators: EBITDA (earnings before interest, taxes, depreciation, and amortization), EBIT (earnings before interest and taxes), and EBT (earnings before taxes). The three profitability indicators are found in the income sheets of the fishing sectors in Iceland and Norway from public data sources to assess the economic performance. Data from the national statistical bureau of Iceland, Statistics Iceland, and the Directorate of Fisheries in Norway published annually will be used. Several scholars have explored resource rent in Iceland and Norway (see, e.g., Flaaten, Heen, and Matthíasson 2017, Greaker, Grimsrud, and Lindholt 2016, and Gunnlaugsson and Agnarsson 2019). However, it is beyond the scope of this paper to explore potential resource rent for the two sectors; thus, we will only rely on official statistics in evaluating the economic performance of the two fishing sectors. In addition to the three profitability indicators, we will explore and discuss quota price in the two countries.

In this thesis, there are three key concepts a) quality of fishing rights, b) economic performance, and c) resource tax. With the first two research questions, we seek to explore a) and b), but with our third research question, we seek to investigate if a) and b) can potentially collectively explain c). Therefore, the argument is that high-quality fishing rights ensure high profitability, which can potentially be tax. Do the

operators in Iceland have to accept increased taxation in exchange for a higher quality of fishing rights? In comparison, the operators in Norway must accept a potentially lower quality of fishing rights and lower economic performance but are "free" from the responsibility of paying a resource tax? If the fishing rights have a low quality that could lead to low economic performance, then the state has less justification for implementing such resource tax as might be the case for the sector in Norway. The objective of the thesis is twofold. Firstly, to explore and compare the quality of fishing rights and economic performance in Norway and Iceland. Secondly, to determine whether the different resource taxation levels in Iceland and Norway can be explained by differences in the quality of fishing rights and economic performance. As our third research question and our underlying hypothesis suggest, we believe that the difference in the quality of fishing rights and economic performance might explain why Iceland has such a high level of resource tax compared to Norway, yet we must confirm those results via our research questions.

However, another angle to this has also been suggested: there are other drivers behind resource tax in fisheries, hereunder economic dependency of fisheries in the total economy, and the nature of the operators being foreign or state-owned companies give government more incentives to establish resource tax.

1.5 Structure of the thesis

The first two chapters are devoted to methodology.

Chapter 2 explores the theoretical framework of this thesis, the notions of property rights. We will explain the theory behind property rights and economic performance in detail, hence, how we derive our arguments that property rights and economic performance are closely related concepts—characteristics of property rights and the Q-measure that will be explained. The notion of property rights will first be addressed from a general perspective, then further narrow the focus to property rights for fish resources.

Chapter 3 explains the general methodology that is applied in this thesis. We will describe our approach, data, and concept to address the quality of the fishing rights and economic performance in Iceland and Norway.

In chapters four and five, we start our analytical process.

Chapter 4 the quality of fishing rights in Iceland and Norway will be investigated. Each characteristic will be evaluated and assessed in order to determine the overall quality of fishing rights and disclose our Q-measure.

Chapter 5 investigates the economic performance of the fishing sector in Norway and Iceland from two aspects. First, profitability indicators and then quota price in the two countries.

Chapter 6 discusses key findings from our research, potential future research, and limitations to our approach.

Chapter 7 provides concluding remarks**.**

2 Theoretical framework

The following chapter will address the theoretical notion of property rights and discuss the connection with economic performance. In the first section, we will explore the notion of property rights in general, and the second section addresses property rights in connection to natural resources were the characteristics by Scott (1988, 2000, 2008) and Arnason (2000, 2005) Q-measure.

2.1 Introduction to property rights

This section provides an example of definitions of property rights given by several scholars from the institutional economic perspective. The scholars have a similar understanding and definition of the concept but with minor variations on what they stress in their notion of property rights. Eggertsson (1990, p.33) refers to *"the rights of individuals to use resources*[7] *as property rights."* He narrows his definition into what he refers to as both private property rights and exclusive rights: *"Exclusive property rights enable specific individuals to use a scarce resource and exclude others from using them"* (Eggertsson 2003b, p.81). In the following, we will focus on the latter definitions by Eggertsson (2003b). The word "use" can be viewed as an umbrella term for numerous activities, but Eggertson (1990) explains property rights generally distinguished within three categories; the right to use an asset as a type of user rights, the right to earn income from the asset, and the right to sell permanently the ownership of the right over the asset. Libecap (1999 p.5) uses the three rights similarly to Eggertsson (1990) and describes general elements that an ownership of an asset must consist of: 1) *"The right to use the assets,"* 2) *"The right to appropriate the returns from the assets"* and 3) *"The right to change its form, substance and location."* According to Libecap (1999), if one or more of these three elements are missing, there is no established ownership of an asset. As Libecap (2010) claimed, the last element is what he views as the essential component of what constitutes ownership. The owner has the right to transfer all or part of his asset to others at a

[7] In the following thesis the word resource, property and asset are used interchangeable.

mutually agreed-upon price. Scott (2000, 2008) mirrors Eggertson (1990) and Libecap (1999). However, instead of using "a right" as the word that resembles the actions in relation to an asset, he uses the word "power." According to Scott (2000, p.4), "ownership powers" can be viewed as corresponding to Libecap's (1999) three components of ownership; 1) *"power to use the thing (or manage it),"* 2) *"power to dispose of it (to sell it or grant it)* and 3) *"power to take its yield. "*As explained by Scott (2008), according to legal economic analyst's "standard" property right is complete when it gives it holders healthy "doses" of all of these three powers.

The economists Yoram Barzel (1997) and Douglas Allen (2011) divided property rights into economic property rights and legal property rights. Barzel (1997) and Allen (2011) demonstrate the difference between economic and legal property rights to clarify the different usage of the terms. Barzel (1997) is mainly concerned with economic rights as, according to him, they are more complex to observe than legal rights.

Barzel (1997, p.1) defines economic property rights to be.

… rights an individual has over a commodity (or an asset) to be the individual's ability, in expected terms, to consume the commodity (or the services of the asset) directly or to consume it indirectly through exchange."

while he describes legal rights as:

"the rights recognized and enforced, in part, by the state. These rights enhance economic rights, but the former are neither necessary nor sufficient for the existence of the latter"

As Barzel (2001) specifies that "economic property rights" are forward-looking, as he emphasizes in his definitions, "in expected terms." As for legal rights, they complement economic rights but are not necessary for the existence of an economic right. *"Economic rights are the end, that is, what people ultimately seek, whereas legal rights are means to achieve the end"* (Barzel 1997 p.1). Economic rights can be

without legal rights but not the other way around; there is no use for legal rights if there are no economic rights. Legal rights are a condition of economic rights but not a necessary condition. Bromley (1992) had similar definitions as Barzel (1997) of property rights, where property entails a benefit or income stream and property right is when the ones who hold the right have a claim to the benefit stream. Higher bodies, such as the state or a village council, are willing to protect property rights by assigning duties to others who may desire or interfere in the benefit stream. Thus, all others that do not hold the right have a responsibility, i.e., a duty to respect the right.

2.1.1 Dimension of property rights

Allen (2011) has a broader definition than Barzel (1997) of property rights and emphasizes the concept of choices, as well as adding a third type of rights, a natural right:

1) Legal property rights: "*the right under the law to freely exercise a choice"*
2) Economic property rights: *"are one's ability to freely exercise a choice"*
3) Natural rights: *the right under Nature or God to freely exercise a choice"* (Allen 2011 p.310)

We will ignore the natural right, which is not necessary for the context of this work. According to him, the right holder can make various decisions regarding their property, such as using the property, reforming the property, selling and lease the property. Those who hold a property right[8]can make decisions, that is, choices, regarding their property. As he stresses, there is a long list of decisions an individual or an entity can make towards the property, and in contrast, there can also be a long list of decisions that an individual cannot operate towards an asset, despite all three rights being in place. The ability to make these choices can, however, be restrained. If the choices are minimal, the right holder has view options concerning the property, and then there are no property rights. *"A property right is complete if you are able to make all of the decisions with respect to the good. A property right is perfect, if on the dimension you are choosing, there is no infringement on the choice you are making"*

[8] Allen (2011) dropped the term “economic” and used only property rights

(Allen 2011, p.311). The central aspects of the degree of completeness and perfectness of property rights center on the ability to make choices. As Allen (ibid) views property rights, they operate within a spectrum, ranging from zero to perfect completeness. The right is not two-sided, either no rights or perfectly complete rights; the rights have different levels; property rights are not an *"all-or-nothing affair,"* and we live in a world that is at neither end of the spectrum, as he explains. Above all, property rights operate within a spectrum such that the more the choices and, therefore, the decisions regarding the property are restrained, the less complete and perfect the right is, and vice versa. Other scholars have similarly addressed this matter; however, this often appears in literature as attenuation of property rights. Eggertson (1990) explains that the state can impose limitations on property rights, and such limitations are often referred to as the attenuations of property rights. If there are no restrictions on the three essential rights of property rights, the right to use, earn income from, and transfer the asset, the property rights are said to be unattenuated, he explains. Scott (2008) outlines that rights can be incomplete, deficient, or attenuated powers and could lead to the reduced economic performance of the holder of such rights. Libecap (1999) mirrors Allen's (2011) notion of a spectrum; restrictions on property rights operate within a spectrum from significant to trivial. In a compelling argument by Libecap (ibid), he stated that attenuations could, if they are not trivial, affect the economic performance of the owner. If property rights are attenuated, this affects the owner's expectation in relation to the use of the asset, the value of the asset to the owners, and others' perception of the value of the asset. Attenuations of property rights limit the economic options for the owner and, consequently, lower the asset's value. Both Barzel (1997) and Eggertsson (1990) reflect Libecap's (2010) arguments of the economic performance of the owner in relation to attenuation. Barzel (1997) mentions that the more the exchange of the asset is restricted, the fewer rights the individual has over an asset. Eggertsson (1990) explained that if the use of the asset is restricted, it will lower the economic value of the asset if highly valued use is excluded. Libecap (1999) stressed that if the attenuation of property rights is widespread in society, the members have fewer economic opportunities, resulting in a reduced economic performance of society and

lowers the societal welfare. The concept of attenuation of property rights is arguable, as Eggertsson (1990) explains. There can be spillover effects that can occur when the property right is exercised, the property rights are sometimes not perfectly delineated, hence it is unclear who has which type of rights and resources can be portioned, i.e., several owners can have different rights towards a resource. Compelling arguments made by Barzel (1997, p. 11) refer to shared "ownership." Commodities or assets, as we refer to them here, can be viewed as collections of attributes. Individuals can decide to divide the "ownership" among others since *"the most efficient owner of one attribute is not necessarily the most efficient owner of other attributes of the same commodity."* p.114. Different individuals can own different attributes of an asset; thus, an effort is needed to exclude other owners from using the attributes owned by others.

To simplify and summarize what has been presented above, according to the scholars, property rights entail some sort of actions towards an asset, the rights to physically use the asset, and the rights to sell an asset. These two actions entail some outcome, the right to receive monetary gain. If the government restricts or limits property rights, it can reduce the economic performance of the owner. Throughout this thesis, we will assume that legal rights always complement economic rights.

2.2 Property rights as fishing rights

So far, we have examined the concept of property rights and defined it in general terms. This section will explore the notion of property rights for natural resources, more precisely, property rights in fisheries. By general, we mean that the description of property rights provided can be converted to numerous types of assets.

2.2.1 Operational rights

Elinor Ostrom is a scholar that has dedicated her life work to explore and study natural resources or what she refers to as common-pool resources (CPR). She defines CPR as a human-made or natural resource system that is sufficiently large. The resource system produces a flow of resource units. The process of withdrawing

resource units from the resource system is an appropriation, and the participants in that process are referred to as appropriators. The appropriators can come in numerous forms; they can, e.g., be single individuals, groups of individuals, and firms[9]. Natural resource systems may be fish stock, and the resource units generated from the fish stock are units of fish. Fishers are an example of appropriators since they participate in withdrawing resource units or harvesting. After the harvesting, the resource units harvested become the catch of the fisher (Ostrom 1990). The notion of property rights concerning natural resources such as fisheries is addressed in Ostrom and Schlager (1992). They two developed a conceptual framework for property rights in a CPR. The framework systematically defines and differentiates the bundle of rights that the users of the resource system may hold. The framework is split into five different bundles of rights, which are distinguishable as two main types of rights, operational rights, and collective-choice rights.

Table 1 Bundle of rights in a CPR (Ostrom and Schlager 1992, p. 250-251)

Operational rights		Collective-choice right		
"Access: The right to enter a defined physical property."	*"Withdrawal: The right to obtain the "product" of resource"* .	*"Management: The right to regulate internal use patterns and transform the resources by making improvements."*	*"Exclusion: The right to determine who will have access right, and how that right may be transferred".*	*"Alienation: The right to sell or lease either or both of the above collective-choice rights."*

Operational rights entail access and withdrawal rights. For fishers, the operational rights must be held collectively; therefore, fishers have both the right to access the resource system and withdraw resource units from the resource system. Fishers who have operational rights are referred to as "authorized users." However, the fishers are subjected to the rules made and modified by the collective-choice rights holders, referred to as operational rules. The collective-choice right holders have rights that entail the authority to impose rules on the authorized users; modifying or changing

[9] In this thesis we use word operator as synonym for single individual, group of induvial or company.

the operational rules is referred to as collective choice action. The collective-choice rights are split into three rights: the right to manage, the right to exclude and alienate, as demonstrated in table 1. In Schlager and Ostrom (ibid) they examine different types of CPR and concluded that the composition of collective-choice rights and operational rights could vary between CPR, such as the authorized users can have all of the collective choice rights, they can have part of the collective choice rights such as only the right to manage etc. Libecap (1999) draws attention to specific conditions where the role of the state might be necessary. For relatively low-valued assets, where there is a history of interactions and where the number of individuals is small, the state's role is not necessarily essential. Opposed to this is the situation where there are relatively high-value assets where the number of participants is significant, as in many users competing for the CPR, where it is easy for newcomers to enter the CPR, and where the parties are heterogenous and do not have a long history of interaction. Under such condition's formal protection such as "legally-defined private property*,"* become necessary where the power of the state supplements informal constraints on the CPR. Ostrom and Schlager (1992) defined the users of the resource system as all entities that have one or several bundles of the five rights within a resource system. An owner of the resource system is the entity that collectively holds the five rights. Authorized users are not owners of the resource system unless they have the right to alienate and set operational rules, management, and withdrawal rights. However, as Ostrom and Schlager (ibid) stress, authorized users can have what they refer to as well-defined operational rights. The authorized users can have a *de jure* right over the operational rights, i.e., the right is *"given lawful recognition by formal, legal instrumentalities*. If the asset is challenged in an *"administrative or judicial setting,"* then the authorized user can expect that their operational right would most likely be maintained (Ostrom and Schlager 1992, 255).

To summarize, operational rights are fishing rights, and those who have the fishing right, authorized users, are the operators or fishers. The ones who design the operational rules have so-called collective choice rights, and we will in this thesis assume the legislatures only have the formal authority to impose operational rules

and define thus the fishing rights. Therefore, in this thesis, operational rules are fisheries regulations or other formal regulations and legal material. If specified in the operational rules, the operators can transfer the fishing rights or the operational right.

2.2.2 Characteristics of fishing rights

Earlier in this chapter, we mentioned Allen (2011) stressed that property rights rest on making choices and property rights are within dimensions. Allen (ibid) defines property right along a spectrum, and the strength of the property right is dependent on the ability to make choices regarding the asset; fewer choices means fewer rights and vice versa. Scott's (1988, 2000, 2008) characteristics can be explored through the dimensions of property rights as referred to by Allen (2011) and the spectrum of attenuation as in Libecap (2012).

Scott (1988, 2000, 2008) has explored property rights concerning natural resources. According to Scott, property rights consist of characteristics. Scott (2000) suggested viewing property rights as being made of dimensions like Allen (2011). However, Scott (ibid) limited the dimension to six characteristics: Exclusivity, duration, transferability, security, flexibility, and divisibility. These characteristics are quantifiable, measurable, and dynamic. To compare two types of property rights or operational rights rests on the "amount" of each characteristic. Each characteristic is measured in its own units along its own axis, as portraited in Figure 4.

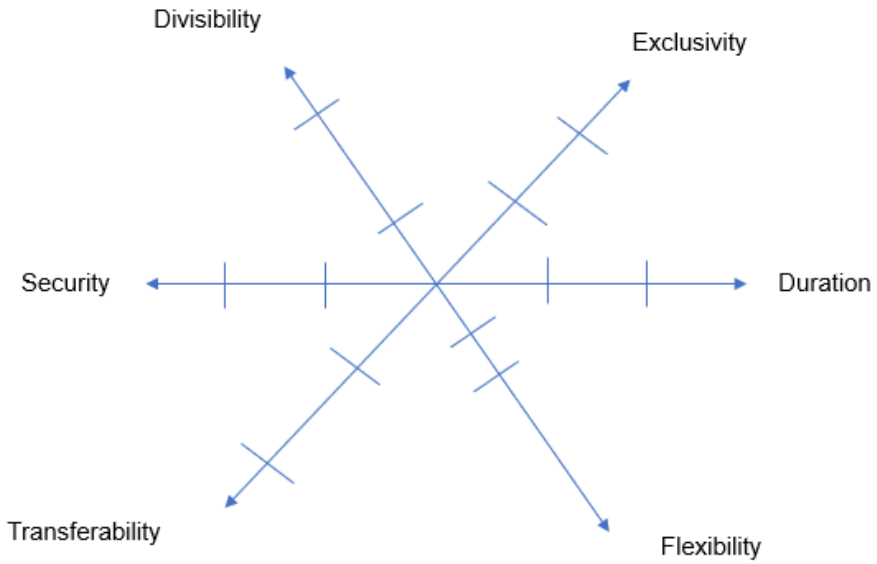

Figure 4 The six characteristics of property rights of natural resources (Adjusted from Scott 1988, 2000, 2008)

However, as Scott (2000) explained, for most analytical purposes, the four characteristics demonstrated in Table 2 are sufficient to explore. Scott (2008) lists up a few disclaimers that should be noted; these characteristics are quantitative. To compare property rights between individuals is to evaluate the difference in the amount of each characteristic. He views them as dynamic, meaning that they are continuous, measurable, and changeable. He also explicitly explains that he is not interested in identifying specific amounts of each characteristic that gives better functional regimes of property rights and an "optimal" solution.

Table 2 Four characteristics or dimension of property right (Scott 2000 p.4-5)

Exclusivity	Duration	Security	Transferability
…"the freedom from interference by a holder of his enjoyment of his right. The more legal interference, the less exclusive the right."	*…"the length of time the holder's powers may be en- joyed."*	*.."every right-holder faces some risk that their ownership may be challenged by someone else."*	*…"when offshore rights became more exclusive,transferability was wanted (it may also be called assigna- bility, marketability or exchangeability). All degrees of transferability are possible."*

As Scott (ibid) explains, these characteristics are familiar notions in the standard economics literature on the efficient allocations of resources. Arnason (2000)

followed Scott (ibid) and developed an aggregated numerical measure, the so-called Q-measure, which he refers to as quality of property rights. The characteristics are the footprint of fishing rights. The Q-measure takes a value from zero to one, where one is equivalent to perfect property rights, corresponding to the spectrum from Allen (2011). His Q-measure consists of the four characteristics exclusivity, duration, security, and transferability. To find one numerical value based on multi-dimension concepts Arnason (2000) ranked each characteristic with a numerical value ranging from 0-1, and the average sum of the characteristics defines the quality of the property rights.

Consequently, the Q-measure is, therefore, a ratio in relation to perfect property rights, a compressed measure of the characteristic. Compelling arguments presented by Arnason (2000, 2005) are that security, exclusivity, and duration are dependent, meaning that if any of those three characteristics have low strength, i.e., they are ranked 0, then the other two are invalidated. While transferability is not essential, the quality of fishing rights can still be positive without the ability to transfer the fishing right. Arnason (2000) presented two compelling arguments or reasoning for why property rights are seldom perfect or, as he explains, property rights are imperfect. First, technical limitations related directly to the spillover effect, i.e., property rights, are not perfectly delineated, as we explain earlier in this chapter from Eggertsson (1990). The second reason, social limitations, or social opposition against an extension of property rights. The social oppositions generate from several factors, as Arnason (2000) explains. Establishing property rights entails that someone is excluded. In fisheries, others without the operational right or the property right do not have access to the fish resource. Those who are excluded will not necessarily be compensated. Hence, those who are allocated property rights are allocated privileges and powers, potentially resulting in social oppositions from other groups of society. In addition, those who are potential beneficiaries of property rights may oppose it since such reforms might create uncertainty.

