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Master Thesis

Taxation in Norwegian Salmon Aquaculture

An Economic Analysis of the Impact of the Introduction of Salmon Tax on the Leverage of the Salmon Farming Companies in Norway

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Abstract

The newly introduced Salmon Tax in Norway has been a hot topic since its announcement in 2022. Shifting the spotlight from political discussions to economic consequences of this taxation – this thesis takes on the topic of how this announcement has affected the leverage among the affected firms within the aquaculture industry. We therefore outlined our research question as follows: "*Does the announcement of the salmon tax affect capital structure decisions of Norwegian salmon farming companies?*"

Based on The Trade-Off Theory, we predicted our results to show an increase in leverage after the post-announcement period. According to this theory, firms balance the costs of financial risk against the tax advantages of debt. With a sample of 297 firms that represents all firms listed on the Oslo Børs, and a sample period from 2018 to 2023, we used a Difference-in-Difference approach to capture the effect on leverage from the pre period to the post period. In general, the evidence fails to provide support for the Trade-Off Theory. And on average, leverage does not change significantly following the announcement of the tax. It is only when we condition the analysis further on profitable firms and leave out fixed effects, that we find some evidence supporting the idea that profitable firms increase book leverage in response to the tax announcement. However, this effect depends on regression specifications and is not robust through all regressions.

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Table Overview

1.0 Introduction

The composition of the capital structure is one of the key decisions a company must make. Companies have the option to use debt or stock issues as external funding, or they can use internal financing like retained earnings. These financing choices significantly impact a business, so substantial research has been done on capital structure. Starting with Modigliani & Miller (1958) when they published their theorem claiming that capital structure has no effect on a company's value. Later theoretical developments by academics such as trade-off, pecking-order, market timing, and agency cost theory have challenged Modigliani & Miller's theory.

There are also other factors that can influence a company's capital structure. Recent research has been done by, among others, Frank and Goyal (2009) where they identified critical factors such as size, expected inflation and profitability as some of these critical factors. Taxes have also been highlighted by many researchers to be a critical factor for the decision about the firm’s capital structure. The trade-off theory argues that there is a trade-off between the benefits of a tax shield against the increased risk debt comes with that firms must consider. Heider and Ljungqvist (2014) argue that firms tend to increase their leverage when there is an increase in taxes, due to the tax benefits as Trade-off theory also suggests. While a more recent study by Ivanov et al. (2022) argues that tax increases can discourage borrowing.

The primary objective of this thesis will be to analyze how the announcement of the salmon tax increase in Norway, has affected the capital structure in these companies. Will the companies increase their leverage as suggested by Heider and Ljungqvist (2014) and the Trade-Off Theory? Or will the tax increase discourage borrowing as was suggested in the recent study by Ivanov et al. (2022)?

1.1 Background of the aquaculture sector in Norway

The global salmon farming industry, with Norway at its forefront, has seen significant changes over the past decades. Norway has huge market shares of salmon in the world. Last year, more than half of the salmon produced worldwide was produced in Norway (Norges sjømatråd, 2023). For four decades, salmon farmers have led innovation within the industry. Today, salmon farmers export

not only the salmon itself, but also innovative aquaculture technology and valuable knowledge cultivated over the years (Laks, n.d.). From technological advancements to sustainability concerns, the industry is continually evolving in response to both internal and external pressures. One recent external pressure to the Norwegian salmon companies has been the introduction of the so-called salmon tax in Norway. Although the tax is known as “the salmon-tax", other fish are also subject to it as well. The tax applies to salmon, rainbow- and regular trout (Endringslov til skatteloven, 2023, § 19-5). The tax is aimed at redistributing the great wealth generated from the country's natural resources and its introduction signifies a significant policy shift in Norway's approach to its lucrative aquaculture sector. The tax was introduced on 16.06.2023 retroactively with effect from and including the income year 2023 (Endringslov til skatteloven, 2023, §19-1) and was announced on 28.09.2022 (Regjeringen, 2022).

1.2 Sequence of this thesis

From now on, our thesis's structure will be outlined to first present our research question and objectives with this study in Section 2. We will then introduce the concept of ground rate in Section 3, until we move on to our Literature Review found in Section 4. Our Literature Review-section is divided into two parts. We first introduce four important and relevant theories connected to capital structure, while we in the second part look at empirical evidence of the connection between tax and capital structure. In the following section, Section 5, we introduce and justify our hypothesis together with our methodology and then move on to discuss our data collection in Section 6. We then present and discuss our findings in Section 7, Empirical Analysis, and summarize the findings and suggest the need for future research in Section 8, which is the last section.