In the following sub-sections, we will explore the six characteristics by Scott and Arnason (2005) and other notions from other scholars concerning the economic

literature on the efficient allocations of resources, that is, fisheries economics. We have also clarified earlier that restriction on choices or attenuation, as Libecap (2011) and Eggertsson (1990) refer to them, if not trivial, can affect the economic performance of the authorized users as Libecap (2011) explained. Thus, economic arguments are presented alongside the explanations of each characteristic. Here, however, it essential to note that the characteristics are not isolated measures. The characteristics are interconnected, according to Scott (2008). Longer duration allows the operators to receive longer gain of their investments. High security means that the operator is secured that fishing rights will not be retracted. Thus, if there are high durations and security, the operator can expect future gains from investments or improvements to the operations. Transferability is directly related to investments since operators invest in fishing rights or quota shares. Demands for transferability occurred when fishing rights became more exclusive. Without exclusivity, transferability was not wanted, according to Scott (2000). In the following, we will explore each characteristic in more detail and simplify the characteristics to explain how they will be interpreted and applied in this thesis.

Exclusivity

Scott (2008) refers to the extent to which individuals must share a resource with others. As such, exclusivity might be lower for fishers operating beyond the Exclusive Economic Zones (EEZ) in comparison to a fish farmer over a pond. As Scott (1988) explains, fish resources managed with quotas, such as in Iceland and Norway, increase exclusivity, as the operators with quota have sole ownership of the amount the quota consists of. Higher exclusivity means avoidance of physical interference by others with the right of the individual. If there is low exclusivity, the operators must compete with other operators for the catch. Hannesson (2004) presented compelling arguments between exclusivity in connection with quotas and economic efficiency. The governmental management policy consists of clear rules, and when not frequently changing, the rules are predictable. This allows the operators to make rational decisions, i.e., operators have incentives to minimize operational costs and maximize the value of the catch or the amount that the quota represents. Examples

of low or non-existence of exclusivity are where there are so-called open-access situations. In an absolute state of open access, everyone is permitted to harvest, and consequently, no one can exclude others from doing so. Under such a state, no one has the authority to manage natural resources. Operators have little or no incentives to maintain or improve the resource since they do not hold any authority to exclude others from extracting from the resource. Consequently, utilization of an open-access natural resource can lead to depreciating biological status. However, in general, few resources are entirely open access situations, as usually open access is referred to as a resource open to a specific community or within a jurisdiction, excluding outsiders (Eggertsson 2003b). The characteristic exclusivity directly explores the delineations and apportioning of property rights, as Eggertsson (1990) explained. Where boundaries of property rights are not fully clear, fishing rights can overlap with other fishing rights or other ecosystem users, for instance. In addition, Barzel (1997) explains there can be several owners of an asset, and in the case of fish resources, the asset can be as broadly described as the entire marine ecosystem.

Another type of exclusivity, according to Scott (2008), is the freedom from government regulations that can restrict options in which the individual uses a resource to meet other governmental objectives. Arnason (2005) refers to the ability to use and manage an asset, and in his analyze he mentioned there could be regulations on specific harvesting methods, such as how the authorized user operates the harvesting process, how they exercise the right to harvest, e.g., gear types, vessel size etc. Compelling arguments presented in Arnason (ibid) state that levies reduce exclusivity, such as resource taxes. Arnason (2005) outlined that special levies reduce economic exclusivity such that operators have less control over their economic outcome. We explained earlier the right to earn monetary gain is an outcome of the right to harvest and the right to transfer. Thus, from Arnason's (2005) point of view, a resource tax, as presented in the introduction, lower exclusivity.

Flexibility

The characteristic of flexibility is some ways related to exclusivity**.** According to Scott (2008), flexibility explores if operators must agree to a specific kind of use, sale, i.e.,

mode of payment, the operator has low flexibility. Government-imposed regulations such as fisheries regulations that can decrease the flexibility of the rights (Scott 2008). Flexibility directly explores Allen's (2011) notions of the ability to make choices and options. Our analysis will limit the interpretation of exclusivity and only explore it regarding the extent to which the fishing rights overlap with others, e.g., do the operators have to compete with other operators in the harvesting process? Can other operators or individuals affect the harvesting volume of operators? While flexibility, we isolate the interpretation to physical and economic limitations. Here under, for instance, the management of catch quota, harvesting method, and any direct economic limitations such as resource tax and sale method of catch. Consequently, our interpretation of exclusivity is narrower than Arnason (2000, 2005) study, but we include the characteristic flexibility, which allows us to specify and give a more detailed portrayal of the characteristic.

Transferability

Explores the ability to buy and sell fishing rights, more precisely quota shares. As Scott (1999) points out, there can be many degrees of transferability instead of a "pure" ITQ system. Hannesson (2013) explains that there are very few examples of an ITQ system that replicate the complete "pure" ITQ system where there are no limitations on the transfer of quotas in fisheries mirroring with Scott (2008) where he explains that total freedom of transferability in fisheries is rarely found in the real world. Thus, despite that quotas can be bought and sold, there can be several limitations on such measures. Transferability is valuable for several reasons. According to Scott (2008 p. 139) *"transferability, which provided incentive to enhance a fishery beyond the period in which the holder intends to fish."* Libecap (1999) mirrors Scott (2008) where he outlines the legal freedom to sell part of or the complete asset to others at a mutually agreed value between seller and buyer. If the right to transfer is not limited, it creates incentives for the owner to operate within an unlimited planning dimension. However, only if the duration of the asset has a long-time length, the owner can efficiently allocate resources over time. Thus, here longer duration compensates transferability. Resources here being the fish resource itself

and other resources, including, e.g., fiscal resources, human resources, operational resources. Other scholars such as Hannesson (2004) have presented similar arguments regarding fisheries within an ITQ system. He explains that the ability to transfer quotas to others is vital concerning efficiency. If quotas can be sold freely, the quota rights can be will likely be sold to individuals willing to pay high prices; he explains that those are usually the individuals who can utilize the quotas most effectively. Restriction on how the fishing rights right can be transferred lowers the transferability of the fishing right. For the economic performance, similar arguments correspond to the transferability and flexibility, the ability to make choices by Allen (2011), and the attenuation of property rights by Eggertsson (1993) and Libecap (1999). Scott (2008) explains the importance of transferability concerning specialization. Hence, when fishing rights or quotas are transferred to operators with better locations in terms of, e.g., harvesting, processing, or closer to the final market, it increases specialization and potentially leads to higher economic performance. If there are limitations and restrictions on the transferability, it reduces options and choices for operators, affecting the operators' economic performance. However, as is outlined in the introduction, the ITQ system in Iceland has not been without criticism due to increased profitability. Scott (2008) mirrors criticism of the ITQ system of Iceland that was presented in the introduction and social opposition to expanding the property rights, as Arnason (2000) explains it. As Scott (ibid) explains, the ability to transfer quotas is often criticized, with the justifications of increased wealth concentrations. In Arnason (2005), he listed up several regulations that reduce transferability. So-called antitrust regulations where there or a quota ceiling means a limitation on the number of quota shares operators can acquire, limitations on foreign ownership, where there is a national requirement. The sixth characteristic by Scott (2008) is **Divisibility**, and is often used in close relation to transferability. The characteristics refer to the ability to divide the quota in the transaction process. As Arnason (2005, p.252) explains, *"perfect divisibility means any fraction of a given quota may be transferred."* Thus, if there is a possibility of transferring part of the quota share in contrast to the compulsory to transfer only fully the quota share, the

fishing rights have the characteristic divisibility. This thesis divisibility will be viewed as part of transferability as Arnason (ibid) did in his study.

Duration

Scott (2008) refers to the length of the time the operators have over the property right. Arnason (2005) referred to it as "permanence." This characteristic is related to the time span of the fishing right. According to Scott (1999), the duration is considered highly valuable in connection to investments, such as quota share or a vessel. If the operators only have a short time to use and enjoy the asset's monetary gain, it has a negative correlation with duration and vice versa. Compelling arguments by Arnason (2005) is the difference between "perpetuity," where it is stated explicitly in regulation that the duration of the quota right is forever in contrast to "indefinite duration," where the time length of the right is not explicitly stated.

Security

As Scott (1999) explains, every right holder can expect a risk that others can challenge their ownership. The government or others can challenge the rights, i.e., how the operator can withstand such challenges affect the strength of characteristic security. The characteristics refer to what extent the right is secured if other desire to claim their right. The characteristic security and duration are closely connected since higher security and duration create incentives for receiving the future gain of investments (Scott 2008). Thus, if the fishing right has low duration and security, the operators will have lower incentives to invest in their operation or improve the resource. If the fishing right is challenged and the operator cannot withstand those challenges, the fishing right has low security. As Arnason (2005, p.246) outlines security as: *"A property right may be challenged by other individuals, institutes or the government. Security here refers to the ability of the owner to withstand these challenges and maintain his property rights"*. This characteristic outlined Barzel (1997), that property rights are excepted concept.

In this chapter, we explore property rights from a theoretical perspective; in the first section from a general perspective, and in the second section, the focus was on

property rights in a fish resource. According to Ostrom and Schlager (1992), operational rights or the fishing right consists of the right to access and the right to withdrawal, meaning the harvest rights. If specified in the operational rules, the operators can transfer the operational rights. Hence, the fishing right consists of the three most fundamental rights, according to Libecap (1999) and Eggertsson (1990). Nevertheless, property rights can be attenuated and is a multidimensional concept, as Allen (2011) outlined, and there can be a long list of choices that operators can and cannot make. In a natural resource setting, Scott (1998, 2000, 2008) explained this multidimensional concept of property rights through the characteristics. Followed by Arnason (2000, 2005) with his aggregated average Q-measure, which defines the quality of fishing rights. According to the scholar presented in this section, the characteristics are all desirable in relation to economic performance. Longer durations, higher security, transferability, and exclusivity allow the operators to have future expectations and plans, allocate resources efficiently, and minimize cost, i.e., retrieve future benefits from investments. High flexibility allows the operators to decide who, how, and when to harvest and expect greater economic flexibility to decide how physical resources are allocated. We will, in chapter 4, analyze the fishing right in Iceland and Norway through the five characteristics: exclusivity, flexibility, duration, security, and transferability, and define the quality of the fishing rights. To conduct our analysis on the quality of fishing rights in Iceland and Norway to answer the first research question, we will simplify the five characteristics presented in Table 3. Before we start our analytical process, we will explain our approach, data, and concepts in more detail in the following chapter.

Table 3 The content of the five characteristics

Exclusivity	Flexibility	Transferability	Duration	Security
Refers to the extent of which the fishing rights overlap with other rights. The more operators must consider others in their operation, the less exclusive is the fishing right.	Refers to the extent of the operational and economic flexibility in the operation.	Refers to the extent of restriction in the transaction process of quota shares.	The expected time span of the rights. Longer duration is viewed as more desirable.	Refers to the expectations of operators holding on to the fishing rights and withstanding legal challenges.

3 Approach, Data, and Concepts

Our research addresses three key topics a) quality of fishing rights, b) economic performance, and c) resource taxation level. Thus, the logic of our arguments is that if a) can explain b), then a) and b) can potentially collectively explain c).

3.1 Mixed method research

In order to answer our research questions and address our underlying hypothesis, we will apply so-called mixed-method research. In mixed-method research, the researcher relies on quantitative and qualitative material to address the research topic (Johnson and Christensen 2014). Johnson and Christensen (ibid) view a mixed-method research approach as complementary in that it allows researchers to include more than one purpose or a "creative mixture of purposes." Applying both qualitative and quantitative data in research brings in diverse knowledge that has different weaknesses and strengths.

Do due to the nature of our research, it can, in practice, be split into two analyses:

1. We analyze fishing rights and asses the quality of fishing rights in Norway and Iceland in chapter 4, where our key data is qualitative material.
2. We are analyzing the economic performance of the fishing sector in Norway and Iceland in chapter 5, where our main data sources are quantitative data.

In the first sub-section below, we first explain our method, approach, and data for evaluating the quality of fishing rights, and in the second sub-section, we will explain our data and concepts to explore the economic performance of the fishing sector in Iceland and Norway.

3.1.1 Qualitative approach; Quality of fishing rights

Type of fishing rights: Due to the nature of the fisheries management system in Iceland and Norway, there are multiple types of regulations that can apply to different fleet groups. Hence, in reality, the fisheries management systems reveal multiple types of fishing rights, which can have a different level of quality. However, in this thesis, we simplify the fishing rights and explore the offshore fishing rights in Norway

and the so-called “unrestricted” ITQ fishing rights in Iceland, briefly explained in the introduction.

The offshore fishing rights in Norway; In the introduction, we explained briefly that the fisheries management system in Norway is segmented into many layers of groups depending on the size of vessels, gear type, and species targeted, which can, in general, be divided into the coastal fleet and the offshore fleet. The fisheries management system in Norway and its history is thoroughly described in two official governmental papers from 2016 (NOU 2016: Et fremtidsrettet kvotesystem) and 2019 (Meld.st 32 [2018-2019] Et kvotesystem for økt verdiskaping). The offshore fishing rights are generally viewed in relation to vessels with 500 cubic meters carrying capacity or 28 meters length or larger, and the quota allocation is based on quota factors or base tons in the case of the pelagic operators. Each group has a fixed number of quota factors and base tons, and each vessel within the group has a number of quota factors or base tons of the total quota factors or base tons that the group has, the fixed number of quota factors. Base tons and quota factors are, in essence, catch quotas and quota shares. Importantly the base tons and quota factors represent a bundle of species or a type of quota package. Thus, one quota factor represents a share in several species. The offshore fleet in Norway consists of 15 types of different licenses. Key groups are the trawling group (cod and saithe), the purse seine group, the pelagic trawling group, and shrimp trawlers. In addition, the conventional offshore fleet is included in the offshore fleet, which mainly consists of large longlines targeting demersal species, thus operating passive gear. The offshore fleet operates under the regulations of the SQS for the offshore fleet[10], hereafter the SQS regulation, where quota factors and base tons can be transferred and combined to other vessels. The vessels group included in the SQS regulation are cod and saithe trawl groups, purse seine group, shrimp trawlers (Greenland), conventional offshore group, pelagic trawl group, and North-Sea trawl group. For the year 2021,

[10] [FOR-2005-03-04-193]

the conventional offshore fleet, and the trawling group, were allocated combined approximately 38% of the TAC for cod, with the rest of the cod quota being allocated to the coastal fleet in closed groups and the open group[11]. The purse seine group was allocated approximately 65% of the mackerel quota in 2021[12].

The "unrestricted" ITQ fishing rights in Iceland: The fisheries management system in Iceland can be split into two types of ITQ groups. As The Fisheries act (2006) outlines, there are two types of general licenses; the first "unrestricted" ITQ group, as we refer to the group and represents the bulk of the operators and the majority of the quota allocations. The second, the "restricted" ITQ group, often referred to as the jig-and-line group, where the operators are only authorized to use passive gear and subject to the size limitations of the vessel[13]. We will focus on exploring the "unrestricted" ITQ group that mainly consists of large operators, but several small-scale vessels operate within the group. The "unrestricted" refers to the fact that there are fewer gear and size limitations on the vessels operating within the group. For the fishing year 2019-2020, the operators within the "unrestricted" group were allocated approximately 82% of the TAC cod quota and 100% of the herring quota (Fiskistofa 2021a).

The two fishing right, offshore fishing right in Norway and "unrestricted" ITQ fishing rights in Iceland, we will explore in chapter 4 are similar in many ways concerning the nature of the operators, as both in Iceland and Norway, the operators operate large long-liners, trawlers, and purse seine vessels. However, we must bear in mind that the mix and nature of the operators are not entirely identical.

Approach and Data: To explore the quality of the fishing rights, we will apply Arnason (2000) approach to define the quality of fishing rights, with slight modifications that will be explained here. The strength of each characteristic

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[11] J-82-2021: Regulation on allocation of quota for cod, haddock, and saithe north of 62°N in 2021

[12] J-69-2021: Regulation on allocation of quota in mackerel in 2021

[13] §4 and 7

depended on the quality of fishing rights. As Scott (1998) explained, the characteristics consist of one or several units that define the strength of each characteristic. In Arnason (2000, 2005), he categorized fisheries regulations according to the definitions of each characteristic, while for the characteristic security, he explored past behavior of the state. With its legislature power and political influence, the state can place barriers, either tangible or intangible barriers on the operators. This can best be described as such that the state has a metaphorical "toolbox,"[14] within the "toolbox" are "tools" that the state can apply to influence the characteristics positively and negatively, hence the quality of the fishing rights. However, we will focus on listing negative "tools." These "tools" or mechanisms[15] , for instance, limit transferability by implementing a limitation on the number of quotas shares an operator can acquire, in the same manner, increase transferability by reducing such limitations. Arnason (2000) ranked each characteristic from the range 0-1. The ranking from 0-1 defines the strength of the characteristics; a higher number means higher strength. Arnason (2000) ranked four characteristics, security, duration, exclusivity, and transferability. We will, in our analysis, add in a fifth characteristic, flexibility, and use the sixth characteristic, divisibility, as part of transferability. Arnason (2000) summed up the rank of each characteristic to assess the Q-measures, which give a numerical value to the quality of fishing rights in Iceland and Norway. For simplicity, we will assume that the state is the only actor that can directly influence the quality of fishing rights. Indirectly, the operators can influence the legislatures, yet we will ignore that for simplicity in this thesis.

We will be split our analysis of the fishing right into two stages: ***1. Strength of each characteristic, and 2. Identify the quality of the fishing right; Q-measure***

1. Strength of each characteristic will be conducted in two steps**:**

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[14] This metaphorical toolbox is influenced by the Høst and Christiansen (2018) where they describe instruments that influences market-mechanisms which was explained in the introductions.

[15] We will refer to "tools" and mechanism interchangeable.

A) Evaluation; Identify potential “tools” or mechanisms that are likely to influence each characteristic and assess if these “tools” are likely a negative factor in the strength of the characteristics. These “tools” are derived from Scott (1998, 2000, 2008) and Arnason (2000,2005). In addition, we will be including some new mechanisms that correspond to the definition of each characteristic from Table 3 in the previous chapter.

B) Assessment; Estimations of the strength of each characteristic based on the evaluation. We will conduct a similar approach as Arnason (2000, 2005), where he estimates each characteristic from a scale of 0 – 1 characteristic. However, we will simplify our assessment based on five levels. The strength of each will be assessed based on the following five levels: Perfect (4), High (3), Moderate (2), Low (1), Zero (0)

The characteristics lie in the interval between 0-4. The levels are given a numerical level, in a bracket, to visualize the characteristics on an axis in a spider chart in the same manner as both Arnason (2005) and Scott (1998, 2000, 2008), as demonstrated in Figure 4 in the previous chapter. In our approach, four equals, for instance, perfect exclusivity, meaning that the fishing rights are perfectly exclusive; thus, the operators, when exercising their right to harvest, do not have to consider any other rights. The right to harvest does not overlap with any others. There is an essential disclaimer in the estimations of the strength of each characteristic. The “tools” can be binary regulations. Either there is a regulation or not, for instance. The regulations can also be on a spectrum or range that is a dimensional element. Thus, we must bear in mind that despite that Scott (1998, 2000, 2008) explained that the characteristics are quantifiable, the strength of each characteristic is based on qualitative measures, regulations, and behavior.

2. Q-measures$_{t:}$ The second stage of our analysis is measuring or defining the quality of the fishing rights. The Q-measure is based on the strength of the characteristics. The measure presents an average measure based on the characteristics to define the quality of the fishing rights. However, we have a different scale or range to

Arnason (2000, 2005) since we have simplified the levels of the characteristics into five levels ranging from 0-4. Thus, our Q-measure is:

Q-Measure$_t$: Quality of fishing rights [0,4].

The quality of the fishing rights will be evaluated as the sum of the strength of the characteristics divided by the total number of characteristics. Therefore, the Q-measure presents an average of the level of strength of each characteristic. Hence, the quality of the fishing rights will be based on the same levels as the assessment of the characteristic. In addition, we have attached a time subscription on our Q-measure to stress the dynamic and alterable nature of the characteristics, hence the quality of the fishing right. Here, however, the quality of fishing rights can lie on a range or interval between two levels. Therefore, if the Q-measure is between two levels, we will present either the Q-measure (+) or (-) to presents the range between the two levels. The range on the interval lying from [0.1-0.9]:

if <0.5, then (+) from the lower level of the range

if ≥0.5, then (-) from the upper level of the range.

This can best be described with an example. In Figure 5, there are two fishing rights visualized on the spider chart. Fishing rights 1 (grey line) has, for instance, “Perfect” quality, i.e., each characteristic has a “Perfect” strength, so it lies on the outskirt of the axis, with an average value of 4, while Fishing rights 2 (yellow line) has moderate +, and average numerical value 2.4; thus it lies in the range of moderate and high. The illustrative fishing rights number 2 below has “High” duration, exclusivity, and security while “Moderate” flexibility and “Low” duration. Consequently, the state may apply some “tools” that reduce the quality of the fishing rights, making them “imperfect.”

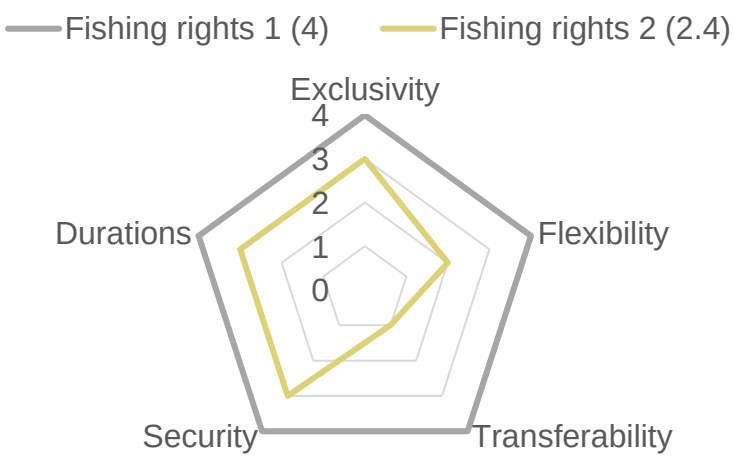

Figure 5 Example of quality of fishing rights

Data: For the first step of the analysis of the strength of each characteristic, the evaluation process, we will mainly use qualitative data, both primary legal sources, i.e., regulations and laws extracted from the online legal database in Norway (lovdata.no) and the parliamentary webpage of Iceland (althingi.is). Another key secondary data source that we will use in the evaluation of the fishing right in Norway are two official governmental reports. The first report is a so-called official Norwegian report (Norges offentlige utredninger, or NOUs) which is written by a committee of expert published in 2016 called a "Future orientated quota system" (NOU 2016: Et fremtidsrettet kvotesystem) and the second report is a white paper published by the Ministry of Industry and Fisheries in 2019 called the "A quota system for increased value creation" (Meld.st 32 [2018-2019] Et kvotesystem for økt verdiskaping]). In addition, we will use other secondary data sources if needed to set our data in context to support our assessment. In the assessment process, we will give each characteristics a level based on quantitative values, resulting in our Q-measure. Thus, the Q-measure$_t$ is a quantitative measure based on qualitative data.

3.1.2 Quantitative approach; Economic Performance

The objective of analyzing economic performance is to explore and compare the economic performance and assess if the outcome corresponds to the level of quality of the fishing rights. In addition to potentially find a connection between the quality of

fishing rights, economic performance, and resource taxation level as our underlying hypothesis suggests. Economic performance can be explored through various concepts and measures. One measure that we have mentioned in the introduction is resource rent, another measure is, for instance, profit indicators, and another approach would be to explore some efficiency or productivity measure. This analysis will focus on reporting three profitability indicators found in official statistics in the two countries for the fishing sector in Iceland and Norway. In addition to exploring the quota prices in Iceland and Norway.

Concepts: An income statement lists all items that positively or negatively affect a company's wealth for a given period. Vernimmen et al. (2014) explain and income statements as the additions to wealth or revenues and all the deductions of wealth, costs, or expenses. The difference between additions to wealth and deductions to wealth is earnings, often referred to as profit, revenues minus cost. While the balance sheet demonstrates all the assets of a company at each point in time, the assets portfolio of the sectors is split into fixed assets and current assets. The total assets equal the sum of the debt and the shareholder's equity. Consequently, a company's asset portfolio demonstrates in the balance sheet whether the company is financed through the shareholder's own equity or debt via financial institutions (Vernimmen et al. 2014). Both the income sheet and the balance sheet or often referred to as financial accounting collectively. Often that ratio between debt and equity of the shareholder is demonstrated to explore how companies are financed, and if the debt ratio is higher than the equity ratio, then the company is financed at a higher level through debts and vice versa (Stjórnarráðið 2014). In the following analysis, we will focus on three types of earnings which we will refer to as profitability indicators, depending on which type of costs is subtracted from the revenues. The first profitability indicator is ***EBITDA (earnings before interest rate, depreciation, amortization)***, which demonstrates activities in the operational cycles. As is outlined by Vernimmen et al. (2014, p. 30): *"The very essence of business is to increase wealth by means of its operating cycle."* The second profitability indicator is ***EBIT (earnings before interest and taxes***). EBIT accounts for all operational cost in

addition to the cost of using the fixed asset, where the cost is presented as depreciations. Depreciation in accounting is when a fixed asset decreases in value due to the use of the asset (Vernimmen et al. 2014). This is what Vernimmen et al. (ibid) refer to as the investment cycle; the difference between the investment cycle and operational cycle is that the things that generate the cost in the operational cycle are finally utilized or "destroyed," while the things that generate cost in the investment cycle are not fully utilized, only lose value in accordance to the use. EBIT indicators account for the cost of investing in the "things" that are used in the operational cycle that are not finally utilized. Investments are *"sacrifice of current consumptions for future uncertain benefits"* (Staszkiewicz, P., and Staszkiewicz, L., 2014, p. 5). ***EBT (earnings before taxes)*** or net profit before tax accounts for all costs in the operational and investment cycle in addition to interest costs. Let us return to the balance sheet where assets are either financed through debt or the shareholder's equity. If the companies are financed through debt, they must pay interest on the debt. The income statement only shows the cost of borrowing or the interest costs, not repayments of loans. The net financial cost is the interest cost minus the interest revenues since companies can acquire interest revenues through their current assets. Repayments of loans are presented as decreased debt in the balance sheet; thus, when companies pay off loans, the debt ratio decreases, i.e., more of the company's assets are thus financed through shareholder's equity, all things equal. EBT accounts for all operational costs, depreciation of assets, and interest rates (Vernimmen et al. 2014). However, EBT also accounts for non-operating items, activities that are not directly related to the operational cycle, such as net currency profit and net profit from sale of assets (Arnold and Kyle 2020). ***Quota price.*** Reflects the price of the asset, or the quota share. Eggertsson (2005, p. 10) outlines that "*In a well-functioning secondary market, the purchase price of quotas or licenses equals the expected net future gain of acquiring the rights*." The price of quotas represents the excepted future gain; the higher the expected future gain, the higher the price. Hence, quota price should, according to Eggertsson (2005) influenced by the profitability indicators.

Data and Material. To explore the profitability indicators, we will derive our data from official statistics. The Statistics Iceland and the Fisheries Directorate in Norway publish annual figures of the financial accounting of the fishing sector in Iceland and Norway. Official Statistics Iceland and the Fisheries Directorate of Norway provide official statistics where aggregate results from income and balance sheets of the fishing sectors are available. Information consists of both aggregated results and segmented aggregated results of different fleet groups. In addition, there is information on the total catch, number of vessels, size, and age. Statistics Iceland publishes yearly key economic results for the fisheries and processing sector in Iceland. There are two sources from Statistics Iceland we will mainly use. First, an online report, “Profitability in fishing and processing,” Statistics Iceland publishes annually. We will use the reports to demonstrate a time-series of descriptive statistics of the fleet in Iceland (Statistics Iceland 2012a, 2012b, 2013, 2015, 2016, 2017, 2018a, 2018b, 2019, 2020). Second, we use an online database on the Statistics Iceland webpage, where time series of figures within the income and balance sheets can be extracted (Statistics Iceland 2021c). The publications and the online database are based on the same survey from the operators within the sectors and tax returns from the operators. The financial information from each operator is collectively presented as aggregate figures.

In Norway, the Fisheries Directorate accumulates key statistical data from the fishing sectors. Yearly the Directorate publishes an online report, “The profitability survey of the fleet” (Fiskeridirektoratet 2021c). The operators participate in a survey to fill out an annual statement of key figures in operation accounts and balance sheets and other information. The Fisheries Directorate also provides a database from previous years where time series of financial accounting are published (Fiskeridirektoratet 2021d) as well as descriptive statistics of the fleet (Fiskeridirektoratet 2021b). Henceforth we will refer to the official statistics from the Statistics Iceland and the Fisheries Directorate of Norway as just the database from Iceland and Norway. The sample size in the database from Iceland represents approximately 85%-88% of the turnover of the fishing and processing sector in Iceland, which is expanded to the

total populations of the sector. Hence, the remaining data is assumed to be the average of the actual turnover. The sample size in Norway is considerably smaller and represents around 20% of the vessels in the vessel populations. The databases are both viewed as reliable official statistics and are used by research institutions, scholars, and in official governmental papers (see e.g., Anon 2016 and Gunnlaugsson and Agnarsson 2019).

The three profitability indicators can best explain by an example; Figure 6 demonstrates the three profitability indicators, and the cost is presented with the italic front. For instance, the fishing sector in Iceland and Norway uses fuel and labor to harvest, i.e., generating revenues. The fuel or the crew members' time, here the crew members exchange their time for salaries, cannot be reused thus is finally utilized. At the same time, we must explore the investment cycle through both the income and balance sheets. In the balance sheet of fishing sectors in Iceland and Norway, the asset portfolio consists of fixed assets, for instance, fishing vessels and quota share, which we demonstrate in Figure 7. The fishing vessels and the quota shares that are used in the operational cycle to generate profit are not fully utilized in the operational cycle. The cost of the “use” vessels and the quota shares is demonstrated in the income sheet as depreciation.

Revenues
Crew members share
Oil
Fish gear
Maintenance and repair
Packaging
Transport cost
Other costs
EBITDA
Depreciation
EBIT
Net financial cost
EBT

Figure 6 Simplified income sheet from Statistics Iceland and Fisheries Directorate of Norway for the fishing sectors.

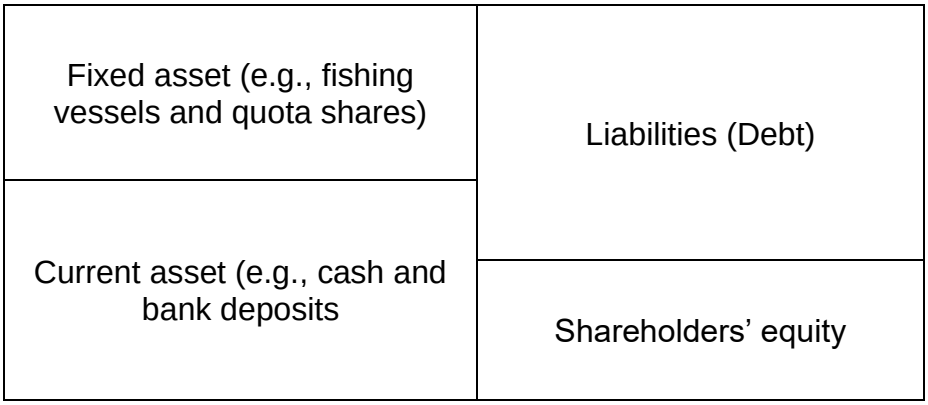

Figure 7 Example of a balance sheet from the fishing sectors in Iceland and Norway (design derived from Vernimmen et al. 2014)

These non-operation items are not explicitly identified in the databases in Iceland and Norway but are listed under net financial costs. The depreciations of fishing vessels are on book value in both databases, while the deprecation of quota shares is based on tax value for Norway. We will present the profitability indicators for the ten years between 2010-2019. This is the second decade of the century which we have described in the introduction as "the decade of increased taxations" for the three fishing nations: Iceland, Faroe Islands, and Greenland. There are some limitations concerning comparing official statistics between two fishing sectors. In the database from Iceland, results are presented on an aggregate level, while in the database will use from Norway, the results are presented as an average per vessel. Thus, we will not compare nominal figures from the income sheets; instead, we will only compare EBITDA, EBIT, and EBT as a percentage of revenues. In the database for Iceland, EBITDA is presented as "Share of capital, gross." EBITDA is not presented in the database from Norway; thus, we must subtract depreciations of fishing rights and vessels from EBIT, which is presented. In the database in Iceland, the EBIT is not presented; thus, we must add net financial cost to the EBT. We will compare the EBITDA and EBT between the two fishing sectors while using EBIT to compare fishing sectors to other industries in the economy. The reason for that is then we will be able to put the profitability of the fishing sector in context to other industries as

well. Is the profitability of the fishing sectors higher, on average, or lower compared to the other industry in the economy? Does the quality of fishing rights correspond with the economic performance? Both Statistics Iceland and Statistics Norway report EBIT on an aggregated sectorial level (see here Statistics Iceland 2021b, and Statistics Norway 2021a). Statistics Norway reports EBIT for all non-financial limited companies, and Statistics Iceland reports EBIT for all sectors excluding pharmaceutical, waste collection, financial, and insurance activities.

Unfortunately, there are no official governmental bodies that track the ***quota prices*** in either country. In order to examine the quota prices, we must rely exclusively on publication from others. For data in Norway we must mainly rely on report (Organisering av verdikjeder i norsk sjømatnæring) published in 2014 written by Asche, Guttormsen and Nøstbakken for the Ministry of Fisheries (see here Asche, Guttormsen, and Nøstbakken 2014). The quota prices presented in the report are based on interviews with brokers, and bank employees provided some indication of the quota prices. For data in Iceland, we must rely on an online publication in a business magazine in Iceland (vb.is) where a quota broker provided data on the quota prices for both ITQ groups, the "restricted" and the "unrestricted" ITQ groups (see here Viðskiptablaðið 2019).

Fishing sector. It is important to note that in the initial analysis, we will compare and explore the quality of the fishing rights for the Norwegian operators in the offshore fleet and for Iceland, the operators operating in the "unrestricted" ITQ group. However, when we analyze profitability indicators, we will compare and explore on an aggregated sectorial level[16]. The databases from Iceland and Norway do provide segmentation of the fleets. The database from Norway provides detailed data on each group within the fisheries management system. The database in Iceland also provides segmentations between various fleet groups but not on the same premises

[16] Hence, in our second analysis we use the word fishing sector in contrast to the fishing operators in the first part of our analysis.

as the groups in Norway since the fisheries management system is not organized in the same manner. The only two fleet groups which we can thoroughly compare are the purse seine groups. For instance, the cod trawl group in Norway cannot be compared to the trawl group in Iceland since the trawl group in Iceland consist of pelagic trawlers as well. The database in Iceland is segmented into five groups: vessels less than 10 GRT, vessels 10-100 GRT, vessels over 200 GRT, freezing trawlers, pelagic vessels, and fresh fish trawlers. In the database from Norway, however, there are a total of 13 groups which can be divided into four categories, demersal and pelagic coastal fleet, and demersal and pelagic offshore fleet group[17].

Another key point is that the database from Iceland reflects the entire population of the sector, while the database from Norway reflects these 13 groups, thus a sample of the population. However, as the Directorate of Fisheries outlines in the database, these 13 groups are the most important. Table 4 describes the total catch for the 13 groups in 2019 to be 1.96 million tons while the total catch in 2019 was 2.48 million tons (Statistics Norway 2021b); thus, these 13 groups represented around 79% of the total catch in Norway in 2019. Henceforth, we will refer to these 13 groups as just the fishing sector in Norway. Table 3 shows the total catch for the most important species in terms of volume in 2019 for the fishing sector in Iceland and Norway. There are relatively similar species compositions within the two fishing sectors studied, as cod represents around 26% of the volume in Iceland and 15% for Norway. The mackerel is around 8% of the total catch for Norway while 12% in

[17] The 13 groups are labeled with number in the data base. Demersal coastal fleet has total five groups: Smaller than 11m. (001), between 11-14.9m. (002), between 15-20.9m. (003), larger than 21m. (004), coastal shrimp trawlers (007). Pelagic costal fleet total 3 groups; Coastal purse seine (009), Coastal purse seine 11-21,35m. (010), Coastal purse seine (SUK group) larger than 21,36m. (011): Demersal offshore fleet total three groups; Conventional offshore fleet (005), Cod trawlers (006), Crab vessels (014). Pelagic offshore fleet total 2 groups; Purse seine (012), Pelagic trawlers (013).

Iceland. Herring is the most important species in terms of catch volume for the sector in Norway, constituting around 27% of the total catch and 13% in Iceland.

Table 4 2019: Total catch for the 13 groups in Norway and total catch for the fishing sector in Iceland (Fiskeridirektoratet 2021b and Statistics Iceland 2021a)

Norway		
Species	Catch (tons)	Percentage of the total catch
Norwegian spring spawning herring	417,256	21%
Blue whiting	337,111	17%
Other fish species	315,893	16%
Cod	290,839	15%
Saithe	184,990	9%
Mackerel	152,381	8%
Herring	127,210	6%
Haddock	92,558	5%
Shrimp	27,038	1%
Greenland halibut	16,658	1%
Totalcatch	1,961,934	100%

Iceland		
Species	Catch (tons)	Percentage of the total catch
Cod	273,040	26%
Blue whiting	268,351	26%
Herring	137,936	13%
Mackerel	128,085	12%
Saithe	64,698	6%
Haddock	57,919	6%
Red fish	53,527	5%
Greenland halibut	12,054	1%
Atlantic wolf fish	9,190	1%
Other fish species	43,412	4%
Total catch	1,048,213	100%

The vessel population in the two fishing sectors that reflects the three profitability indicators is presented in Table 5 over a ten-year period (2010-2019). For the fishing sector in Norway, the average catch was 2 million tons on average in the period compared to 1.2 million tons in Iceland. Total value is presented in nominal figures; for the fishing sector in Norway, the total yearly first-hand value is between 12.5 – 19.8 million (NOK) in the period. For the fishing sector in Iceland, the first-hand value is between 6.2 – 9.9 billion NOK in the period. Value per kg. is similar between the two sectors: Norway 4.9- 10.1 NOK per kg. and Iceland 6.2 -9.9 NOK per kg. in the period. However, the value per kg is only two years (marked with grey in the table) higher in Iceland than in Norway.

The key difference is that the vessel population in Iceland is larger in terms of average length. In addition, the average age of the vessels is higher in Iceland. The average age of the vessels in Iceland increases steadily throughout the period to an

average of 28 years in 2017, with a sharp drop in 2018; the average age of the vessel population in Norway is relatively steady between 22-24 years.

In this thesis, we compare two types of fishing rights in two countries and compare the economic performance of the two fishing sectors. Therefore, it is essential to disclose that the two fishing sectors are not identical; the species compositions, type of and size of vessels, and revenues are not identical, as is demonstrated in Table 5. In addition, there can be natural conditions that can affect the economic performance, such as stock density, i.e., catchability, seasonal pattern, among other things.

Table 5 Descriptive statistics from 2010-2019 for the fishing sector in Iceland and Norway (Fiskeridirektoratet 2021b and Statistics Iceland 2012b, 2020, 2012a, 2013, 2015, 2016, 2017, 2018a, 2018b, 2019) *

*Total value is presented on current price, and value from Iceland is calculated using the average annual exchange rate extracted from the Central Bank of Iceland (2021)

Norway	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	Average
Total catch (million tons)	2.55	2.02	1.89	1.80	1.96	2.00	1.72	2.10	2.18	1.96	2.0
Total value (thousand million NOK)	12.5	14.6	12.7	11.4	13.2	15.3	16.7	17.1	19.0	19.8	-
Value per kg.	4.9	7.2	6.7	6.4	6.7	7.7	9.8	8.1	8.7	10.1	-
Number of vessels	1731	1525	1565	1451	1748	1672	1630	2060	2184	1928	1749
Average length of vessels (meter)	18	19	19	19	18	18	18	16	16	16	17.75
Average age of vessels	22	22	23	22	23	23	23	24	24	23	23.00
Iceland											
Total catch (million tons)	1.06	1.15	1.45	1.36	1.08	1.32	1.07	1.18	1.26	1.05	1.20
Total value (thousand million NOK)	6.58	7.43	7.41	7.33	7.35	9.24	9.26	8.56	9.61	10.41	-
Value per kg.	6.2	6.5	5.1	5.4	6.8	7.0	8.7	7.3	7.6	9.9	-
Number of vessels	1339	1338	1451	1425	1364	1309	1275	1213	1145	1132	1299
Average length of vessels (meter)	14	14	32	32	32	36	33	34	33	31	29.1
Average age of vessels	21	22	26	26	26	27	26	28	20	24	24.6

4 Quality of fishing rights

The following chapter is the first part of our analyses and is devoted to the first research question in this thesis. How is the quality of fishing rights in Iceland and Norway, and what is the key difference between the quality of fishing rights in the two fishing nations? In the first section, we analyze each characteristic that the fishing rights consist of, and in the second section, we assess the overall quality of the fishing rights. Approach and data were disclosed in section 3.2.1.

4.1 The strength of characteristics

In the following section, we will study the strength of the five characteristics and delineate their content to eliminate overlap. We will conduct the process in two steps 1. Evaluate each characteristic 2. Assess the level of each characteristic.

4.1.1 Exclusivity

The strength of exclusivity is perfect; if the operators do not have to compete with other operators for their catch, other operators cannot influence future catch quotas. In their operation, the operators are not subjected to limitations and restrictions to protect other property rights or fishing rights. The fishing rights are thus, perfectly exclusive. In contrast, if the strength of the characteristic is zero, the fishing rights have no exclusivity. It is an “open access” situation where the operators must compete and can highly influence future catch and affect the biological status of the fish resource. The only exclusive thing is the catch after the harvesting process.