2.0 Research question and objectives

Our study's objective is how the announcement of the tax might affect the company’s capital structure in the salmon farming industry. Prior research of capital structure has been debating how taxes impact the capital structure. With recent research showing that taxes influence how much debt companies take on, the increase in salmon farming taxes raises important questions about how

companies in the fish farming industry will handle their finances. However, understanding exactly how these tax changes might affect the company's capital structure requires a detailed analysis. To understand this, we need to study how changes in taxes may impact the capital structure of a company, filling in the gaps from previous research on how taxes influence capital structure decision in businesses with a focus on the salmon farming industry.

Our thesis assesses the impact of the *announcement* of the salmon tax, which took place in 2022, on the capital structure of Norwegian salmon farming companies. Meaning that this paper will evaluate the immediate financial response of these companies to the policy announcement, offering a clear understanding of corporate behavior in the face of significant regulatory tax changes. Based on this, our research question is outlined as follows: "*Does the announcement of the salmon tax affect capital structure decisions of Norwegian salmon farming companies?*"

3.0 What is Ground rate?

3.1 Definition

The ground rate tax is based on the principle that the natural resources owned by the state belong to the whole community. "*Production of natural resources (...) can often yield returns beyond what is normal because the production is based on a limited resource*" (Regjeringen, 2023). Therefore, the state created a ground rate tax to obtain a portion of the "extraordinary" income made from stately owned limited resources. Through this tax, a portion of the "extraordinary" income is given back to the community.

3.2 Ground rate in the aquaculture sector

The introduction of the ground rent tax in Norway's aquaculture sector in 2023 is based on the extraordinary profits that are derived from this industry, that is generated due to the nation's common natural resources. Norway's favorable conditions for salmon farming, including currents, weather patterns, their oxygen density, and temperatures of Norwegian fjords - contribute significantly to the

companies' success. Additionally, restrictions on permit issuance play a role in shaping the industry's profitability (Innst. 372 L (2022–2023), p. 2).

In 2022, the Norwegian government proposed a new cash flow tax system for implementation in 2023, targeting revenues generated or incurred within the same fiscal year (Endringslov til skatteloven, 2023, §19-5). The calculation of the income is different for each fish species. The salmon income is based on a predetermined price derived from market prices, while trout revenue is determined by actual sales prices (Regjeringen, 2022). Companies deduct eligible costs from these revenues to determine the tax base, known as a cash-flow-tax. The government stipulates that the tax base should reflect the value chain's key operational points, which are determined to be at the edge of the cage. This figure is estimated and determined by the companies that own the fish farm or the aquaculture facility (RSM, 2023). According to «Lov om endringer i skatteloven» § 19-5, gross income is determined by the market value of salmon, trout, and rainbow trout at the cage's edge, multiplied by the slaughter volume (Endringslov til skatteloven, 2023, §19-5). Nonetheless, it is only the businesses with substantial profits that will be subject to the ground rent tax. For this purpose, they have implemented a minimum deduction of 70 million NOK which ensures that only those companies exceeding the threshold are affected.

This cash-flow system will only be implemented for 2023. From 2024 and forward the finance minister has established an independent price board responsible for determining a norm price estimated to be as accurate as possible.

4.0 Literature review and previous theories

In this part, we systematically review existing literature and theories within our research domain. In section 4.1, we discuss competing theories of capital structure, including the Trade-off theory, Pecking-order theory, Market timing theory, and Agency theory. Following this, we explore the implications of tax and tax changes on capital structure choice in section 4.2.

4.1 Competing theories of capital structure

4.1.1 Trade-off theory

Modigliani and Miller published their seminal work in 1958 where they stated their so-called Modigliani-Miller Theorem, or “Capital structure irrelevance theorem”. The theorem argues that in a perfect market, a company's overall worth is not affected by its capital structure. They suggested that the market valuation of a company is not influenced by its capital structure but rather by its expected returns, relative to the risk. They therefore observed that determining the ideal capital structure involves finding a balance between two crucial elements: the present value of the tax benefits gained from slightly more debt, and the present value of the additional costs that come with taking on this extra debt, such as agency costs (Robichek & Myers, 1966).

Kraus and Litzenberger (1973) confirmed Robichek & Myers (1966) conclusion that real-world factors, like taxes on company profits and the penalties for going bankrupt, significantly impact how a company's value is linked to its use of debt. Kraus and Litzenberger made it formal by including the benefits of debt because of taxes and the costs due to bankruptcy risks into a specific model. Which indicates that the value of a company that has debt equals the value of a company without debt, in addition to the tax benefits from the debt, minus the costs associated with the risk of going bankrupt (Kraus and Litzenberger, 1973). This means, unlike earlier ideas that suggested a company's value would always drop if it had more debt than it could cover with earnings, this is not always true according to this new view. The authors therefore introduce the concept of a trade-off between the tax benefits of debt financing and the costs associated with potential financial risk (Kraus and Litzenberger, 1973).

Considering the possibility of bankruptcy and assuming the imperfection of asset secondary markets, Scott Jr (1976) offers a multi-period model of business valuation. Formally, the model is the same as the model Modigliani and Miller’s brought out in 1958, if you assume bankruptcy cost are set to zero. The research confronts debates about the concept of an ideal debt structure. Recently, there has been a focus on the ideal capital structure, particularly for regulated businesses, with a focus on the possible disadvantages of having more debt. It provides guidelines for the ideal debt level and investigates the effects of outside variables

on it, with implications for regulated businesses. It highlights that predicted future profits and asset liquidation value define a non-bankrupt company's worth. There are specified requirements for an ideal capital structure. The ideal debt amount is found to grow with the company's size, corporation tax rate, and asset liquidation value - validated by using comparative statics research, however not significant (Scott Jr, 1976).

The trade-off theory has however also received tough criticism by Miller (1977) and Myers (1984). Miller (1977) contended that the trade-off theory oversimplified the complexities of real-world financial decision-making by emphasizing the need to balance tax benefits and bankruptcy costs. He contended that the theory fell short in considering additional elements including agency costs, asymmetric knowledge, and flaws in the market that affect a firm's capital structure. Miller's criticism emphasized how the trade-off theory falls short of adequately describing the dynamic character of capital structure choices. He stressed that while choosing their ideal capital structure, businesses must consider a variety of criteria other than the trade-off between financial distress costs and tax benefits because conditions change frequently. By presenting the pecking order theory, which questioned the trade-off theory's presumptions about how businesses decide between debt and equity funding, Myers built on Miller's criticism. He maintained that businesses favor internal funding over external financing and favor debt over equity when external financing is required. The realization that businesses have vital information asymmetry and signaling problems when gaining access to external capital markets was the basis for Myers' criticism. Also, Myers highlighted the fact that even though the static tradeoff theory partially works, empirical regressions suffer from an unacceptably low explanatory power (Myers, 1984).

Because of the critique, it became crucial to create a more dynamic capital structure choice. The paper written by Fischer, Heinkel and Zechner (1989) provides evidence that companies actively modify their leverage in response to shifting market conditions. The findings suggest that firms consider the static trade-off between tax benefits and financial distress costs and the timing of debt issuance. By examining companies' ideal reshaping choices over time, the research explores the shortcomings of single-period capital structure models. The

paper emphasizes the need of understanding the cost factors related to dynamic restructuring of capital and suggests that significant adjustment costs could potentially explain the reported broad variances in real debt ratios across different enterprises. They examine how several factors including tax benefits, debt financing costs, and asset volatility influence capital structure decisions using their framework. It suggests that because recapitalization costs can cause optimal debt ratios to change over time, even across comparable enterprises, differing leverage ratios could occur. The research's findings offer perspectives that go beyond static leverage ratios and show a statistically significant correlation between various levels of debt ratios and business attributes.

More recent work in the field of dynamic trade-off, Bhamra et al. (2010), investigated the interplay between macroeconomic conditions and the aggregate dynamics of corporate capital structure. The study's findings reveal a significant relationship between the business cycle and aggregate leverage. During economic recessions, firms tend to reduce their leverage, reflecting a risk-averse behavior to mitigate financial risk. Conversely, in economic upswings, firms increase leverage, indicating a greater risk appetite in favorable economic conditions (Bhamra et al., 2010).

Empirical Evidence:

Titman & Wessels (1998) studied empirical data and discovered a negative correlation among debt levels scaled by equity market value and prior profitability. To be said that when a company has higher past profits, it tends to have lower levels of debt relative to the value of its stocks – which goes against the predictions of the trade-off theory. While Danis et al (2014) reveal that while more profitable companies generally carry higher debt levels at a given moment, this relationship inverses over time for firms not at their optimal leverage. However, during refinancing periods, an observed positive correlation between leverage and profitability supports dynamic trade-off theories, suggesting that firms strategically adjust their capital structure in alignment with profitability peaks and not continuously. Although, Eckbo & Kisser (2020) finds that contrary to the theory's predictions, the correlation between leverage and profitability remains negative, even during substantial debt-financed rebalancing events. The study also shows that financing sources for rebalancing (debt versus internal cash)

significantly influence this correlation, with only internally financed rebalancing showing a positive leverage-profitability relationship.

4.1.2 Pecking order theory

The pecking order theory challenges the traditional trade-off theory by suggesting that firms prefer internal financing over external financing and, when external financing is necessary, they prefer debt over equity. The groundwork of this theory was originally proposed by Donaldson (1961). His work was later refined by Myers and Majluf (1984) where they concluded that a company´s preferable source of funding is internal funds, debt and as a last choice, issuing new equity.