Evaluation

For the following characteristics, there are mainly two types of mechanisms we will explore, first, ***competition for the catch***. Do the operators in Iceland and Norway have to compete with others for their catch? Furthermore, do they have to consider other interests in the harvesting process? The operators in Iceland and Norway enjoy great exclusivity in relation to their catch quotas, meaning they can harvest the catch quotas within the limits of a specific period. Other operators are unlikely to influence

the catch quotas directly. The advice on the TAC is based on scientific data; thus, it is to be expected that what is harvested in a particular period should not affect future catch. The marine research institution in Iceland and Norway provides advice on the TAC in cooperation with the International Council of the Exploration of the Sea (ICES). Both the state in Iceland and Norway provide an infrastructure to secure that the catch quotas are exclusive. In Iceland and Norway, the coast guard, Fisheries Directorate, has monitoring and enforcement responsibility to monitor the marine ecosystem's harvesting process and other activities. The sales organizations have a responsibility to monitor the landing in cooperation with the fisheries directorate in Norway, whereas, in Iceland, the harbor authorities play a significant role in the monitoring of landings (Ministry of Fisheries and Coastal Affairs n.d. and Ministry of Industries and Innovation 2021). In the light of the above, it can be expected that the operators in Iceland and Norway do not have to compete with others for their catch, and unlikely that other operators can affect future catch, the fishing right is exclusive in relation to the catch quotas. However, Iceland and Norway share many of the commercially important species with other nations, such as mackerel, blue withing, herring (ICES 2020d, 2020c, 2020a), and Norway share the North Atlantic Cod with Russia, as well as a small share to other nations (ICES 2020b). Here the fishing rights of operators in Iceland and Norway can overlap or conflict with operators in other nations. As Scott (2000) pointed out, there is low exclusivity beyond the 200 miles Exclusive Economic Zone. Other operators in other countries that also target the same species can affect future catches of the operators in Iceland and Norway. However, since we assume that the state is the only actor who can influence the quality of the fishing rights, we will ignore the overlap with other nations, though the state can naturally not control the migration pattern of fish stocks. Another mechanism is the ***overlap between fishing rights or other rights***. Here we explore if fishing rights within the same country and or when other interests are prioritized above the operators. In both Iceland and Norway, the operators are subjected to several limitations such as gear selectivity to protect juveniles, area closures; bottom trawl is forbidden in certain areas to protect the seabed (Ministry of Fisheries and Coastal Affairs n.d. and Ministry of Industries and Innovation 2021). Some operators benefit directly since these regulations protect the species the operator's target, while

other operators do not benefit directly from them since they are not targeting the species. Protecting the ecosystem such as the seabed does not benefit them directly; thus, other interests are prioritized if some operators want to harvest with bottom-trawling in these areas. The fishing right is not fully exclusive, and operators in Iceland and Norway must consider other's interests in their operation.

Assessment

According to the above, we estimate that the fishing rights in Iceland and Norway have “High” exclusivity. Thus, the state in Iceland and Norway positively affects the fishing right concerning exclusivity. The exclusive catch quotas complemented with infrastructure results in that the operators in Iceland and Norway are pretty secured regarding their catch quotas. The fishing rights in Norway and Iceland are not perfectly exclusive since the nature of the fish resources in open water is unlikely to be fully exclusive, i.e., it is not a static resource. Fish resources are part of a marine ecosystem, and there are many operators targeting different species and even other industries that can affect the exclusivity of the rights. Hence, the fishing right is not perfectly exclusive or fully delineated.

4.1.2 Flexibility

Flexibility has, in general, a broad interpretation. Regarding the fishing rights, the term flexibility can overlap with all the characteristics. For instance, limitations in the transaction process of quota shares can reduce flexibility, low duration can reduce the flexibility of the operators etc. Here, however, we will limit the interpretation to only operational flexibility in the harvesting process. We will look at two types of flexibility: physical flexibility and economic flexibility or financial flexibility. The operation here refers to the actual harvesting process. Physical restrictions reduce flexibility, and the operators have fewer options and choices in their manner of harvesting. We explore two types of mechanisms: limitations on harvesting method and limitations of management of catch quota. While economic restrictions reduce economic flexibility, the operators have fewer options and choices to allocate monetary gain in the way they wish, other things equal. Here, we will explore three types of limitations on economic flexibility catch quota reduction, resource tax, and limitation on the method of sale. The fishing rights have “Perfect” flexibility if there are

no operational limitations. The operators can choose any harvested method, decide how and when the operator harvests the catch quota. There are no direct economic restrictions related to the harvesting operations themselves, though they have an economical translation, and sales restrictions are relevant. In contrast to perfect flexibility, the fishing rights have zero or low flexibility if the limitations on different aspects of harvesting are highly limited.

Evaluation

First, we will explore physical limitations thus any types of “tools” or mechanisms that the state can apply to reduce physical flexibility for the operators. There are mainly two mechanisms we have identified that reduce physical flexibility. First, **limitations on harvesting method** meaning; can the operators choose the type of gear and size of the vessel in the harvesting process. Second, barriers in catch quota management can the operators decide when and who harvests the catch. For Iceland, within the “unrestricted" ITQ rights, there are few if any restrictions on the type of gear and vessel size. The operators can choose the harvesting method. For Norway, however, the operators operate within groups that specifically state which types of vessel and gear can be operated; trawling group for bottom trawling, pelagic vessels equipped with purse seine, and the conventional vessel only operate with passive gears such as long line (Anon 2016). When it comes to **limitations of management of catch quotas,** this mechanism explores the transferability of catch quotas.[18] Operators have no guarantee that they will harvest the exact mix of species that the fishermen have a specific catch quota in. Scott (2008) refers to this type of regulation *“as the carryover of unused quota to the next season”* and discusses quota trading mitigated by the by-catch problem. There are two types of fisheries regulations that correspond to such limitations.

First, transfer between fishing periods. It is possible to transfer 10% of the catch quota for a specific vessel to the next period in Norway. Operators can either overfish the catch quota by 10%, and then it will be subtracted for next year, or under fish the

[18] Here, we must not confuse transferability of catch quota and quota share, the latter will be addressed in evaluations of the characteristic Transferability.

catch quota by 10% and be supplemented next year (Anon 2016). In Iceland, catch quota between periods can be transferred up to 15% in some species, and in addition, operators can overfish the catch quota up to 5%, which will be subtracted for the next fishing year (Fiskistofa 2020b). Regarding transfer between vessels and other operators. In Iceland, The Fisheries act (2006) outlines that there is authorization to transfer 50% of the catch quota using the cod equivalence index[19] between fishing periods[20]. The operators can, in addition, rent 50% of the catch quota to other operators. In Iceland, there is an active rent market of catch quota which the Directorate of Fisheries monitors (Fiskistofa 2020d). The only limitation is that the operator is required to harvest 50% of the catch quota annually, and if not, the operator loses the catch quota. Thus, in addition to transferring catch quota within the same operation, the operators can also transfer relatively easily to other operators and rent the catch quota. However, these transactions must be approved by the Directorate of Fisheries (Fiskistofa 2020b), and the Directorate can deny transactions of catch quota if it clearly exceeds the capacity of the recipient's vessel. As is explained by the Directorate of Fisheries in Iceland, this type of flexibility within the system is to help operators to comply with the regulatory framework, thereby promoting sustainable utilization of the resource (Fiskistofa 2020b).

In contrast, in Norway, the permission to transfer between vessels and rent the catch quota is highly limited. There is a mechanism or so-called lump fish scheme to transfer 20% of the catch quota within the fishing year if the vessel that transfers the quota has fished at least 30% of their catch quota (Anon 2016). The ability to transfer catch quota share can be viewed as some sort of catch quota accounting; harvesting over the limits of the catch quota is credit, while harvesting under the limits can be

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[19] The Fisherie act (2018, §19) explains the cod equivalence index. The index is frequently used in fisheries regulations in Iceland. The index represents the firsthand price of species in accordance to cod. For instance, 1 kg of cod = 0.55kg of saith for the fishing year 2020/21. If the catch quota is e.g.1000 tons of cod and 1000 tons of saithe for one user, the number of cod equivalence kg the user is allocated is 1550. The ratio changes every year, as it is based on the firsthand price from the previous year. Thus, value of saithe was 55% of cod value.

[20] §15

viewed as a debit for next season. These types of regulations have embedded mechanisms that allow for catch quota and catch to balance. The fishing right in Norway entails more physical limitations on the operators; they have fewer options in choosing the type of gear they operate with and fewer options to manage the catch quota, less transferability of catch quotas than the fishing right in Iceland.

The following three mechanisms reduce economic flexibility directly in the harvesting process, give operators less flexibility in managing the monetary gain, the outcome of the harvesting operations, all things equal. First, we will explore a mechanism in Iceland and Norway that we will refer to as ***catch quota reduction***. Catch quota reductions reduce the amount of the catch quota without interfering directly with the catch share of the operators. Share of the TAC is set aside to allocate to other groups, the share of the TAC is redistributed. This type of regulation does not intervene directly in the catch share, but the TAC for allocation or the net TAC. In Iceland's Fisheries act (2006), it is outlined directly that 5.3% of the TAC is set aside for coastal fisheries, a special quota for rural development, and other groups[21]. Norway has a similar share subtracted for side groups such as development quotas, recruitments quotas, research quotas according to a white paper from 2019[22]; the extent of the share to specific side groups has been between 4.3% - 6.8% since this type of mechanism was established in 2013. This type of mechanism is a catch redistribution by the state, where the state reallocates part of the catch quota to others to the detriment of the original operators.

The next type of regulation we will explore that reduces economic flexibility is **a specific type of levies on the volume harvested and/or value harvested**. Hereunder, for instance, resource tax. We have already mentioned resource tax in the introduction and directly linked it to our underlying hypothesis and the third research question. Since our third research question and our underlying hypothesis suggests that the high quality of fishing rights and economic performance might

[21] §8

[22] Meld. St. 32

potentially explain the high resource tax level in Iceland compared to Norway. Thus, this might seem as a contradictory argument that resource tax potentially reduces the quality of fishing rights. Nevertheless, we must bear in mind that in our analysis, we assume that resource taxes are only one mechanism that reduces the quality of fishing rights out of all other "tools" or mechanisms we explore and list in our analysis. In the following analysis, we explore any direct fees or levies on the volume harvested and assume it reduces economic or financial flexibility, all things equal. Naturally, the state has the authority to impose taxes, which directly influence monetary gain. Here, we differentiate between general levies and taxes that every entity within the same legal framework within the country is subjected to, and special levies and taxes subjected directly only to the harvesting process, such as value or volume taxes. Here, we will discuss the Fishing Fee act (2018) in further detail. The resource tax in Iceland is supposed to meet the cost of fisheries management, including a share of the profitability from the sector to the nation[23]. The tax is the so-called volume tax for each species subjected to quota restriction. Thus, for each kg. harvested, the operators must pay a specific amount depending on the species harvested. The Fishing fee act (2018) outlines the calculation method. The form of the fee each year is based on a so-called estimated profit for each species. The calculation method can be described in four steps. 1) Operators must deliver information on estimated "profit" for each species to the tax authorities in Iceland. 2) Information from each operator is combined, and a fixed percentage of 33% is then subtracted from the total "profit," which gives a specific amount 3) These amount for each species constitute 33% of "profit," is then further divided by the total catch from the year when the estimated "profit" was generated[24]. Equation 1 demonstrates the calculation method. The "profit" is not the same as the typical earnings before taxes (EBT) income sheet of companies or presented in official statistics. Since it is a required estimation of fixed costs such as depreciation and interest cost for each

[23] §1

[24] §3,4,5

species, and the fishing fee are excluded from the operational cost. The per kg. fishing fee in Iceland therefore becomes:

$$\frac{(\sum_{i=1}^{N} "profit"_x^{T-2}) * 0.33}{Total\ catch_x^{T-2}} = Fee\ per\ kg._x^T \qquad (1)$$

where N is the number of operators and x is the type of species.

The total fee at time T becomes:

$$Fee\ per\ kg._1^T * Catch\ per\ species\ _1^T \ldots . + \ldots . Fee\ per\ kg._S^T * Catch\ per\ species\ _S^T = Total\ fee^T \qquad (2)$$

where S is the number of species subjected to quota restriction.

The fee from 2021 is, for instance, based on estimated profit and catch from 2019. In 2021 the fishing fee for cod is ISK 16.63 per kg round weight (approximately NOK 1.1 per kg), which is equivalent to 33% of "profit" from cod per kg. in 2019 (Law Gazette 2021).

In Norway, there is no resource tax. However, the operators are required to pay a cost-recovery charge in from of a research fee as we mentioned in the introduction, it follows from the regulation on the Fisheries Research fee (2013)[25]. The purpose of the research fee is to meet part of the cost generates from fisheries management, such as monitoring and research purposes[26]. The fee was first introduced in 2013, and currently, the fee is 1.35% of the first-hand value after deductions of the fee from sales organizations (The Norwegian Fishermen's Sales Organization 2021a). Hence the fee is less than <1.35% of first-hand value. The research fee in Norway differs from the fishing fee in Iceland in three ways. 1) The extent of the fee: We have already outlined in the introduction the difference in the FSE between the countries, where we demonstrated that the level of cost-recovery charges in Norway does not

[25] FOR-2013-12-17-1567

[26] §1

meet the management cost while in Iceland, the fishing fee does. The cost-recovery charge in Norway is around 1.35 % of first-hand value, while in Iceland, it is on average 5% in the period 2010-2019, as Figure 8 shows. In 2018 the resource tax was 9% of firsthand value. 2) The fee calculation: The Norwegian fee is value-based and not based on profit, in contrast to the Icelandic fee, which is a volume-based fee based on profit. 3) Purpose of the fee: The Norwegian fee is only to meet the cost of management, in contrast to the fee in Iceland, where the purpose of the fee is supposed to give the nation a direct share in the profitability of the sector in addition, to meet the cost of management.

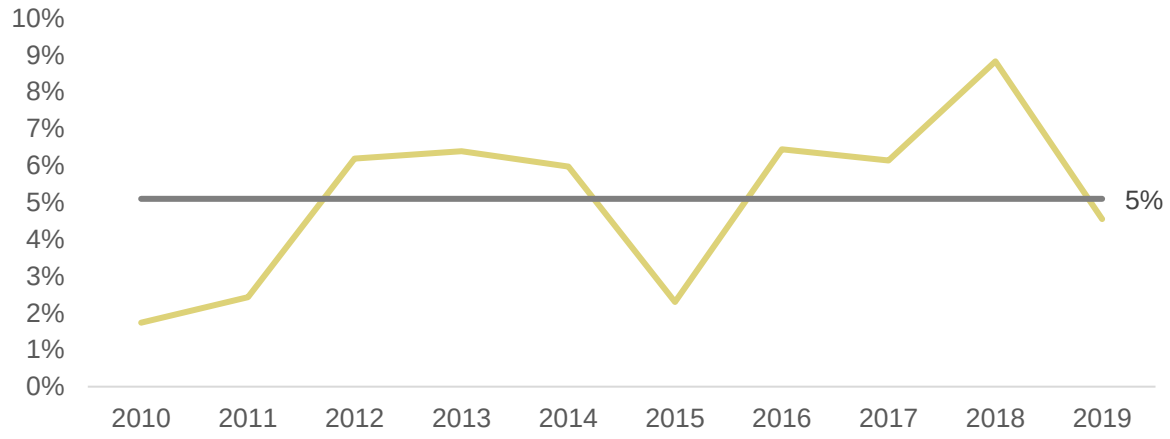

Figure 8 The resource tax in Iceland as a percentage of first-hand value from 2010-2019 (Deloitte 2020, Fiskistofa 2021b, and Statistics Iceland 2021a)

The operators in both countries are also subjected to other fees directly placed on the sectors that can be qualified as cost-recovery charges. Such fees are at a municipality level or institutional level. On a municipality level, there are, for instance, harbor fees. In Iceland, there is a special levy on the landings of the catch for harbor services. The harbor fee is 1,27% of the firsthand value and lowers if the products are frozen on board (The Associated Icelandic Ports 2021). In Norway, the fee is more moderate than the Icelandic harbor fee and dependent on each harbor. The fee is based on the size of the vessels and time spent in the harbor (Norway's marine fishing fleet organisation 2020). It is worth pointing out that the harbor fee in Iceland is similar to the cost-recovery charge in Norway.

The last mechanism or “tool” we will explore that we expect to reduce economic or financial flexibility is ***limitations on the method of sale,*** which explores the pricing system in the sale of catch, the first-hand value. The method of sale of the first-hand price or the pricing system is quite different in the two countries and based on two separate premises. In Norway, the operators must sell catch via the sales organizations, according to The Raw Fish act (2013). There are several sales organizations in Norway; the main one for selling pelagic species is the Norwegian Fishermen´s Sales Organizations for Pelagic fish (Norges Sildesalgslag), and the sale of demersal species is the Norwegian Fishermen´s Sales Organizations (Norges Råfiskelag). The operators own these sales organizations, and all transactions must go through these organizations. One of the objectives of the sales organizations is to secure payments to fishermen (Norwegian Fishermen’s Sales Organization for Pelagic Fish 2021 and The Norwegian Fishermen’s Sales Organization 2021b). According to the Raw fish act, the sales organizations have the mechanism to set so-called minimum prices, and one of the objectives is to provide a fair sharing between the operators and the industry, such as processing plants or other buyers of the raw material[27]. Another point in relation to the method of sale and research fee in Norway is that the sales organizations in Norway require fees of 0.1% - 0.9% of first-hand value dependent on the processing method on board (The Norwegian Fishermen’s Sales Organization 2021a). We do not necessarily view sales fees as taxation of the sector; however, as we outlined earlier in our analysis of the characteristic exclusivity, the sales organizations have a legal obligation to monitor landings. Considering that there are two points essential to mention: 1) The operators are required by law to sell through the organizations; thus, they do not have any options to escape the payments. 2) The sales organization in Norway also has official monitoring obligations, as all landings go directly through the sales organization, and thus there are strong arguments that a part of the fee to the sales organizations can be viewed as a cost-recovery charge. In Iceland, the method of sale is based on

[27] §11

different premises. Many of the largest operators in Iceland are vertically integrated companies (Knútsson, Kristófersson, and Gestsson 2016). Thus, the first-hand price in Iceland is often a transfer price, which is the price that occurs between related units within a company. The transfer price is essential concerning crew members' salaries since their salaries are based on a share of the first hand-priced catch. The first-hand price is monitored via cooperation between crew members association, industry organizations, and a governmental agency (Verðlagssofa skiptaverðs). The transfer price is decided as a substantial fraction of the price in open fish markets, around 80% of the price that is generated through open fish markets (The Agency of First-hand price 2021). In the light of the above, the method of sale in Iceland is restricted due to limitations of collective agreements between the operator and the crew members, not directly limited by the state. This is the case if the companies are vertically integrated, and if not, the operators sell their raw material on an open fish market. While for Norway, it is questionable whether the limitations set by the Raw Fish Act (2013) should be viewed as a restriction on sales method since the sales organization is owned by the operators themselves. The objective of the sales organizations is to secure the operator's fair payment; thus, it can be argued that the "limitations" on the method of payment might even increase their negotiation position. With this in mind, both the pricing system in Iceland and Norway are market-based price systems. Here, it is unclear if the pricing system is a negative mechanism or a positive mechanism; thus, we will ignore the "tool" in our assessment.

Assessment

We have listed and explored five types of "tools" or mechanisms that the state has to influence the strength of the characteristic flexibility: Harvesting method, catch quota managements, catch quota reduction, resource tax, and method of fish sale. In the light of the above, we estimate that the fishing rights in Iceland and Norway have "Moderate" flexibility. Despite that, we suggest that both countries' fishing rights are at the same level or strength; it is based on two completely different premises. The fishing rights in Norway have less physical flexibility, while there is less economic flexibility in Iceland. However, here are some essential points to outline;1) In Norway, the operators are limited with a specific type of gear, yet that does not necessarily mean that they are highly limited in their operations and they are not limited to a

highly inefficient gear such as hand line. To support this argument, the operators in Iceland, even without such restrictions, still choose many gear types such as purse seine, long line, and bottom trawling. Consequently, if the operators in Norway had complete freedom to choose the type of gear, they might choose the gear types they are limited within. Hence it is unclear if this type of physical limitation does significantly affect their operations. 2) The fishing rights in Iceland entail higher flexibility in catch quota management than in Norway, yet the operators in Iceland are still limited since there is a specific ceiling on the harvesting requirement. To stress, regulation or not only a binary mechanism but can also be a dimensional mechanism. According to our approach, perfect flexibility entails several rights, the right to choose a harvesting method, the right to decide who and when to harvest, including the right to lease catch quota, the rights to allocate monetary resources in the manner they choose, and the right to choose the method of sale.

4.1.3 Transferability

Transferability is related directly to investments in quota shares. Here, we will explore any limitations in transactions processes, where quota shares are bought and sold. Our focus is one of the key essential rights outlined in chapter 2, the right to sell an asset. For the following characteristics, we will mainly explore four types of “tools” that we expect to reduce the strength of the characteristic; 1) First is a regulation collection. Limitations on market share, here transactions can only be within a predefined group and within a specific area and loos of value of the asset in the transaction process 2) Limitation on the number of assets an operator can acquire. 3) Specific qualification requirement of buyers of quota shares. 4) Limitations of portioning the quota share in the transaction process. Hence, the strength of characteristics is “Perfect” if operators are not in any way limited within a predefined area or a group, and the value of the asset does not lose value in the transaction process. The operators can require total quota shares, portioned the quota share in the transaction process, and do not qualify the buyers. In contrast, transferability is low if any of these tools are highly limited; the strength of the transferability is zero if the operators do not have the right to sell quota shares.