Stewart C. Myers' (1984) seminal paper contends that firms prioritize internal financing due to information asymmetrical issues associated with external financing. His exploration highlights the preference for retained earnings, followed by debt, with equity considered as a last resort. Debt is more often "cheaper" as a financing source than issuing equity, since investors often demand high returns because of information asymmetry (Myers, 1984). Thereby, if investors understand that the company will opt for equity issuance only when the stock is overvalued and choose debt otherwise, they will decline to invest in equity unless the company has reached its limit for borrowing, incurring significant additional costs for issuing more debt. Consequently, investors would compel the company to adhere to a specific financing hierarchy (Myers, 1984).

Noe (1988) presents a detailed analysis showing why companies prefer borrowing over selling shares, due to the problems identified by Myers and Majluf (1984) related to adverse selection. Through a model based on signaling theory, Noe shows that companies capable of paying back loans are more likely to choose debt financing because it is safer for investors (Noe, 1988). However, this preference doesn't apply each time. The pecking order hypothesis acknowledges the existence of scenarios where firms may opt for equity issuance despite the theoretical feasibility of taking on more debt. Noe's (1988) discussion extends to the implications of introducing residual uncertainty, which complicates the straightforward preference for debt by adding a layer of strategic decision-making for firms considering equity issuance to avoid potential dilution losses from pooling with lower-quality types.

Empirical Evidence:

Further on, looking at empirical evidence, Shyam-Sunder and Myers (1999) explore the hierarchy of the Pecking Order Theory and the implicit importance of information asymmetry in shaping corporate financing decisions. Firms are cautious about external financing, particularly equity issuance, due to concerns about signaling adverse information to investors (Shyam-Sunder and Myers, 1999). While both Frank & Goyal (2003) and Fama & French (2005) found results arguing against the Pecking Order Theory as described by Myers (1984) and Shyam-Sunder and Myers (1999). Frank & Goyal´s (2003) research showed that internal funding was often not sufficient to cover the financing need, leading to more reliance on debt and equity financing. It also showed that equity funding is more common for smaller firms than for bigger ones, based on public trading statistics.

Leary and Roberts (2005) find that, when adjusting capital structure, companies with a high level of internal equity or high cash flows are less likely to use external financing. While firms with large capital expenditures often rely on issuing debt or equity, according to the Pecking Theory. However, the modified pecking order (Myers, 1984) shares similarities with the tradeoff theory in predicting that, as leverage goes up, firms are more likely to issue stocks or buy back debt to avoid the cost of bankruptcy. This delayed adjustment is influenced by the associated costs (Leary and Roberts, 2005) and confirms Noe´s (1988) findings, saying that the selection of financing source is not absolute.

Frank et. al.´s (2020) study challenge the Pecking Order Theory by real-world data showing diverse financing behaviors that do not always align with the theory's predictions. Despite its utility in explaining certain financial patterns, the theory struggles with the prevalence of equity financing and lacks concrete evidence for its assumptions, making it a subject of debate rather than a definitive guide. Furthermore, the theory's connection to adverse selection is complex, as multiple factors can influence financing choices, such as tax, transaction costs and agency frictions and/or behavioral factors. This reveals a need for more nuanced approaches to understanding capital structure decisions.

4.1.3 Market timing theory

The Market Timing Theory is a financial concept that suggests companies attempt to capitalize on favorable market conditions when making financing decisions, particularly regarding the issuance of equity. The concept behind market timing theory stems from Stewart Myers ideas in 1984 where he discusses the importance of timing of security issues. According to Myers businesses schedule the issuing of shares to correspond with an increase in the securities prices. Since firms are seeking outside money, companies tend to issue shares following stock price increases. This theory calls into question the pecking order hypothesis and static trade-off theory. According to trade-off theory, when a company's value increases, its debt-to-equity ratio decreases, suggesting that corporations should issue debt instead of stock to rebalance their capital structures. This is contrary to the idea that businesses usually issue equity when their value increases. In the same way, the pecking order theory proposes that companies rather choose internal funding before issuing debt and subsequently stock. However, there is no proof that managers have better insider knowledge when stock values are high. If they had, investors would have seen this trend and modified how they understood the firm's choices regarding issuance. A rational expectations equilibrium would prevent corporations from continuously taking advantage of investors in new equity (Myers, 1984).

Empirical evidence:
Graham and Harvey (2001) thereafter researched how executives attempt to time the market by issuing debt when they perceive market interest rates to be low, with stronger tendencies observed among larger firms. Additionally, firms exhibit similar behaviors by issuing short-term debt when they anticipate declines in long-term rates and foreign debt when foreign interest rates are comparatively lower.

Later, the market timing theory was properly articulated by Baker and Wurgler in 2002, suggesting that historical attempts to time the equity market impact how a company structures its capital. They argue that there are two versions of equity market timing that lead to similar dynamics in capital structure. In the first version, there are investors and managers who are rational. It implies that they take different adverse selection costs into account for different organizations or

periods of time. To reduce information asymmetry, companies often issue equity after information is released. Additionally, shifts in the market-to-book ratio are indicative of variations in the costs associated with adverse selection. Because of this, short-term fluctuations in the market-to-book ratio might affect leverage in the long run.

Secondly, Baker and Wurgler argue that there are irrational investors and time-varying mispricing. Meaning that managers take advantage of time-dependent mispricing by repurchasing shares whenever they think it is excessively high and issuing equity when they think it is unreasonably low. Leverage may be irreversibly impacted by changes in the market-to-book ratio if management sees chances to profit from market mispricing. Importantly, the authors stress that the second version depends on managers' perceptions of their ability to time the market rather than actual market inefficiencies. The evidence provided supports the idea that long-term stock returns after equity offerings and repurchases strongly impact financing decisions, with a focus on market timing and taking advantage of mispricing (Baker & Wurgler, 2002).

However, Leary and Roberts' (2005) findings offer evidence that contradicts Baker and Wurgler's (2002) behavioral theory. Baker and Wurgler suggest that rather than basic considerations like profitability, market timing and investor sentiment impact a company's financing selections. But according to Leary and Roberts' research, businesses actively modify their capital structures in reaction to variations in profitability, pointing to a deeper justification for their financing decisions. Companies often raise leverage in response to improvements in profitability and decrease it in response to falls in profitability. Furthermore, companies that have larger amounts of internal equity or cash flows are less likely to rely on external funding, whereas those that have significant capital expenditures frequently issue debt or stock. This contradicts the notion that firms' financing decisions are primarily driven by market timing and sentiment, as suggested by Baker and Wurgler.

4.1.4 Agency Cost Theory

The Agency Cost Theory, developed by Jensen and Meckling in 1976, addresses the conflict of interest that may arise between those who manage a company (the agents) that does not align with those of the owners or shareholders (the principals). This theory addresses the internal conflicts within a firm, focusing on the costs associated with ensuring that managers act in the best interests of the shareholders. The theory of agency costs includes three main categories: the costs of monitoring managers' activities by the shareholders, the costs incurred by managers to commit to acting in the shareholders' interests, and the residual losses that occur when managers' actions deviate from the optimal interests of the shareholders. These costs reflect the resources used to match the managers' and owners' goals, which would not be required if the two parties had fundamentally similar goals. (Jensen & Meckling, 1976).

The theory also looks at the impact of a firm's ownership structure on agency costs. It suggests that as managers have less ownership in a firm, their motivation to align with the shareholders' interests decreases, potentially leading to higher agency costs. To mitigate these costs, firms employ various strategies such as performance-based compensation, detailed oversight mechanisms, and contractual agreements that limit managers' actions. The theory also examines how agency costs influence the firm's financial and operational decisions, including its capital structure and investment choices. By understanding how to manage these costs, firms can potentially improve their efficiency, decision-making, and overall performance (Jensen & Meckling, 1976).

Asset substitution is a key problem in the agency theorem discussed by Jensen and Meckling in their 1976 article. A significant concern in corporate finance is the asset substitution problem, which highlights the conflict of interest that arises due to the company's capital structure between its debtholders and shareholders. A company that issues debt complies with making fixed payments to its debtholders, but because shareholders have remaining rights on the company's assets, they also gain from higher risk. Due to this incentive mismatch, shareholders may seek asset substitution strategies, which often means raising the riskiness of the company's assets to improve returns. But this elevated risk also raises the possibility of financial trouble or bankruptcy, which would be harmful to debt holders. To

address this problem, debtholders can establish constraints or covenants that restrict the company's willingness to take risks, while monitoring mechanisms such as credit ratings offer signals concerning the company's financial condition. Ultimately, keeping a firm's capital structure balanced between risk and return and guaranteeing that the interests of debtholders and shareholders are properly aligned depends on how well the asset substitution problem is managed.

Stewart C. Myers' 1977 paper continues based on the work of Jensen and Meckling (1976). Myers is filling a gap from them regarding the suboptimal investment problem, which is an agency cost that occurs due to the issuance of risky debt. In his research, Myers studies how agency costs can lead to suboptimal investment decisions, such as underinvestment or overinvestment, as managers may prioritize projects that benefit themselves rather than maximizing shareholder value. He suggests debt can serve as a disciplining mechanism by imposing constraints on managerial discretion, thereby mitigating agency costs and aligning stakeholders' interests. Furthermore, Myers discusses various mechanisms to address agency conflicts, such as debt covenants, executive compensation arrangements linked to firm performance, and the role of outside monitoring mechanisms like board oversight.