Evaluation

Before analyzing the “tools” and mechanisms that the state has to influence the strength of characteristic, we will provide a brief historical overview of the transferability of quota shares in Iceland and Norway. We will start with the transferability of fishing rights in Norway. The Norwegian fisheries management system is embedded in a mechanism to transfer quota or combine the quota factors called the Structural quota system (SQS). The SQS was implemented in 2005, while earlier, other similar functions such as the unit quota scheme modified in slightly different manners (Anon 2019). The SQS authorizes operators to transfer or combine the quota factors from one vessel to one or more vessels within the same group. The traded vessels must be removed from operation within that fishery, and the operator must return the fishing licenses. The quota factor transferred to a vessel is referred to as a structured quota. As is explained by the expert official paper from 2016[28], the objective of SQS is twofold 1) to adapt the capacity of the fleet to the size of the resource, meaning it is a tool that creates incentives to decrease the number of vessels in accordance to the size of the resource 2) to secure that the fishing sector, in order to keep up with the productivity growth in the economy, to give incentives to increase the competitiveness of the sector (Anon 2016). There has been embedded mechanisms in the SQS system that might be considered to be counterproductive or deterrent to the objective of the system: 1) A vessel is only authorized to transfer within the same vessel group, and different vessel groups have different regulations. 2) Time limitation of the bough quota share 20- or 25-years dependent on when the transaction took place. The bough quota share is expected to be redistributed to the group. 3) Deduction of the structured quota can apply in the transaction process and be redistributed to the group, and 4) Limitations on the maximum number of quota factors a vessel can accumulate (Anon 2019). However, at the end of last year, several barriers were lifted for the offshore fleet in Norway, which will be explained further in detail.

[28] NOU 2016:26

There has been a mechanism to transfer quotas in Iceland since 1984; however, a uniform ITQ system was first implemented fully in 1991 (Daníelsson 1997). As we have outlined in 3.2.1, we focus on fishing rights for the offshore fleet in Norway, including the conventional offshore fleet, mainly large longlines, and the operators with fishing rights in the “unrestricted” ITQ group.

Our first mechanism is collecting of barriers or limitations derived from the SQS in Norway, such as a **limitation on market size, geographical or within the same predefined group, and quota share deprecation in the transaction process**. The regulations of the SQS for the offshore fleet (2005)[29], hereafter the SQS regulation, outline some of the “tools” listed above. First, quota share can only be transacted within the same group, and the vessel much be removed from the group, and the operators must return their fishing licenses, thus can no longer participate in fisheries[30]. Second, the quota share depreciates in the transaction process by 10% and is distributed to the vessel group. Previously the SQS-scheme entailed stricter geographical restrictions and a higher percentage of deprecations in the transaction process (see further detail in Anon 2019). However, at the end of last year, the despeciation of purchased quota share was made unified between groups and lowered to 10%, and most of the geographical restrictions were abolished (Ministry of Industries and Fisheries 2020). However, there is still a geographical restriction for the trawl group, where quota shares cannot be sold from North-Norway to South-Norway[31]. In Iceland, there are no geographical restrictions on the quota share, the quota share is not attached to a specific area, and in the transaction process, the buyers receive the total quota share that was offered for sale. One embedded mechanism in the system outlined in The Fisheries act (2006) gives the municipality a preemptive purchase right if a vessel with commercial licenses is being sold to an operator listed in another municipality[32]. Above all, the following mechanism explores

[29] [FOR-2005-03-04-193]

[30] §5

[31] §8

[32]§12

collections of regulations that consist of market size limitations: geographical restrictions and limitations on transactions within a limited group, and quota share deprecations in transactions processes. We conclude that these are limiting factors, thus reduce the strength of the characteristic's transferability for the fishing right in Norway.

The following mechanism is often referred to as a quota ceiling or maximum acceptable quota shares and is derived from Arnason (2005) and Scott (2008), i.e., limitation on the number of assets an operator can acquire. In both Iceland and Norway, there is a quota ceiling. There is a key difference in the practice of the quota ceiling in the Fisheries act in Iceland and the SQS regulation in Norway. In Norway, there is a limitation on the number of quotas shares or quota factors attached to a vessel, and in Iceland, there is a limitation on combined quota share that companies or individuals, including connected partners, can acquire. In Norway, the quota ceiling for offshore operators varies between groups. For instance, in the trawl group, the total number of quota factors that a vessel can acquire is 4 per vessel (including the vessels own quota)[33], in the conventional offshore fleet; total 5 quota factors per vessel[34], and in the purse seine group, it is 850 quota factors[35]. The quota ceiling for each group is not comparable since each group has a predefined amount of quota factors that vary between groups. In order to examine and compare between groups, we have listed in Table 5 the limit of quota factors as a share of total quota factors in each group. The quota ceiling for the Purse seine group (PS) is the lowest of the three groups presented in Table 5. The vessels in the (PS) group may only have 2% of total quota factors attached to a single vessel, while in the trawling group (TG) and conventional offshore fleet (CF), the limit is more than double as high compared to PS. However, as we explained, the quota ceiling is on the vessel, not the entity or the company, as is the case in Iceland. Thus, companies can own several vessels with quota factors. For instance, in the trawl group, the largest operator, Havfisk AS, has

[33] §8

[34] §12

[35] §9

seven vessels in operation that have nearly 18 quota factors, thus 20% of the total quota factors in operation.

Table 5 Quota ceiling for Purse seine group (PS), trawl group (TG) and conventional offshore fleet (CF) (Fiskeridirektoratet 2021e)

	PS	TG	CF
Quota ceiling: number of quota factors per vessel	850	4	5
Total number of quota factors	41481	88	92
Quota ceiling as % of total quota factors per vessel	2.0%	4.5%	5.4%

Several vessels within the trawl group and the conventional offshore group have reached the quota ceiling or are close to it, but as explained, there are still options for expansion in those two groups (Anon 2019). The quota ceiling in Iceland varies between species. In the case of demersal species, an individual, a company, or connected parties, quota share may never be higher than 12% for cod, 20% for haddock, 20% for saithe, 35% for redfish, 20% for Greenland halibut. For the pelagic operators, the limitation is 20% for herring and capelin. In addition, there is a limitation on the combined value of the catch quota share of a person or a company which cannot exceed more than 12% of the total value of the catch quota share for species that are limited by TAC[36]. The 12% are determined according to the cod equivalence index as we explained earlier, where the index represents a bundle of quota share based on the first-hand value of the species. Since cod is the indicator species, a company or individual can never own 12% of the cod shares. The Icelandic Fisheries Directorate publishes the number of quota shares by the company at the start of each fishing year. The five largest companies in relation to total allocate cod equivalence are listed in table 6. Brim, the largest company, has a little over 10% of the allocated cod equivalence in 2020, thus close to the ceiling, illustrated in Table 6.

[36] The Fisheries Act, §13

Table 6 Largest companies in relation allocation in cod equivalence in 2020 (Fiskistofa 2020c).

Companies	Brim	Samherji	Fisk-Seafood	Síldarvinnslan	Thorbjorn
Cod equivalence index	10.13%	7.02%	5.48%	5.22%	4.80%

However, for the pelagic sector where the ceiling is higher than for the demersal species, several operators have reached the ceiling or are close to the ceiling, as Table 7 demonstrates (marked with grey in the table).

Table 7 Quota shares of individuals companies for herring and capelin 2020 (Fiskistofa 2020a)

Companies	Brim	Samherji	Fisk Seafood	SVN	VSV	Skinney	Ísfélag V.	Eskja	Gjögur	Loðnuvinnslan
Herring	0%	11%	13%	16%	12%	19%	13%	0%	10%	3%
Capelin	18%	9%	0%	16%	11%	8%	20%	9%	3%	2%

Above all, the quota ceiling reduces expansion options for operators close to the ceiling and reduces the market size for potential sellers if a potential buyer is close to the ceiling. The effect of the fisheries regulations varies significantly between operators; thus, for some operators close to the ceiling, it indeed affects the expansion opportunities. While some operators are not close to the ceiling, the limitations only affect them in potentially lower market size. We, therefore, conclude that the quota ceiling is an opposing mechanism in the strength of the characteristic's transferability. However, it is unclear if the operators in Iceland or Norway are more limited. There is a ceiling on vessels for the operators in Norway, while in Iceland, there is a ceiling on the companies. Consequently, the operators in Norway have more options to expand on a company level, while in Iceland, there are more options to expand on each vessel within the limits of the company's total quota share.

The third mechanism we will explore is what we will refer to as **qualifications requirements.** This element explores if there are any specific requirements for the buyers or sellers. Arnason (2005), for instance, outlined that the limitations on foreign ownership reduce transferability. Within Iceland and Norway, some fisheries regulations exclude specific types of buyers. For Norway, the Participations Act

(1999) (Deltakerloven) outlines specific requirements for those who are authorized to participate as operators, thus be holders of fishing rights. The Participations Act (1999) outlines a license requirement (Ervervstillatelse)[37]. In order to have a fishing license there, the requirements of a specific qualification, such as foreign ownership, cannot exceed 40% of a company's total shares[38], and there is a requirement to be an active operator; thus, licenses cannot be handed out to agents that are not active[39]. The requirement to be an active user excludes anyone who wishes to participate in a fishing activity but has not been active previously; in addition, it deters backward (vertical) integrations. There are no similar licenses required for individuals to participate in Iceland, except there is a limitation on foreign ownership, higher than in Norway; According to the Act on fishing and processing of foreign vessels in Iceland's economic exclusive fishing zone (1998), foreign ownership cannot exceed 25% for companies operating in fishing activity[40]. Earlier, there were similar participation requirements in Iceland as is in Norway, but in 1998 the Supreme court of Iceland ruled that these requirements contradict equality under the laws and freedom of occupation outlined in the Icelandic constitutions. The laws were changed in order to mitigate the ruling of the Supreme court (Government of Iceland 2001).

The assessment of the specific qualification requirements is arguable. These types of restrictions do not limit the operators' options to buy quota shares, as on the contrary, it protects potential buyers from competition from other unauthorized actors. Thus, these limitations are only on the seller side since it excludes specific types of potential buyers, hence reducing the market size. In our analyses, we view the right to sell as complemented with the right to buy; thus, the right to buy cannot be separated from the right to sell. In addition, we are not analyzing the effect of the right of others to buy that does not have the right to sell, i.e., without fishing rights. Thus, even though it clearly affects the right to buy for potential foreign owners as is

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[37] §4

[38] §5

[39] §6

[40] §1

in both in Iceland and in Norway, or potential buyers that do not have licenses in Norway. In our analyses, we estimate the quality of fishing rights; we will not estimate the potential effects of actors who do not have a fishing right: the right to buy. Thus, although restrictions limit the market size for potential sellers due to fewer potential buyers, the restriction also assists potential operators since it reduces competition. There are more options to sell in Iceland, while operators have more competition from outside buyers, except for potential foreign buyers. Thus, we estimate that the effect of these types of barriers balances out. Compelling arguments presented by Hannesson (2004) relate to if the quota is sold freely, it will likely end up with users that can provide the highest payments for the quota share. As Hannesson (2004) explains, usually the ones who are willing to pay the highest price are the most efficient operators mentioned in chapter 2. However, another angle presented on this point from Nøstbakken (2012) is that traditional economic theory such as Hannesson (2004) applies does not necessarily apply to quotas if the owners have acquired quota shares via grandfathering or below market price. Scott (2000) explains that grandfathering is when TAC is implemented in fishery and operators or vessels are allocated catch quotas in accordance to historical catch of the operator or vessel. Nøstbakken (2012) argued that resource rent allows operators to operate inefficiently. Thus, they can afford to let other objectives than pure profit maximization influences their investment decisions. She concluded that it is not necessarily the most efficient owner that invests in quota and the least efficient owner that sells out, which contradicts Hannesson (2004). Thus, it is highly unclear whether such regulations affect the potential monetary gain from the asset. However, if we assume the operators are the most efficient owners, it[41]is unlikely that outsiders can compete. However, Arnason (2005) presented compelling arguments related to reducing foreign restrictions improving the overall ITQ system in Iceland by allowing international trade of quotas, thus allowing for global specializations for the sector. Thus, according to Arnason (ibid), it would improve the overall ITQ system in Iceland if foreign restrictions would be eased. However, another point which we presented in

[41] even though Nøstbakken (2012) demonstrated operators are not a homogeneous group, some are less efficient operators compare to others.

the introduction, that governments might more likely implement resource tax if foreign ownership is a considerably large share of the operators. Hence, this suggests that operators in Iceland and Norway might potentially prefer a limitation on foreign ownership, especially if that meant lower resource taxes. Due to the above, we will ignore special qualifications requirements since it is highly unclear if it increases or decreases the strength of characteristics transferability.

The last element we will analyze for the characteristic transferability is divisibility, ***portioning the quota shares*** **in the transaction process**. There are no limitations on divisibility in Iceland; the operators can freely divide their quota share in the transaction process. Thus, operators in Iceland can decide to sell a part of their cod quota shares, or only their haddock quota share etc. In Norway, there is zero divisibility on the seller's side; thus, if an operator decides to sell, it must return the fishing licenses, and the vessels must be removed from operation, as we mentioned at the start of this sub-section. However, there is divisibility on the buyer side; thus, buyers can buy several quota factors from one vessel and divide them into one or more vessels (Anon 2019). It is essential to mention that potentially operators can go around zero divisibility by emerging into companies; at least, there is no formal divisibility. Also, it is worth pointing out, which we have mentioned previously, that the quota shares in Norway represent a bundle of species, while in Iceland, it is on an individual species level. Low divisibility or lack of divisibility clearly reduces options for operators; the operators must sell the entire quota and leave fisheries, consequently few options to continue fisheries if the operators decide to quota shares.

Assessment

In the following analysis, we have listed up to four potential harmful mechanisms that are likely to affect the strength of the characteristic transferability: 1) limitation on market size, which we explore geographical limitation and within the same predefined group as well a quota share depreciation in transaction process 2) quota ceiling 3) qualification requirements and 4) limitations on portioning the quota shares in the transaction process. In the light of the above, we estimate the strength of the characteristic transferability as "High" for the fishing rights in Iceland while suggesting

that the fishing rights in Norway have “Moderate” transferability. The fishing rights in Iceland cannot be estimated as “Perfect” due to the quota ceiling. In the case of fishing rights in Norway, the geographical limitations have in many ways been uplifted, yet there is still a quota share deprecation in the transaction process, quota ceiling, and low divisibility.

4.1.4 Duration

Here, we will explore the expected duration of the fishing rights, i.e., how long the operators can expect to exercise their fishing rights is an important aspect. Clearly, the longer the expected duration, the higher the strength of the characteristic. The fishing rights have a “Perfect” duration if there are no time limitations on the fishing right. The strength of the characteristics decreases gradually the shorter the operators can expect to exercise the fishing rights. The characteristic has a “Low” duration; if operators can expect to exercise their fishing rights for a relatively short time, here rule of thumb would be if operators cannot expect future gain from investments. The short time here clearly depends on the discount rate. Less than five years would be perhaps a realistic benchmark for a short time. In contrast, if operators can expect future gain from investment, the fishing rights have “Moderate” or “High” duration depended on the duration and the discount rate, while if there are no time limitations, the fishing rights have “Perfect” duration.

Evaluation

We will only explore one type of mechanism for the characteristic: **limited timespan of the fishing right**. Evaluation of the duration should be relatively easy to examine, i.e., by determining how long operators can exercise their fishing rights. However, both for Norway and Iceland, this is not as clear-cut as it may appear at first glance. In Norway, the fishing rights are highly tight to the licenses; if not, the license is the formal fishing rights. If we start with fishing rights in the form of licenses in Norway, the offshore operator licenses have no time limitations, while the coastal fleet must renew their licenses annually (Anon 2016). Nevertheless, it would be hard to argue that the fishing right for the coastal operators has only one year in duration. However, if we explore the duration in the form of the time span of the quota shares, the duration can be viewed as partly limited. The bought quota share has a predefined

timespan. There are two durations, 25 years if the quota shares were bought in the period 2005-2007 and 20 years if the quota share was bought after 2007 (Anon 2016). The quota shares bought under the SQS scheme have not “expired” yet, and it is unclear what will occur after the time limitations have passed. As is explained in the expert paper from 2016,[42] it will be up to the authorities at the time to make decisions on how and if the quota shares will be redistributed. A white paper from 2019[43] mentioned that are expectations from the sector that the quota shares will be distributed back to the groups (Anon 2019). Nevertheless, the base quota share, that is, quota share that has not been purchased, can be viewed in connection to the fishing licenses that do not have time limitations. In the case of the fishing rights in Iceland, it is explicitly outlined in The Fisheries act (2006) that the fishing rights do not constitute an irrevocable guardianship[44]. However, a linkage to permanence in the Income-tax act outlined that bought time-unlimited quotas shares cannot be depreciated[45]. According to the Income-tax act (2003), bought quota shares are permanent, and as such, cannot be depreciated since the quota shares do not lose value over time and usage, while fishing vessels according to the same act depreciate in accordance to use and estimated lifetime[46]. The key difference between the duration of the fishing right for Iceland and Norway is the defined durations for bought quota shares in Norway. Consequently, bought quota share in Norway can be depreciated according to tax authorities (Norwegian Tax Administration, 2021).

Assessment

In the light of the above, we assess the fishing right in Iceland to have a “Perfect” duration. The fishing right has indefinite durations, but there is a mentioning of bought quota shares as permanent in tax laws. Thus, if bought quota share is viewed as permeant, we, therefore, conclude that the fishing rights has “Perfect” duration. For the fishing rights in Norway, we estimate that the fishing right has a “High”

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[42] NOU 2016:26

[43] Meld. St. 32 (2018-2019)

[44] §1

[45] §48

[46] §33

duration. The duration of the fishing rights in Norway is viewed from two angles. Firstly, the fishing right itself has an indefinite right, such as the Icelandic fishing rights. However, since the bought quota shares have definite time limitations, the fishing right cannot have a “Perfect” duration for Icelandic fishing rights. We conclude that 20 years or 25 years is a long duration.

4.1.5 Security

The last characteristic we will assess in our attempt to define the quality of fishing rights is security. Security refers to the expectations of the operator’s ability to hold on to the fishing rights. The extent of the following characteristics refers to the likelihood of the state retracting the fishing right and the likelihood of withstanding legal challenges if the fishing right is challenged in a legal setting. The fishing rights have “Perfect” security if there are no examples of the state retracting the fishing right fully and operators can expect to win legal challenges if the fishing rights are challenges. The fishing rights have “Zero” or “Low” security if there are examples of the state retracted the fishing rights or per. The evaluations of the characteristics differ from the other characteristics that we have evaluated earlier in the way that we are not looking directly at fisheries regulations, as we will instead explore past behavior, i.e., taking a look in the rear mirror. The evaluations of Security are directly linked to expectations, outlined in definitions of economic rights by Barzel (2001), as explained in chapter 3. Barzel (2001) explains that property rights are a forward-looking term, relates to expectations.

Evaluation

Security is closely linked to predictability; thus, for security, we will explore the mechanism related to lack of predictability. Hannesson (2004) outlined that if government management policy consists of clear rules that do not frequently change, thus are predictable. The operators can make rational decisions. Here we will explore two so-called unpredictability mechanisms. First, we will examine the ***likelihood of the state retracting the fishing right fully***. In both Norway and Iceland, there are no examples of the state stepping in and retracting the fishing rights fully, terminating the fishing rights on an aggregate level. While for instance, in Faroe Islands, the state retracted all fishing rights with a ten-year notice in 2007 (Ministry of Fisheries in

Faroe Islands 2016). The second mechanism we will explore is **the likelihood of withstanding legal challenges** if the state challenges the fishing right. We have already outlined no examples of the state stepping in and retracting the fishing rights fully; thus, we do not have any legal examples of the operators challenging such an outcome in a legal setting. However, there are examples of the state modifying the quality of the fishing rights negatively and the operators in Iceland and Norway challenging such outcomes in a legal setting. In Iceland, there is a recent case concerning the quota allocation of mackerel. In short, several operators in Iceland complained to the Ombudsman of the parliament that the allocation of mackerel quota had not been in accordance with the law (Althingi Ombusman). The operators complained that the allocation of mackerel quota was based on a yearly regulation instead of according to the Fisheries Act. The minister of fisheries had not allocated the mackerel quota in accordance with the historical catch as the Fisheries Act states. Thus, the operators complained that they were allocated lower quota shares than what they were entitled to based on their historical catch. The companies got recognition from the Ombudsman of the Parliament that the minister had not followed the Fisheries Act concerning the allocation of the mackerel quota (Althingi Ombusman 2014). The companies summoned the state to a district court, where they won against the state. The state then appealed to the supreme court, which did not revert the district court's findings (Supreme Court of Iceland 2018). At the start of 2020, seven operators summoned the state, including the two operators that complained to the Ombudsman, the state, for compensation for the financial loss of the effect of lower quota allocations. A political process occurred where politicians questioned the operators' right to claim compensation from the state as unappropriated. The prime minister encouraged the companies to withdraw the claims, and the finance minister told in an interview that the companies would be sent a "check" if they continued with their financial claims (200 mílur 2020b and Bjarnason 2020). Five out of seven companies withdrew their financial claims against the state, while two continued (200 mílur 2020a). The process has currently not been settled for the two operators. The example from Iceland demonstrates that even though the legal system potentially protecting fishing rights, the political arena can influence the outcome. The words or the threat from the finance minister were clear, meaning that

the state has several tools to retract the compensations from the companies. For instance, the state could raise the resource taxation level and other measures without being susceptible to a loss in a legal setting. In Norway there is an example known as the Volstad case (Volstad Dommen). As explained earlier, there are two types of duration; 25 years for the quota shares acquired in the two years 2005-2007, and 20 years from 2008 and after. Initially, when the SQS system was implemented in 2005, there was no time duration of quota share, but the state changed this in 2007 where acquired quota share was limited to 20 years, while quota acquired before the change was handed a duration of 25 years. Volstad AS, a fishing company, challenged these changes in a court of law, claiming they were introduced retroactively (*tilbakevirkende kraft*), which is often referred to as “Ex post facto law.” The company had invested in quota share, expecting that the invested quota rights had unlimited time duration. The company lost to the state in the Supreme court of Norway; however, with the smallest majority possible, not all supreme judges agreed with the majority's interpretations (Supreme Court of Norway 2013). The example from Iceland demonstrates that operators can win in a legal setting if their fishing rights are being challenged, but the political arena can influence the outcome. The examples from Norway demonstrate that the state has the authority to change regulations retroactively, which is generally not considered legal. Arnason (2005) mentions the political threats to the continuity of the fisheries management system, but he did not account for this in his estimations of security for Iceland. He mentioned political threats in relation to duration. In our view, the political challenges are more related to the characteristic security, but as both Arnason (2005) and Scott (2008) have explained, these are closely related. It is important to note that both examples presented above occurred after Arnason (2005) performed his analysis.