Gavish and Kalay (1983) investigate the asset substitution problem within firms, exploring the implications of leverage ratios on stockholders' incentives to increase investment risk. It critically examines the theories proposed by Jensen and Meckling (1976) regarding the agency costs of debt and the potential conflicts of interest between stockholders and bondholders. The study argues that the shareholders' incentives to increase investment risk does not grow consistently with the firm's leverage ratio. The research contradicts common theories by showing that the link between leverage and willingness to make riskier investments peaks when the face value of the debt is equal to the firm's expected value. The findings challenge the known theory that increased leverage ultimately results in greater risk-taking by investors by revealing that companies with high leverage ratios are less willing to pursue high-risk projects with negative net present values. The authors argue that this insight is significant for understanding the complex dynamics of corporate finance and the role of capital structure in shaping investment decisions (Gavish & Kalay, 1983).

Debt can mitigate conflicts between shareholders and managers because debt must be repaid to prevent bankruptcy (Jensen and Meckling, 1976; Jensen, 1986). However, debt also increases conflicts between shareholders and debtholders (Stulz, 1990). These conflicts arise due to differences in priorities and incentives between shareholders and debtholders. Shareholders may pursue strategies that prio ritize higher returns and riskier investments, potentially at the expense of debtholders who prioritize debt repayment and minimize default risk. Often, this is because management values investments more than shareholders, in addition to having more information than the shareholders. In Stultz (1990) "Managerial discretion and optimal financing policies" he creates a model that focuses on managerial discretion in choosing investments and how that discretion affects the value of the company. It illustrates how managerial discretion can, under specific conditions, may lead to both underinvestment and overinvestment, both of which can be costly for shareholders. One of these expenses can be reduced by financing policy, but not at once. The study looks at when shareholders would rather have more resources under management's control and when they would try to have management pay down debt. It also provides comparative-statics data with respect to the attributes of the company and its debt-to-equity ratio. It is demonstrated that there is an inverse relationship between the firm's cash flow volatility and the financing policy's efficiency in lowering the agency costs of management discretion.

The analysis also includes scenarios in which the set of investment opportunities is randomly selected, showing how private companies may more effectively manage certain agency costs of debt because of the potential of renegotiation prior to default. The study also considers situations in which investors watch cash flow but not the company's investment prospects. It is expected that given perquisite consumption is related to investment decisions, management's utility will rise during the research. Unless prohibited from outside events, managers invest all available cash flow, with financing choices depending on shareholder approval to maximize shareholder wealth.

Empirical evidence:
392 CFOs participated in a study by Graham and Harvey (2001) about, among

other subjects, capital structure choices and the different CFOs' views on underinvestment and asset substitution. They investigate whether observed company finance practices are consistent with agency theory predictions using empirical evidence. Both the underinvestment and asset substitution hypotheses received little support, according to the study. More specifically, there was minimal evidence that executives utilized short-term debt to resolve difficulties with asset substitution, and there were also limited indications that short-term debt was employed to address underinvestment issues.

4.2 Factors for testing capital structure

Capital structure is a term used to describe the composition of a company's funding sources, specifically the balance between debt (loans, bonds) and equity (stocks). It reflects how a corporation finances its overall operations and growth by using various sources of funds. A company's capital structure is a key aspect of its financial strategy and decision-making, influencing its risk profile and the cost of capital (Frank & Goyal, 2009).

There have been many theories of factors that may explain the choice of capital structure of a firm, as described above. Titman & Wessels (1988) explores the influence of unobservable factors on corporate debt ratio choices. Their research suggests a negative correlation between a firm's debt levels and the uniqueness of its business sector. The paper also points to transaction costs as a critical factor in determining capital structure. Specifically, it finds that smaller firms, which face higher costs for issuing long-term debt, tend to have lower short-term debt ratios. This suggests that transaction costs play a considerable role in determining capital structure, challenging traditional theories that argue they are insignificant in relation to other factors.

Frank & Goyal (2009) study the determinants of leverage of US publicly listed firms. Frank and Goyal (2009) aimed to identify and validate key determinants of capital structure decisions. Their research highlights industry median borrowing, ownership of physical assets, profitability, company size, the market-to-book value ratio, and expected inflation as critical factors influencing borrowing levels. Particularly, the study reveals that the significance of these factors can shift over

time, reflecting changes in market conditions and corporate strategies (Frank and Goyal, 2009).

Faulkender & Petersen (2006) highlights that the choice of certain levels of debt and equity could be explained by the effects of tax and credit constraints. Small private firms often face credit limits due to their lack of public information, which makes borrowing more expensive. In contrast, larger public companies have more information available due to regulatory requirements, yet their ability to borrow is still influenced by market conditions. Surprisingly, traditional metrics don't fully capture the impact of these constraints on companies' borrowing decisions, which can lead to them having less debt than might be expected, even after considering various company characteristics.