Assessment

As we have explained, we are looking in the rear mirror. By that, we mean that we explore previous behavior and actions by the state. Consequently, we are not exploring directly listed fisheries regulations that are found in fisheries regulations or other laws as we did in our evaluations of the other characteristics. We suggest that both the fishing rights in Iceland and Norway have “High” security. We conclude that there is a low risk that the state would retract the fishing rights fully, and if the state

would, then legal settings would probably clarify whether such measures by the state are legal or not. It is expected that the operators would withstand such drastic measures in a legal setting. However, this has not been tested in either Norway or Iceland. Thus, here we are presenting pure speculation. However, due to the legal examples in Norway and the political challenges in Iceland, we presented some alarming signals. Operators are in challenging positions concerning legal and political challenges where the state modifies the fishing rights negatively, without retracting the fishing rights fully. In the light of the above, the strength of this characteristic cannot be “Perfect” for fishing rights in Norway and Iceland, precisely because the state has the toolbox and can use it, and the operators appear to be in weak legal and political positions.

4.2 Q-measure

We have now completed the first stage in our analytical process in this chapter and have evaluated and assessed the strength of each characteristic. We have used our metaphorical toolbox to identify and list potential “tools” and mechanisms that are likely to influence the strength of each characteristic. Table 8 provides an overview of all the “tools” and mechanisms we have identified and explored in our evaluation process. The “tools” represent the premises of our analysis to define and assess the quality of the fishing rights in Iceland and Norway. Now we will move to our second stage and present our Q-measure, where we combine the evaluation of each characteristic into one measure, an average measure. Based on our approach, the quality of the fishing rights in Iceland is “High” while in Norway, “High (-),” ranging from Moderate to High. The results are presented in Table 9 and are visualized in Figure 9 presented on a spider chart. As Arnason's (2005) explained exclusivity, duration, and security are the three most essential characteristics of the fishing rights and based on our evaluation, the three characteristics have high or perfect strength in Iceland and Norway.

Consequently, according to our findings, the operators in Iceland and Norway can expect to be relatively free from outside interference in their operations; thus, fishing rights are exclusive. The fishing rights have high security; the operators can expect high predictability in operation and expect a long duration of exercising the fishing

rights. Thus, based on our findings and Scott (1988, 2000, 2008), the operators in Iceland and Norway can expect future gain from their investments. The only difference between the two countries' fishing rights in relation to the three most essential characteristics is that we estimated the duration of fishing right in Norway as "High" in contrast to "Perfect" for Iceland since there are time limitations on bought quota shares for the operators in Norway.

However, when we explored the characteristic flexibility, we assessed the fishing rights in Iceland and Norway to have "Moderate" flexibility. For the fishing right in Norway, we outlined more physical restrictions for the operators, less flexibility in harvesting method, and catch quota management than in Iceland. At the same time, we concluded that there is less economic flexibility or financial flexibility for the operators in Iceland. The state in Iceland places more direct economic barriers than the state in Norway due to the resource taxation level. However, both countries have a so-called catch quota deduction at a similar level. Concerning transferability, the fishing rights in Iceland have higher transferability; thus, fewer restrictions and barriers in the transaction process. Transferability could not be assed "Perfect" in Iceland due to the quota ceiling. In Norway, transferability has increased for the operators for the past one and a half decade; at the end of last year, the state relieved most of the geographical restrictions, confirming the dynamics of characteristics. Despite that, the fishing right in Norway still entails depreciation of quota in the transaction process, low divisibility, and a quota ceiling; thus, we assessed the fishing right to have a "Moderate" transferability. In the light of the above, the only difference in Q-measure or the quality of the fishing rights is the unlimited timespan of the fishing right in Iceland and the lower transferability for the operators in Norway.

Table 8 The premises of quality of fishing rights

Exclusivity	Flexibility	Transferability	Duration	Security
Competition for catch	Limitations on the harvesting method	Limitation on market size, geographical or within the same predefined group, and quota share deprecation in the transaction process	Limited timespan of the fishing right	The likelihood of the state retracted the fishing right fully
	Limitations of management of catch quotas	Quota ceiling or maximum acceptable quota shares		
Overlap between fishing rights or other rights	Catch quota reduction	Qualifications requirements		Likelihood of withstanding legal challenges
	Specific types of levies on the volume harvested and/or value harvested	Limitations on portioning the quota shares		
	Limitations on the method of sale			

Table 9 The level of the characteristics and the Q-Measure for the fishing rights in Iceland and Norway

	Iceland	Norway	Iceland	Norway
Exclusivity	High	High	3	3
Flexibility	Moderate	Moderate	2	2
Transferability	High	Moderate	3	2
Durations	Perfect	High	4	3
Security	High	High	3	3
Q-Measure~$_{2021}$	High	High (-)	3	2.6

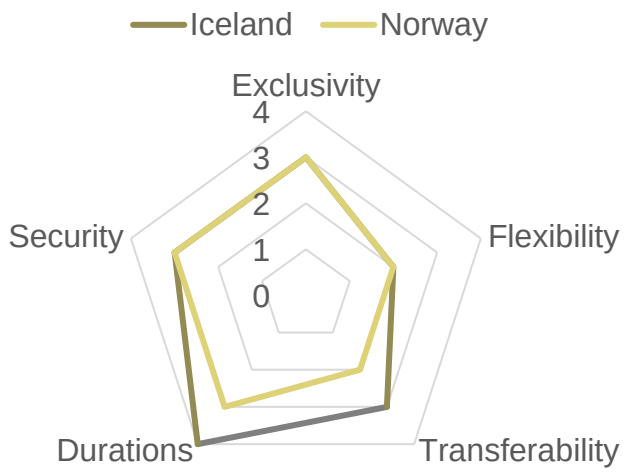

Figure 9 Quality of fishing rights in Iceland and Norway

In this chapter, we have compared fishing rights in Iceland and Norway systematically from a theoretical aspect. Identify key differences in fishing rights between the two countries. Our approach provides a useful overview of essential laws, regulations, and other mechanisms that influence the quality of fishing rights. In the following chapter, we seek to explore the economic performance of the two fishing sectors.

5 Economic Performance

In the previous chapter, we concluded that the fishing rights in Iceland and Norway have both “High” quality fishing rights. In the following chapter, we move to the second and last stage of this research, examining and comparing the fishing sectors' economic performance in the two countries. In the last chapter, we could not find a significant difference between the overall quality of the fishing rights, but perhaps there can be a difference in economic performance, potentially explaining the difference in the resource taxation level between the two countries. We have previously outlined our approach, data, and concept in chapter 3, section 3.2.2. This chapter aims to explore and compare the economic performance between the two countries. In addition, to find a potential explanation for higher resource tax in Iceland compared to Norway. The following chapter is split into two sections. The first section will explore the three profitability indicators: EBITDA, EBT, and EBIT. In the second section, we will explore the quota prices in the two countries.

5.1 Profitability indicators

In this section, we will first compare the EBITDA and EBT between the two fishing sectors; then, we will explore the EBIT of the two fishing sectors compared to other industries in the economy to identify the level of profitability in comparison to other sectors.

Earnings before interest, taxes, depreciation, and amortization (EBITDA)

We will present our first profitability indicator for the fishing sector's EBITDA as a percentage of revenues. This indicator only accounts for costs generated in the operational cycle. Figure 10 demonstrates the development of EBITDA from 2010-2019 for the two sectors in Iceland and Norway. The EBITDA for both sectors follows similar trends in the reference period, but the sector in Norway has far higher EBITDA for all the years in the period compared to Iceland. For the sector in Norway, the EBITDA fluctuates from 24% to 33%, with an average EBITDA of 29%. For the sector in Iceland, the EBITDA fluctuates between 18% to 27% in the reference period and is on average 23%. Consequently, according to the results presented in Figure

10, the sector in Norway generates higher earnings or profit in the operational cycle or core operations compared to the sector in Iceland. On average, the Norwegian sector has lower relative operation cost, 71% of total revenues, compared to the Icelandic sectors ‘77% of total revenues. Thus, the fishing sector in Norway has higher profits to meet depreciation and interest costs.

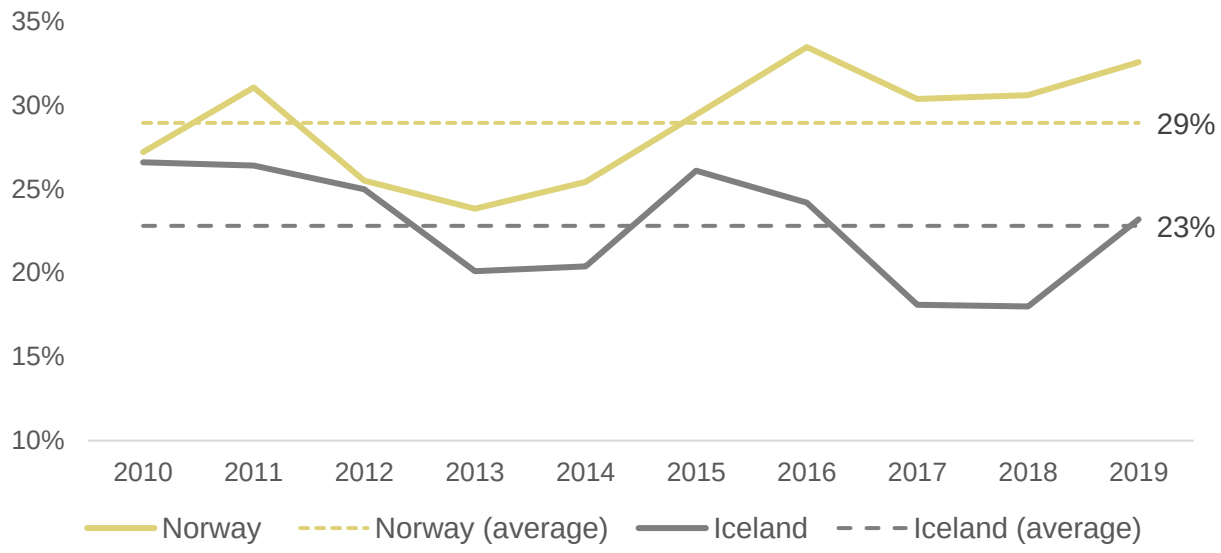

Figure 10 EBITDA as a percentage of revenues for the period 2010-2019 for the fishing sector in Iceland and Norway (Fiskeridirektoratet 2021d and Statistics Iceland 2021c)

There is, however, a key difference in operational cost between the two sectors. The fishing sector in Iceland is obliged to meet significant expenses in the operational cycle via the resource tax, which we have already outlined is on average 5% of total first-hand value in the period, as Figure 8 displays in the previous chapter. In order to examine the effects of the resource tax for the sector in Iceland, we will adjust the EBITDA, meaning we will subtract the resource tax from the EBITDA for each year in the time period.

$EBITDA_t$ – resource tax_t = Adjusted $EBITDA_t$

Adjusted $EBITDA_t$ / $Revenues_t$ = “Adjusted $EBITDA_t$ (%)”

Figure 11 demonstrated the results from our “Adjusted $EBITDA_t$”, on average the “Adjusted EBITDA” for the Icelandic sector was 28%, 5% points higher than “actual” EBITDA for the same period. Indicating that, on average, for the period 2010-2019,

the resource tax lowers the EBITDA by 5% points. Further demonstrations of this calculation are shown in Appendix 2. However, the “adjusted EBITDA” for the Icelandic sector is still 1% point lower than the EBITDA for the Norwegian sector. Consequently, from our first profitability, the fishing sector in Norway appears to have marginally higher profitability than the fishing sector in Iceland.

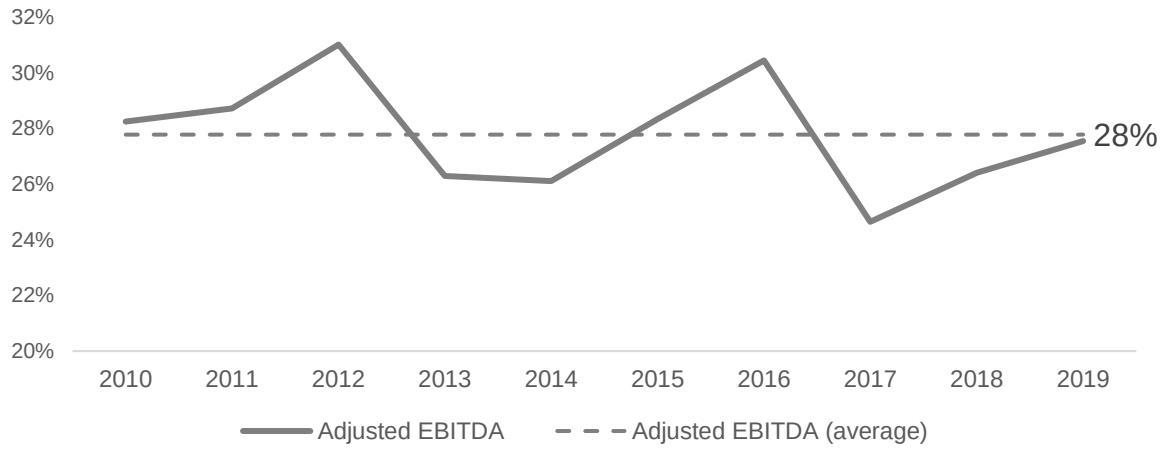

Figure 11 "Adjusted EBITDA" as a percentage of revenues for the fishing sector in Iceland (Statistics Iceland 2021c and own calculation)

Earnings before taxes (EBT)

The second indicator we will explore in this section is net profit before tax or EBT; this indicator, as we have explained in section 3.2.2, includes all costs generated in the operational cycle, investment cycle, and financial cost. Figure 12 demonstrates the development of the EBT as a percentage of revenues for the sectors in Iceland and Norway. Our second profitability indicator gives different findings than the first one. On average, the EBT is higher for the sector in Iceland than the sector in Norway, 14% on average in the period compared to 12% for the sector in Norway. The EBT for the sector in Iceland fluctuates between 7% - 24%. The EBT for the sector in Norway fluctuates between 2%-19% in the reference period. Although, for the three last years in the reference period, the EBT is higher for the sector in Norway compared to the sector in Iceland. More uncertainties are comparing the EBT in contrast to the EBITDA. EBT accounts for non-operational activities, for instance, net currency profit, net profit of the sale of assets, and adjustment for inflation for the Icelandic sector.

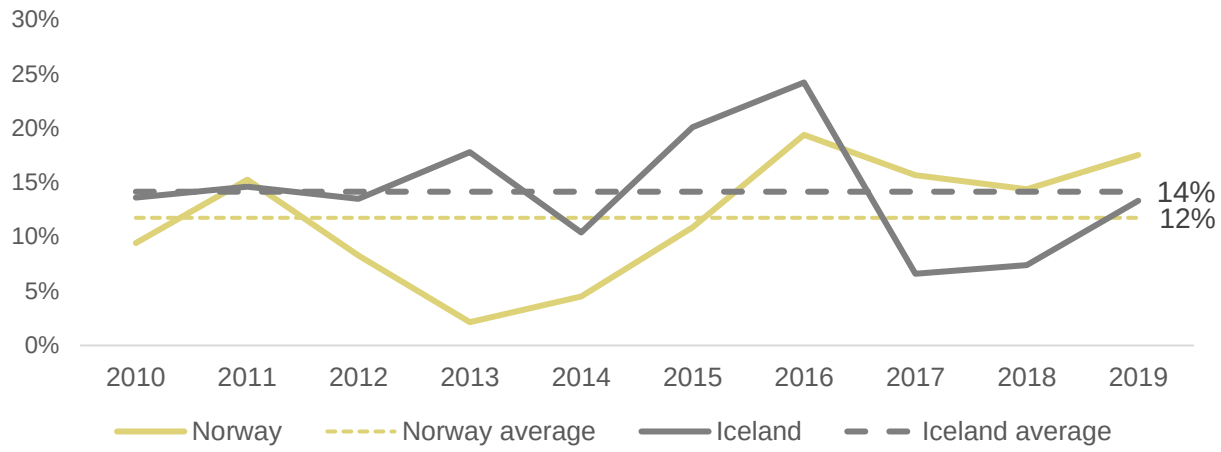

Figure 12 Net profit before tax (EBT) for the fishing sectors in Iceland and Norway between 2010-2019 (Fiskeridirektoratet 2021d and Statistics Iceland 2021c)

For the Icelandic sector, the "net financial cost" was positive two years in the reference period 2010-2018, in 2013 and 2016, which resulted in similar EBT and EBITDA in 2013 and 2016; see further details in Appendix 2. According to the results presented in Figure 12, the EBT for the fishing sector in Iceland is higher in the reference period by 2% points. Might perhaps the results indicate that Iceland has higher EBT profit because the fishing rights in Iceland have a slightly higher quality of fishing rights compared to fishing right in Norway, as we concluded in the previous chapter. Not necessarily, three points might explain why Iceland has higher EBT than Norway. Firstly, the EBT accounts for net currency profit and other irregular activities. For instance, in the two years where "net financial cost" was positive, it increases the average EBT for the period. Secondly, higher EBT might be explained by potentially low depreciation of fishing vessels due to the higher average age of the fishing vessels than the fishing vessels in Norway in the reference period, outlined in Table 5 in section 3.2.2. Thirdly, there is a fundamental difference in the investment cycle between the two sectors; the operators in Norway are authorized to depreciate purchased quota shares. We have already mentioned the depreciation of purchased quota share in relation to the characteristic duration in chapter 4. In order to examine the effects of the depreciation of the purchased quota share, we will conduct a similar approach as we did with the "Adjusted EBITDA" for the Icelandic sectors. We will adjust the EBT for the sector in Norway, meaning we will exclude the depreciation of purchased quota share:

EBT_t – Depreciations of purchased quota share$_t$ = Adjusted EBT_t

Adjusted EBT_t / Revenues$_t$ = “Adjusted EBT_t (%)”

The results of our approach are demonstrated in Figure 13. The results show that the average “Adjusted EBT” for the fishing sector in Norway is 15%, thus the effect of the depreciation of purchased quota share lowers the net profit by 3% points on average in the reference period. Consequently, the EBT for the fishing sectors in Iceland is lower compared to the “adjusted EBT” for the fishing sectors in Norway. Calculations for each year are demonstrated in further detail in Appendix 2.

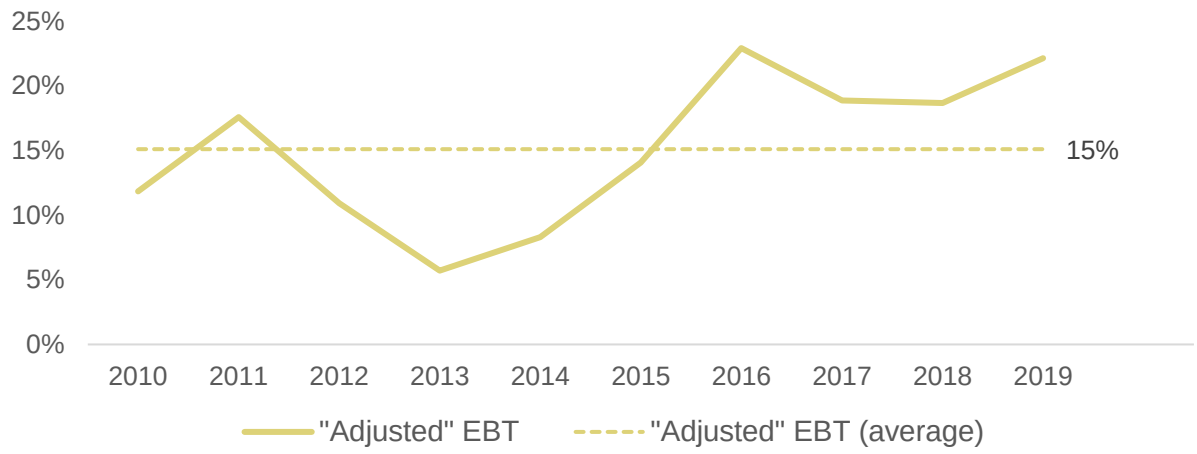

Figure 13 "Adjusted EBT" as a percentage of revenues for the fishing sector in Norway (Fiskeridirektoratet 2021d and own calculation)

Earnings before interest rate and taxes (EBIT)

Our last profitability indicator is EBIT which accounts for all costs in the operational cycle and the investment cycle but excludes net financial costs. Now we want to explore if profitability in the fishing sector is higher, on average, or lower compared to other industries in the economy. Figure 14 demonstrates results for Norway, and Figure 15 demonstrates results for Iceland. In Norway, the EBIT for the fishing sector is 18% on average in the reference period while for other industries, 10% in the reference period, consequently 8% points higher on average for the fishing sector compared to all other industries. For the fishing sector in Iceland, the EBIT was 17% on average or a 1% percentage point lower than for the fishing sector in Norway.