Focusing on Norway, Mjøs (2007) highlights that firms distributing dividends face fewer financial constraints and rely less on debt. They secure more funding from external sources and doubling the total return compared to non-dividend payers, with less return volatility. Smaller firms, constrained by lower profits and limited external capital access, struggle with new fund acquisition, affecting their debt but not equity financing. Mjøs further notes differences in financing strategies among firm types; listed and foreign-owned firms lean on equity, while individually owned entities prefer minimal debt, achieving stable debt levels and high returns. He also identifies high leverage in firms with auditor comments, attributed to weak cash flows and returns. Additionally, his research covers sector-specific findings, particularly in agriculture and fishing, which show high interest-bearing debt use and significant new equity raising.

Sikveland and Zhang's (2020) research into the Norwegian salmon aquaculture industry unveils a notable difference in how private and publicly listed companies manage their finances. Their findings suggest that public companies lean towards a more cautious financial approach, characterized by less reliance on both long-term and short-term debts and holding higher liquidity levels. This strategy, while potentially minimizing bankruptcy risks, could also impact the return on investments. In contrast, private companies in the industry show a tendency towards a different capital structure, often involving higher levels of debt, underlining the importance of company type for capital structure choices.

Frank & Goyal´s (2022) later research highlights several key factors that could explain changes in leverage. They suggest that alterations in tax or bankruptcy codes could be a major influence. Similarly, events like natural disasters or severe weather conditions are considered as triggers. In the view of macroeconomics, they point out the increasing use of high-frequency monetary announcements to identify changes. Additionally, shifts in intermediary capital are recognized as potentially impactful, based on studies that have explored this avenue.

4.2 Empirical evidence of the connection between tax and capital structure

Over time, the discussion around the relationship between tax policy and firm's leverage has evolved significantly as research studies discover new elements. The best course of action when company debt has tax benefits involves a trade-off between the tax benefits of borrowing with the drawbacks of the costs of having a suboptimal capital structure.

Modigliani and Miller improved upon their previous conclusions from 1958 in their follow-up paper, "Corporate Income Taxes and the Cost of Capital: A Correction" (1963). They there responded to critiques concerning their initial research and thereafter offer an updated version of the Modigliani-Miller theorem that accounts for debt interest payments being tax deductible. The impact of taxes on a firm's ideal capital structure and cost of capital is recognized in this updated model. They updated their valuation equations to reflect that the additional earnings gained from debt, after taxes, should be valued at a rate that accounts for their relative certainty, as opposed to a rate used for less certain income streams.

Risky loans create an agency cost which contributes to a suboptimal investing strategy (Myers, 1977). Yet, Jensen and Meckling (1976) did not emphasize this specific agency cost. They base their research of the ideal capital structure on other factors. To apply economic principles to corporate finance issues, Miller explores in his paper "Debt and Taxes" (1977) various perspectives on debt and taxation that have been influenced by discussions with University of Chicago colleagues. He argues that, in a market equilibrium, the worth of a company is independent of

its capital structure, even in the case of tax advantages of debt. He cast doubt on the idea of an ideal capital structure based on tax benefits versus bankruptcy costs. Miller argues that the bankruptcy costs, often cited as a reason for optimal capital structure, are disproportionately insignificant compared to tax savings. The market's equilibrium is likely to be disturbed by any effort from corporate owners to grow wealth by modifying the proportion of debt to equity. The outcome would be modifications in the stock and bond yields as well as ownership structures, which would bring the market back into balance while not taking insolvency or financing expenses into account.

Challenging Modigliani and Millers was Wrightsman (1978) view on tax benefits and capital structure. He points out that capital structure theories often assume that the tax savings from interest payments on debt are guaranteed, which makes sense if the debt carries no risk. However, when there is a risk associated with the debt and its interest payments, these tax savings also become uncertain. In situations where debt is risky, the highest value from these tax savings might be achieved with a moderate amount of debt, rather than the maximum possible.

Jeffrey K. MacKie-Mason (1990) explores the influence of taxes on corporate financing decisions using empirical analysis. MacKie-Mason discovers statistically significant data in favor of taxes having an impact on businesses' capital structure through regression analysis with control variables. In particular, he argues that companies' decisions about their capital structure are influenced by changes in tax rates and the tax deductibility of interest payments. Firms tend to increase their portion of debt due to the tax deductibility. The study also shows that companies modify their financing plans in reaction to shifts in tax laws, increasing their leverage with higher taxes.

However, MacKie-Mason (1990) and Scholes and Wolfson (1992) argue that historically there are some weaknesses to the way tax effects are tested. Graham pursued to fill this gap in his paper “Debt and the marginal tax rate” (1996). The focus of this paper was to both “*calculate company-specific marginal federal income taxes and using these rates to examine incremental financing choices, thus allowing for a direct test of whether tax status influences corporate debt policy*” (Graham 1996). 10 000 firms were in his study in a year span from 1980-1992.