However, in comparison to other industries, the EBIT was 8% points higher. Consequently, both the fishing sector in Iceland and Norway have nearly double the EBIT (%) compared to the other sectors in the economies. Further detailed are disclosed in Appendix 3.

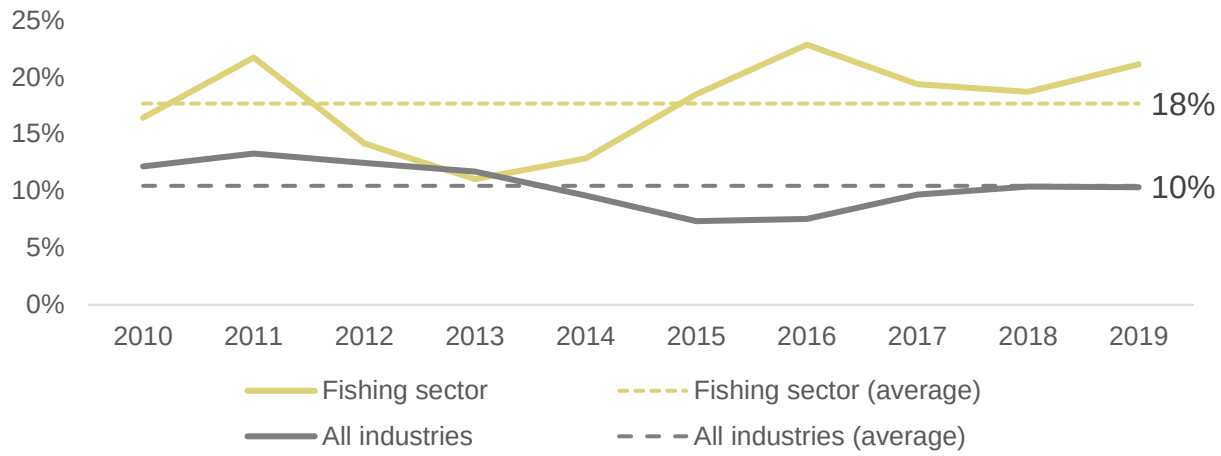

Figure 14 Norway: Earnings before interest rate and taxes as percentage of revenues (EBIT) for the fishing sector and other sectors from 2010-2019 (Fiskeridirektoratet 2021d and Statistics Norway 2021a) [47]

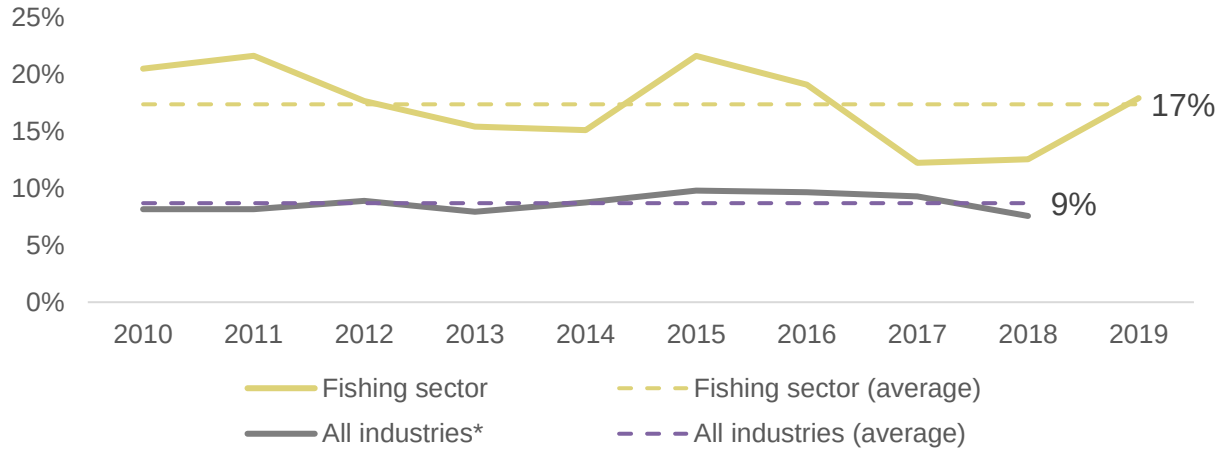

Figure 15 Iceland: Earnings before interest rate and taxes (EBIT) for the fishing sector and other sectors from 2010-2019 (Statistics Iceland 2021c, 2021b) [48]

*Timeseries only available until 2018.

[47] All industries means “all non-financial limited companies”

[48] all industries means excluding pharmaceutical, waste collection, financial, and insurance activities.

In this section, we have explored the economic performance through financial accounting for the sectors in Iceland and Norway. We have demonstrated that profitability is high in the two fishing sectors in Norway and Iceland compared to other sectors in the economy with Figures 14 and 15. The results indicate a connection between our analysis in chapter 4 and the theoretical framework in chapter 2, property rights and economic performance. Hence, evidence supports that high-quality fishing rights result in high economic performance, confirming the theory from chapter 2. However, we could not find any evidence that Iceland has higher profitability; in essence, the profitability of the two fishing sectors is relatively similar. The results presented in this section are not necessarily surprising in the light of the findings we presented in the previous chapter. The fishing sector in Norway has higher EBITDA, which can largely explain by the high resource taxation level in Iceland compared to Norway. The fishing sector in Norway has lower EBT, but that can largely be explained since it is authorized to depreciate purchased quota shares which reduce the EBT.

In this section, we must bear in mind that the vessel population that the two fishing sectors represent are not identical in size, the catch compositions, value per kg. and other measures, as we have demonstrated in Tables 4 and 5. We have, for instance, not addressed one mechanism that we mentioned in relation to flexibility in the last chapter; the method of sale of fish. In our evaluation of the quality of the fishing rights, we ignored the method of sale since we were unsure if it could be assessed as a negative “tool.” For Norway, the price is regulated to secure the fishing operators a fair share of the cake divided between them and the buyer of the raw material. In Iceland, the price is regulated via collective agreements to secure the crew members a fair share of the cake since the operators are, in many cases, the buyer themself, through vertically integrated companies. Could one explanation for favorable profitability in the fishing sector in Norway be that the method of sale gives the sector in Norway such an advantage concerning profitability? In addition, several external factors can influence the operational cycle, both revenues, and costs, of the sectors, such as development in TAC, prices on international markets, and currency exchange. However, for both the sector in Iceland and Norway, there has been a favorable development concerning catch of cod. In the reference period that we

explored in this section, both biomass of the Icelandic cod and the North-East Atlantic cod has increased considerably, resulting in higher TAC and catch (see here ICES 2019, 2020b). If we explore the currency development for the two fishing nations, the real exchange rate of the Icelandic krone (ISK) was relatively weak in the first five years of the reference period compared to the ten previous years earlier and appreciated in the second half of the reference period. The Norwegian krone (NOK) was relatively strong concerning the USD in the first half of the reference period but depreciated in the second half of the reference period (Central Bank of Iceland 2021b and Central Bank of Norway 2021 see more detail in Appendix 4). Hence, both sectors have experienced periods with a relatively weak and strong currency in our reference period. A weak currency is more favorable than a strong one since these are export-orientated sectors. Regarding the inputs, we expect changes in oil price to affect the two sectors on a similar scale.

5.2 Quota price

In the final sections of this chapter, we will explore one final indicator to evaluate potential economic performance, namely the quota prices in fisheries in the two countries which we briefly explained in section 3.2.2. We addressed this topic in the theoretical chapter where limitations on property rights were argued to influence the economic performance of owners, not only directly via the profitability indicators as we explored in previous sections of this chapter, but also through the value of the asset, meaning the price of the quota share. In the last section, we could not find any evidence to support that the fishing sector in Iceland has high profitability. However, could the marginally higher quality of the fishing rights in Iceland be reflected in the quota price. In Flaaten et al. (2017), it is outlined that there is a higher quota price in Iceland than in Norway, yet in Flaaten et al. (ibid), there are no references to actual quota prices. This does not necessarily come as a surprise, as there are no official publications that track the quota prices in either country, as we mentioned in section 3.2.2.

Norway

Several researchers have suggested that quota price in Norway has increased in recent years. In a white paper from 2019[49] it is outlined that higher quota prices could be the results of expectations of higher profitability in combinations of deregulation within the fisheries management system (see here Anon 2019). Mirroring Iversen et al. (2018), which suggested that expected profitability in combinations with the legal framework due effect quota price the development in quota price. Iversen et al. (ibid) listed up several of the limitations we have mentioned in chapter 4 that are likely to influence the quota price negatively; depreciation of quota share in the transaction process (transferability), time limitations of the purchased quota price (duration), geographical limitations (transferability) which have though been revoked at large extend and quota ceiling (transferability). In the light of the above deregulation, i.e., higher quality of fishing rights in combinations of higher expected profitability is likely to influence the quota price as has been suggested from the theory presented in this thesis and presented in detail in chapter 2. Hannesson (2017) has also researched the development of quota price and concluded that quota price had increased. However, he brought out an interesting point to the subject. He explained that, in general, the quota market is thin and not very transparent. Yet, as Eggertsson (2005) outlines that in a "well-functioning secondary market" the price of quota should be equivalent to all expected net profitability as outlined in section 3.2.2. Thus, Hannesson (2017) implies that the quota market is precisely not what can be described as a "well-functioning secondary market." High quota prices could partially be explained by the fact that operators do not account for a fixed cost; thus, additional bought quota shares are to increase utilization of existing equipment, the vessels, for instance, which drives up the willingness to pay, as he explains. Above all, perhaps increased quota price can partially be explained from two sides; firstly, high quality of fishing in combinations of economic performance secondly, the nature of the market, meaning that purchased quota prices are marginal quota shares.

[49] Meld. St. 32 (2018-2019)

Asche, Guttormsen, and Nøstbakken (2014) explored the quota price in a governmental report published for the Ministry of Fisheries (Organisering av verdikjeder i norsk sjømatnæring). The researcher estimated the quota price based on interviews with brokers and bankers. The research explored the price of one quota factor for the trawl group and the conventional offshore group, while 100 base tons for the pelagic group. To recap, base tons and quota factors represent a bundle of species. Table 11 demonstrates the research results. One quota factor equaled 1658 tons of cod and 184 tons of haddock for the trawl group and sold for 106.6 million NOK: thus, the average price per kg. was 57.87 krone (NOK) for the trawl group. For the conventional offshore group, one quota factor equaled 411 kg cod and 55 kg. of haddock, and the total price was 25.8 million resulting in an average price of 55.36 NOK per kg. In relation to the purse seine group, 100 base tons equaled 457 tons of mackerel, 279 tons of Norwegian spring-spawning herring, and 267 tons of North Sea herring the total quota price was 63.4 million and the average per kg thus 63.2 NOK per kg. These three groups listed in Table 11 are all part of the offshore fleet.

Table 10 Quota price for the trawl group, conventional offshore group, and purse seine group 2013 (Asche, Guttormsen, and Nøstbakken 2014)

	Number of tons behind one quota factor			Quota price (NOK)	
Demersal species	Cod	Haddock		Total price (million)	Price per kg.
Trawl group	1,658	184		106.6	57.87
Conventional offshore group	411	55		25.8	55.36
	Number of tons behind 100 base tons				
Pelagic species	Mackerel	Norwegian spring spawning herring	North Sea herring		
Purse seine group	457	279	267	63.4	63.21

Iceland

In order to approach the quota price in Iceland we must rely on an online publication in a business magazine in Iceland (vb.is) where a quota broker published time series on the quota prices for the both the ITQ groups in Iceland; the “restricted ITQ” and the “unrestricted” ITQ group. In the latter group, we analyzed the quality of fishing

right in chapter 4. Table 11 presents quota price per kg. of cod for the period 2010-2019, where quota price ranges from 101 NOK per kg. to 222 per kg for the “unrestricted” ITQ group, and 78 -150 NOK per kg for the “restricted ITQ” group. An interesting result is that the quota prices for the “restricted ITQ group” are lower than for the “unrestricted” ITQ group. We did not explore the quality of the fishing rights for the “restricted” group; however, we would expect the quality of the fishing rights to be lower for that group since the operators are limited to operate a standardized vessel size and can only operate with passive gear. Thus, the results in table 11 correspond with what has been presented in this section in relation to quota price and deregulation; limitations on the fishing rights are expected to decrease the economic performance, i.e., the quota price. The data outlined here might give some indications that the quality of fishing rights can affect quota price or the value of the asset.

Table 11 Cod quota price in NOK per kg in Iceland, 2010-2019 (Viðskiptablaðið 2019)*

	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019
“unrestricted “ITQ group	108.9	103.8	97.7	98.4	134.8	153.4	186.5	224.3	221.7	222.5
"restricted” ITQ group"	99.0	91.8	88.4	69.6	118.6	140.5	167.0	154.7	161.6	150.7

*Data is presented on current price and average annual exchange rate retracted from Central Bank of Iceland 2021a

Above all, the data presented in this section supports what was argued in Flaaten et al. (2017) that quota prices are higher in Iceland than in Norway. In addition, the material discusses here supports that deregulation is expected to increase economic performance. The data for quota prices must be treated with caution and viewed critically for both Iceland and Norway since there are no data on the number of transactions or the volume behind the prices. In addition, we do not have a time series for Norway, but only one year, 2013.

6 Discussion

6.1 Key findings

The argument presented in this thesis is that a high quality of fishing rights can explain high economic performance, which then potentially collectively explains the different levels of resource tax in Norway and Iceland.

Quality of fishing rights

In the first part of our analysis, we explored the quality of fishing rights in Iceland and Norway. In this thesis, it has been argued that the quality of fishing rights in the "unrestricted" ITQ group in Iceland is "High" and the offshore fishing rights in Norway are "High (-)" based on five characteristics; exclusivity, flexibility, transferability, duration, and security. We used a metaphorical toolbox to illustrate the legal power the Norwegian and Icelandic states have influence each characteristic, and hence, the quality of fishing rights. Surprisingly, the difference in the quality of fishing rights in Iceland and Norway is not as great as expected. According to our analysis, fishing rights in both Iceland and Norway have "High" security and exclusivity. We assessed the fishing rights in Iceland to have "Perfect" duration since there are no time limitations on the fishing rights. However, the fishing rights in Norway we assessed to have "High" duration since bought quota shares have a time span of 20 years or 25 years. Transferability we assed as "Moderate" for the fishing right in Norway due to catch quota depreciations in the transactions process of quota share, quota ceiling, and no formal divisibility for the seller of quota shares. The fishing rights in Iceland we assed to have "High" transferability, only the quota ceiling in Iceland reduced the strength of the characteristic. In relation to flexibility, both fishing rights we assessed with "Moderate" flexibility. The fishing right in Norway have more physical restrictions, fewer options to choose the harvesting method, and more limited options to manage their catch quota management, i.e., fewer options to decide when and who can harvest the catch quota. While the fishing right in Iceland involves more economic restrictions since resource tax applied there, reflected in lower economic flexibility. Similar catch quota deductions apply in both countries, where the state redistributes a share of the TAC to other side groups. Our findings correspond with the description provided by Høst and Christiansen (2018) outlined in the introduction, that

transferability in Iceland is “High” with few restrictions in the transaction process of quota shares, while in Norway, the sector is more limited in relation to transferability. The findings also partially correspond to Arnason’s (2000, 2005) findings. According to his results, the fishing right in Iceland has high quality, but the fishing rights in Norway has much lower quality. While we conclude, there is only a slight difference in the overall quality of the two fishing rights. This can be explained that Arnason (ibid) analyses were conducted first more than two decades ago. The characteristics are dynamic as Scott (1988, 2000, 2008) stresses, thus laws and regulations can change. Many of the mechanisms we included in our evaluation of the characteristics occurred after Arnason (2000, 2005) performed his research. In addition, his analyses of the fishing right in Norway were based on a “rough” estimate, while our evaluation is a much more detailed analysis of the fishing right in Norway. It is also worth mentioning that our approach and Arnason (ibid) are not identical, meaning not based on the same premises. We, for instance, he included the characteristic flexibility in our approach, which he did not.

Economic performance

We explored economic performance on an aggregated sectoral level between the fishing sectors in Iceland and Norway through three profitability indicators, EBITDA, EBIT, and EBT, in addition to the quota price. According to those three profitability indicators, the fishing sector in Norway appears to have marginally higher profitability. In Norway, the fishing sector scored higher profitability on two out of three profitability indicators on average for the ten years reference period, 2010-2019. The only indicator the sector in Iceland scored higher was EBT, but as we demonstrated, that might be to a larger extent explained by depreciation of quota shares. In addition, over the last three years of the reference period, the sector in Norway has higher EBT than in Iceland. In Norway, there is higher EBITDA in all years in the reference period, which can be to a large extent explained by the resource taxes that the fishing sector in Iceland is obliged to pay. Yet, despite accounting for resource tax with our “adjusted” EBITDA, the sector in Norway had on average 1%-point higher EBITDA than in Iceland in the reference period. However, we also demonstrate that the fishing sector in Norway and Iceland had relatively high profitability when we compared the EBIT of the fishing sector to other sectors in the

economies. These results indicate that the quality of fishing rights reflects good financial performance. However, we do not claim that the limitations of the fishing rights in Iceland and Norway are trivial in relation to economic performance. Would the profitability be even higher if the fishing rights had “Perfect” quality? Based on the theory from chapter 2, the answer would probably be yes. If the operators in Norway had, for instance, higher flexibility in catch quota management, or there was less catch quota deduction in Norway and Iceland, one can expect higher profitability. We could, for instance, demonstrated the impact of the resource tax in Iceland with “adjusted” EBITDA (%) for the fishing sector in Iceland. Where the resource tax clearly reduced the profitability of the fishing sector. Despite that the fishing sector in Norway has a slightly lower quality of fishing rights than Iceland, it does not reflect in lower profitability compared to the fishing sector in Iceland. There are several potential explanations or perhaps a combination of all of them; Some of the limitations we concluded that reduced the quality of the fishing rights might be insignificant, such as a limitation on gear type. The method of sale might also be a possible explanation. Perhaps the higher first-hand prices might explain it. The species composition of the fishing sector is not identical in addition to other external factors.

The only economic indicator that reflected better economic performance in the sector in Iceland was the quota price. Nevertheless, the data was very limited. In addition, we also outlined that quota price has increased considerably in recent years in Norway. One explanation suggested is deregulations, which could result in higher expected future profit from the viewpoint of the operators, which outline the connection between the quality of fishing rights and economic performance.

Hypothesis

This brings us to our underlying hypothesis: ***“****Resource tax is a form of payment for high-quality fishing rights.”* As Gunnlaugsson et al. (2018) and Eggertsson (2003a) explained, the resource tax in Iceland was implemented to appease critics of the fisheries management system, which the high quality of fishing right reflects. As they explain, increased criticism has occurred due to the increased profitability of the fishing sector. The state in Iceland is pressured by the public to extract some of the

profitability in the form of a resource tax. Thus, we thought we could explain the difference in resource taxation level between the two countries with differences in quality of fishing rights and profitability. As we explained above, we did not find any evidence from our findings to support that. Thus, we must reject the underlying hypothesis presented in this thesis. Even though the resource tax might be a form of payment for the high quality of fishing rights and high profitability in the case of the fishing sector in Iceland, this is not the case for Norway. The fishing sector in Norway does not have to sacrifice part of the profitability, although the operators enjoy a high quality of fishing rights and high profitability. What could then explain that the state in Norway has not followed their fellow fishing nations in the North-Atlantic down the path of increased resource tax levels? Here, there are two potential scenarios; either the pressure from the public is not enough, or, what we view as a more plausible explanation; the high quality of fishing rights are relatively new for the operators in Norway, as only in recent years, with the implementation of the SQS scheme and further modification and deregulation of the scheme, have Norwegian operators reached a similar level of quality more close to Iceland. While in the case of the operators in Iceland, they have enjoyed high transferability almost since the implementation of the ITQ system in 1991. Thus, potentially an implementation of a form of a resource tax may be expected in Norway in the foreseeable future when the relatively new “High” quality of fishing rights has been in “use” for a longer time. Such a situation might then lead to pressure from the public for the state to implement a resource tax. Other explanations are also likely mentioned in the introduction. Iceland, Greenland, and Faroe Islands are highly dependent on fisheries in their total economy, while Norway is not. Thus, it could be that economic importance drives the resource taxations level. Perhaps the state in Norway does not need extra income from the fishing sector at the same level as the other three countries? Such extra income would perhaps be insignificant to the financial budget of Norway. Another suggestion is to view the nature of operators. In Greenland, the largest operators are state-owned, in Faroe Islands the foreign ownership is not uncommon in fisheries. Thus, this could also be one explanation; it is perhaps easier to accept taxation of foreigners or lucrative state companies. We have now listed up three potential forces for a resource tax: high quality of fishing rights, economical dependency on fisheries

and the nature of the operators. In Iceland, two out of the three potential forces are in place, while in Norway only one; high quality of fishing rights, which could perhaps explain that the fishing sector in Norway has not, at least not yet, been exposed to a similar level of resource tax as the three other countries.

Despite rejecting our hypothesis, we still think there are strong arguments that high quality of fishing rights, thus high economic performance, is a prerequisite if governments are planning a resource tax. Thus, we can perhaps only partially reject the hypothesis. We have not identified the exact level of quality of fishing that must be in place to justify resource tax. Here, a rule of thumb would be to explore the economic performance of the fishing sector in relation to other sectors, other industries not operating in fisheries. If the profitability of the fishing sector is below the average of the sectors in the economy, there are weak arguments to implement a resource tax. In contrast, if the fishing sector generates higher profitability than the average sector of the economy, there is at least a base to implement resource tax.

In the light of our arguments, we have demonstrated evidence to support that high quality of fishing rights results in high economic performance, both through our theoretical framework in chapter 2 and with our analyses of Norway and Iceland in chapters 4 and 5. However, what we have not been able to demonstrate is the quality of fishing rights, and economic performance can collectively explain the difference in resource taxation level between the countries.

6.2 Future research

Suggestions for future research would be to conduct a similar analysis regarding the quality of fishing rights and economic performance for Greenland and the Faroe Islands. Such a study would provide greater grounds for comparison between four fishing nations in the North-Atlantic to explain different levels of resource taxes. In addition, by implementing such research, the other potential forces, namely resource taxation level, economic dependency on the fishing sector in the economy, and the nature of the operators, state-owned and foreign influences in the fishing sector, could be further assessed. Another way to address the potential causal relationship between quality of fishing rights and resource taxation level would be to conduct a

survey among the operators in Iceland and Norway. Such a questionnaire could get deeper into further understanding what operators' value in the fishing rights. Instead of applying the more theoretical assessment conducted here by evaluating the characteristics based mainly on legal material and fisheries management concepts, a survey would give more applied insight. Do for instance, operators in Iceland accept resource taxation in exchange for a high quality of fishing rights? What would alternatively the Norwegian operators "be willing to pay" in resource taxation for higher quality fishing rights?

6.3 Limitations

In this thesis, we have addressed three key concepts a) Quality of fishing rights, b) Economic performance, and c) Resource taxation level. The logic of our main arguments is that a influences b and a and b can potentially collectively explain c. However, we used c as an input to our analyses of a and b. We reduced the quality of fishing rights in Iceland due to the resource taxes. The resource tax in Iceland was hard to ignore in the context of both the quality of fishing rights and economic performance since we could demonstrate the impact of resource tax on economic performance with our "adjusted" EBITDA. However, we were able to address this limitation partially with our "adjusted" EBITDA, and the quality of the fishing right in Iceland would be higher if we would exclude the resource tax in our approach. In addition, resource tax is only a limited mechanism that determines the quality of fishing rights. If we explore our approach in relation to the quality of fishing rights, our fundamental limitations are that we give qualitative aspects found in legal material and fisheries management a quantifiable measure. Hence, some researchers might evaluate each mechanism differently, weigh each mechanism differently, or even categorize them differently. It is also worth mentioning the simplifications behind the fishing rights. We analyzed the offshore fishing rights in Norway and the "unrestricted" ITQ rights in Iceland. In reality, and especially in the case of Norway, offshore fishing rights represent several different types of vessel groups that have different levels of quality, such as the purse seine group having a lower quota ceiling than the trawl group. The same is the case for the pelagic operators in Iceland, who have a higher quota ceiling compared to the demersal operators. Concerning economic performance, we explored three profitability indicators on a sectorial level.

The data behind the profitability also includes data from operators that do not have offshore fishing rights and “unrestricted” ITQ rights. The limitations of the data can partially explain why we could not completely and perfectly compare the economic performance of the groups with the two fishing rights. The disaggregation of the database from Iceland is less thorough in relation to fishing rights compared to the database in Norway. In addition, the profitability indicators and the quota price are not the only measures to assess economic performance.

7 Conclusion

In Iceland, it appears that resource taxation has been the logical outcome of high-quality fishing rights following increased profitability, as Eggertson (2003a) and Gunnlaugsson et al. (2018) suggested, and from which we derived our underlying hypothesis. This thesis attempted to determine whether the fishing sector in Norway had less attractive fishing rights and, therefore, potentially lower profitability than in Iceland, which again might explain why Norway has not followed similar development towards a resource tax. However, based on our approach, and the results we find, we could not identify a significant difference between the level of quality of the fishing rights in Iceland and Norway or the economic performance. In light of this, a logical connection hypothesized cannot be mirrored in general. The outcome in Iceland is potentially and very likely influenced by the economic importance of the fishing sectors in the total economy. The fishing sector in Norway is shown to be in a desirable position compared to the fishing sector in Iceland, simultaneously enjoying a high quality of fishing rights, high economic performance, and exempted from paying resource tax.

In essence, if or when resource tax in fisheries are implemented in in Norway, legislature and governmental bodies have at least a potential benchmark with three close neighboring countries, Greenland, the Faroe Islands, and Iceland, with extensive experience from implementing and executing resource tax in fisheries.

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Appendix 1 FSE 2010-2018

Demonstrations of the variables, the support from state and cost-recovery charges, included from the FSE database from OECD behind figure 2 for Iceland, Norway and New Zealand.

ICELAND

I. DIRECT SUPPORT TO INDIVIDUALS AND COMPANIES

I.B. Transfer based on fisheries income

II. Support for services to the sector

II.G Management of resources

III. PAYMENTS MADE BY THE FISHERIES SECTOR

III.C. Payments made by the fisheries sector, for management, research, and enforcement

$FSE_{ICELAND} = [I.B + II.G] – III.C$

Norway

I. DIRECT SUPPORT TO INDIVIDUALS AND COMPANIES

I.B. Transfer based on fisheries income

I.E. Tax exemptions

II. Support for services to the sector

II.E. Education and training

II.F. Research and development

II.G. Management of resources

III. PAYMENTS MADE BY THE FISHERIES SECTOR

III.C. Payments made by the fisheries sector, for management, research, and enforcement

FSE_{NORWAY} = [I.B+ I.E+II.E+II.F+II.G]-III.C

New Zealand

II. Support for services to the sector

II.B. Provision of infrastructure

II.F. Research and development

II.G. Management of resources

III. PAYMENTS MADE BY THE FISHERIES SECTOR

III.C. Payments made by the fisheries sector, for management, research, and enforcement

$FSE_{NEWZEALAND}$ = [II.B+II.F + II.G] – III.C

Appendix 2 Operational account for Iceland and Norway

Iceland:

Operating accounts of fishing 1997-2019	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019
1. Operating revenues	136582	159120	164397	157538	142927	154574	137559	105239**	133635	151572
1.3 Export products	58512	69475	64432	60120	48574	48861	42888	33595	37315	44949
1.2 Fresh fish for processing	74467	84398	94843	92440	87736	101263	90134	76358	90623	100127
1.3 Other income	3603	5248	5121	4978	6618	4450	4538	4564	5697	6496
2. Operating expenses	100294	117146	123252	125872	113734	114225	104237	93804	109629	116410
2.1 Fishermens shares	36503	42766	44047	42206	37315	41003	36413	29586	34097	43458
2.2 Other waages	6443	6148	7126	6871	7021	4380	3978	5362	6064	0
2.3 Labour related costs	7011	8112	7060	6955	6214	8924	8499	7798	7943	8270
2.4 Oil	15503	18170	22540	17154	15699	13203	8970	8594	11417	12305
2.5 Fishing gear	4568	4645	3914	3936	3520	3962	3725	3918	4665	4768
2.6 Maintenance and repair	6193	7484	8720	8683	8639	9088	8574	7690	9050	8973
2.7 Packaging and freezing ost	1582	1356	1458	1516	1293	1120	934	799	1005	992
2.8 Transportation cost	2323	1406	1082	1788	1497	1693	1249	1250	1542	1365
2.9 Salaries	265	475	526	930	1425	1834	1840	1674	1444	940
2.11 Overhead cost, excl. salaries	3826	3953	4509	4259	4091	3977	2733	2552	2556	1108
2.10 Insurance	1644	1804	1613	1555	1387	1650	1062	1019	1028	1785
2.12 Sales cost abroad	2200	2922	2593	2063	2144	2004	2450	2123	2304	2282
2.13 Disembarkation cost	2436	2591	2428	2484	2307	2401	2564	2139	2856	2988
2.14 Renting of catch quotas	.	.	.	.	.	.	0	0	0	0
2.15 Other expenses	9797	15313	15638	25471	21183	18985	21246	19301	23658	27175
Share of capital, gross	36288	41974	41144	31666	29193	40349	33322	19143***	24006	35162
Share of capital as % of revenue	26.6	26.4	25	20.1	20.4	26.1	24.2	18.1	18	23.2
Depreciation	8266	7518	12056	7339	7590	6904	7040	6253	7233	7995
Interests and adjustments for inflation	9405	11239	6969	-3657	6730	2344	-6942*	5954	6891*	6999
Net profit	18617	23218	22119	27985	14873	31100	33224	6936	9882	20167
Net profit as a % of revenue	13.6	14.6	13.5	17.8	10.4	20.1	24.2	6.6	7.4	13.3
Imputed cost of capital, 6%	14407	14032	15733	15308	15711	16325	16082	18251.5	19674.8	18695.1
Net profit, after imputed cost of capital	21881	27942	25411	16358	13482	24024	17240	2461	4331	16467
Net profit as a % of revenue after imputed cost of capital	16	17.6	15.5	10.4	9.4	15.5	12.5	2.1	3.2	10.9
EBITDA	36288	41974	41144	31666	29193	40349	33322	19143	24006	35162
EBT	18617	23217	22119	27984	14873	31101	33224	6936	9882	20168
Fishing fee	2310.8	3738.0	9860.6	9765.1	8140.5	3479.4	8576	6800	11300	6600
Adjusted EBITDA	38599	45712	51005	41431	37333	43828	41898	25943	35306	41762

Adjusted EBITDA (%)	28%	29%	31%	26%	26%	28%	30%	25%	26%	28%
EBITDA %	27%	26%	25%	20%	20%	26%	24%	18%	18%	23%
EBT%	14%	15%	14%	18%	10%	20%	24%	7%	7%	13%

The figures above are in 1000 ISK values. There is some mismatch between the online database from Statistics Iceland and the reports published by Statistics Iceland. In the years 2016-2018, marked with yellow in the table above, we changed few figures in the online database to match what is reported in the report. The figures that were changed are marked with a star. Thus, in our analysis, we assume that the reports are correct, matching with the earnings figure reported in the online database.

Norway:

Resultatregnskap (kr):										
Driftsinntekter	**6,180,666**	**7,338,265**	**9,761,902**	**8,282,614**	**8,107,567**	**7,746,342**	**9,342,391**	**10,741,684**	**8,724,890**	**8,968,367**
Driftskostnader:										
Produktavgift	163,331	213,691	271,865	215,801	217,434	243,297	277,922	264,487	185,971	194,401
Strukturavgift	0.00									
Kontrollavgift	11,743	14,329	18,952	15,877						
Fiskeriforskningsavgift						87,966	108,150	137,625	111,443	113,653
Arbeidsgodtgjørelse til mannskap	2,111,116	2,411,284	3,183,567	2,725,078	2,683,217	2,529,905	3,143,640	3,557,574	2,958,528	2,975,912
Kostnader til proviant	84,092	78,888	88,087	87,813	85,720	71,082	81,851	88,284	74,150	72,240
Sosiale kostnader	26,914	28,814	36,074	38,508	38,514	33,439	35,393	46,744	40,267	32,135
Pensjonstrekk	14,663	17,834	23,551	19,932	19,369	18,491	22,494	25,444	20,609	21,139
Avskrivning fartøy	562,636	610,556	682,622	719,054	747,818	680,167	725,634	759,366	679,896	678,199
Avskrivninger fisketillatelser	167,062	178,687	227,795	219,224	289,421	293,366	297,910	380,947	279,155	388,204
Drivstoff	626,528	748,453	945,338	972,202	1,000,909	874,900	808,423	689,531	684,407	822,849
Agn, is, salt og emballasje	71,358	82,590	116,410	110,227	93,074	80,428	93,004	102,621	97,675	99,688
Vedlikehold fartøy	551,466	644,696	755,819	671,566	682,268	602,731	684,593	734,017	672,761	674,022
Vedlikehold/nyanskaffelser redskap	263,677	309,739	354,928	326,162	314,534	259,735	341,649	350,671	307,404	288,310
Forsikring fartøy	97,836	112,770	130,203	132,978	134,676	120,642	122,501	126,147	107,876	102,433
Andre forsikringer	61,907	60,326	63,633	71,391	71,055	57,387	56,888	55,637	47,936	41,991
Andre kostnader	544,925	618,899	741,248	782,374	834,538	795,671	815,965	967,011	764,898	784,123
Sum driftskostnader	**5,359,256**	**6,131,557**	**7,640,090**	**7,108,188**	**7,212,547**	**6,749,207**	**7,616,018**	**8,286,105**	**7,032,976**	**7,289,298**
Depreciation	**729,697**	**789,243**	**910,417**	**938,278**	**1,037,239**	**973,533**	**1,023,544**	**1,140,313**	**959,050**	**1,066,404**
Cost - deprications	**4,629,558**	**5,342,313**	**6,729,674**	**6,169,910**	**6,175,308**	**5,775,675**	**6,592,474**	**7,145,793**	**6,073,926**	**6,222,894**
EBITDA	**1,551,108**	**1,995,952**	**3,032,228**	**2,112,704**	**1,932,259**	**1,970,667**	**2,749,917**	**3,595,892**	**2,650,965**	**2,745,473**
EBITDA %	25%	27%	31%	26%	24%	25%	29%	33%	30%	31%
Driftsresultat	**821,410**	**1,206,708**	**2,121,812**	**1,174,426**	**895,020**	**997,134**	**1,726,373**	**2,455,579**	**1,691,915**	**1,679,070**
Rentesub./kontraheringstilsk.										
Finansinntekter	352,144	174,748	178,286	235,919	161,555	154,046	198,460	278,930	261,060	169,600
Finanskostnader	608,427	690,720	810,783	724,654	882,841	801,921	908,124	652,397	584,904	560,542
Netto finansposter	**-256,283**	**-515,972**	**-632,497**	**-488,735**	**-721,285**	**-647,874**	**-709,664**	**-373,467**	**-323,845**	**-390,943**
Ordinært resultat før skatt	**565,127**	**690,736**	**1,489,314**	**685,691**	**173,734**	**349,260**	**1,016,708**	**2,082,112**	**1,368,070**	**1,288,127**
Net profit - depreciation of fishing rights	**732,189**	**869,423**	**1,717,109**	**904,915**	**463,156**	**642,626**	**1,314,618**	**2,463,058**	**1,647,224**	**1,676,331**
"Adjusted Net profit (%)"	**12%**	**12%**	**18%**	**11%**	**6%**	**8%**	**14%**	**23%**	**19%**	**19%**

Appendix 3 EBIT for non-financial sectors in Iceland and Norway

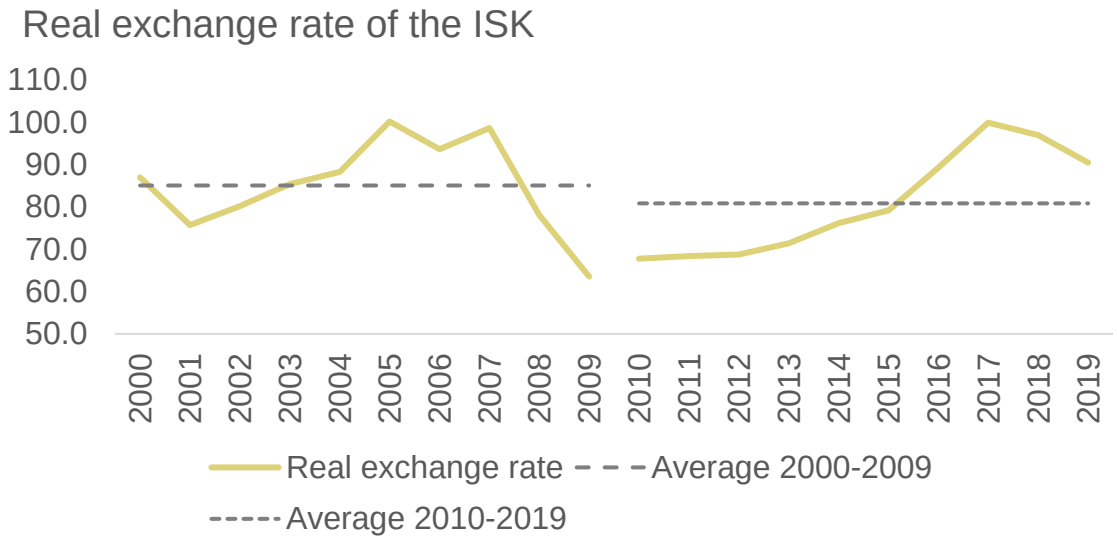
Iceland:

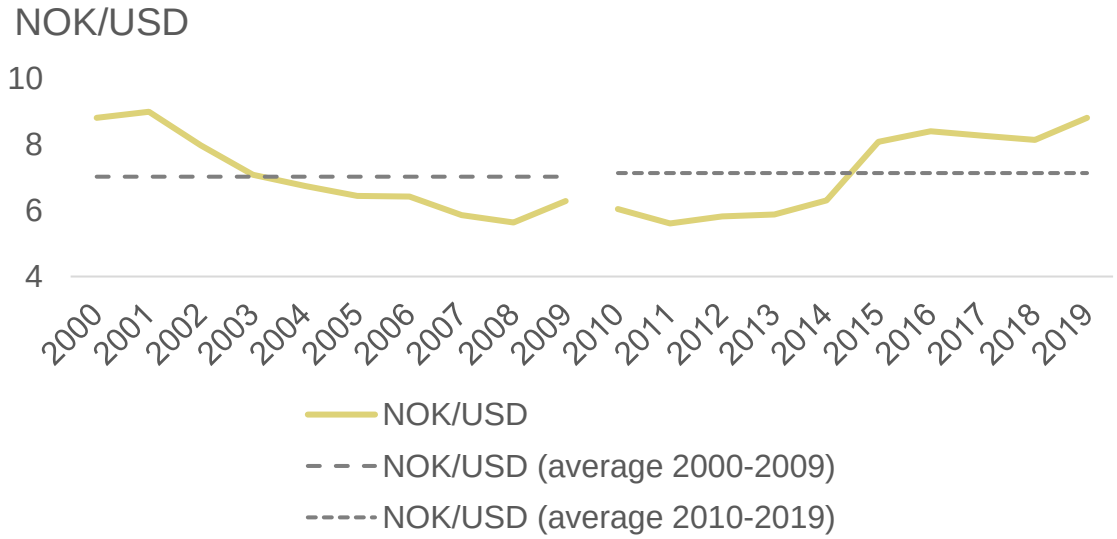
Income statement and balance sheet 2002-2018									
Total business economy including fisheries and excluding pharmaceuticals, waste collection, financial and insurance activities (ÍSAT nr. 03-20, 22-37, 39-63, 68-82, 95-96)	2010	2011	2012	2013	2014	2015	2016	2017	2018
1-1-0 Total income	2670009	2926696	3142436	3295449	3456634	3756113	3931662	4139834	4481081
1-3-0 Earnings before interests and tax (EBIT)	218534	239623	279536	262172	302885	368361	379769	385287	339591
EBIT/Total income	8.2 %	8.2 %	8.9 %	8.0 %	8.8 %	9.8 %	9.7 %	9.3 %	7.6 %

Norway:

All industries	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019
Operating income (NOK million)	4230889	4662503	4844104	4943435	5088215	5008095	4997377	5415932	5915724	5900605
Operating profit (NOK million)	514018	619628	604206	578846	488663	368140	377028	523707	615238	609107
EBIT/Operating Income	12%	13%	12%	12%	10%	7%	8%	10%	10%	10%

Appendix 4 Exchange rate development in Iceland and Norway





The real exchange rate in Iceland in relative to consumer price index. Higher number means stronger real exchange rate, while lower means weaker real exchange rate. While for Norway the exchange rate is relative to US dollar. Higher number means weaker currency in relations to the US dollar, while lower number means.