Through his study using, for instance, a linear regression model, he found a correlation between firms with higher tax rates issuing more debt than those with lower taxes.

Fama and French (1997) provide new perspectives on the relationship between corporate taxes, financing choices, and the value of a business. They study how corporate income taxes affect financing decisions made by businesses and how those decisions affect the value of the business. They examine the trade-offs between debt and equity financing options, considering the tax benefits of debt, such as interest deductibility, and the drawbacks, such as bankruptcy and financial risk. The study finds that debt does not bring the expected tax benefits for companies. Even after adjusting for profitability, higher debt levels were linked to lower company value, challenging the traditional view that debt has tax advantages. This supports the theory that increasing debt might be seen negatively by the market, suggesting that it could signal poor company performance rather than financial savvy.

Dhaliwal et al. (2006) build on Modigliani and Miller's theory by analyzing how leverage, alongside corporate and individual taxes, affects a firm's equity cost. They show that corporate tax benefits from debt can reduce the equity risk premium, suggesting taxes lower the additional return investors demand due to leverage. Conversely, the study finds that higher personal taxes on debt increase this risk premium, indicating that personal tax rates can affect equity investors' return expectations. This research highlights the significant impact of both corporate and personal taxes on equity financing costs, refining Modigliani and Miller's model to account for these tax effects.

Building upon the foundation of earlier research, Heider and Ljungqvist (2014) in their "As Certain as Debt and Taxes," paper, delved deeper into the theory of the tax-leverage relationship, uncovering compelling patterns in firms' responses to tax changes. Their findings not only confirmed the relevance of tax advantages in driving leverage decisions but also revealed asymmetric effects, where firms adjusted leverage in response to tax increases but not decreases. The key finding of the study is that firms significantly increase their leverage in response to tax increases, with an approximate 40 basis point rise in leverage for each percentage

point increase in tax rates (Heider & Ljungqvist, 2014). This result is consistent with dynamic tradeoff theory because the study finds that on the other hand, leverage does not respond to tax cuts, indicating an asymmetric effect. This asymmetry suggests that firms adjust their leverage upwards in response to tax increases, but they do not similarly decrease leverage when taxes are reduced. A reduction in debt would increase the default option value for the shareholders. Furthermore, the debt would appreciate until the company's present debtholders completely profited from the decreased risk, eliminating any incentive for shareholders to cut back on leverage. The effects are more pronounced among profitable and investment-grade firms, which align with the theory that these firms experience lower marginal cost of issuing debt while maintaining a bigger marginal tax benefit.

The discussion took an unexpected turn with the study by Ivanov et al. (2022) written in his paper "Taxes Depress Corporate Borrowing: Evidence from Private Firms". It challenged conventional wisdom regarding the tax-leverage relationship, particularly in smaller private firms. Contrary to expectations, the research revealed a negative correlation between taxes and leverage in these private firms, suggesting that tax increases may discourage borrowing. This finding prompted a reevaluation of the traditional view and highlighted the importance of considering tax-sensitive costs in understanding firms' financing behavior.

The reasoning behind this conclusion stems from an understanding of how small private firms react to tax changes compared to their larger counterparts. The study posits that for small firms, the conventional benefits of debt are outweighed by tax-sensitive costs. In these firms, higher taxes reduce profits, increase the likelihood of default, and thus, make borrowing less attractive, leading to lower leverage. This is a significant departure from the usual narrative where tax increases are assumed to boost debt levels due to the attractiveness of the interest tax shield (Ivanov et. al., 2022).

5.0 Hypothesis and Methodology

5.1 Hypothesis

The fundamental theories about capital structure that are explained in our literature review serve as the foundation of our analysis. These theories collectively provide a robust framework for hypothesizing the relationship between the tax change and firm's corporate leverage decisions.

Our hypothesis mainly revolves around the Trade-Off Theory and the Pecking Order Theory, alongside others. The Trade-Off Theory suggests that firms balance the tax benefits of debt against the costs of financial risk. It proposes that the introduction of the salmon tax might encourage firms to increase their leverage to capitalize on tax shields, despite the potential for increased distress costs. On the other hand, the Pecking Order Theory suggests that firms prioritize internal financing and only resort to external finance as a last resort, with debt being preferred over issuing equity. It proposes that an increase in taxes might push firms towards relying more on debt financing, thereby increasing leverage as internal funds decrease and external financing becomes more needed. The question remains: will the announcement of the increase in the salmon tax lead to the predicted rise in leverage, as suggested by the Trade-Off Theory? Or will the leverage only increase when the internal funds are not enough?

Nevertheless, there are differences in the timing of leverage changes of a firm between these two theories. According to the Trade-Off Theory, the announcement of the new taxes alone could lead to an increase in leverage, given that the tax was announced in September 2022 and became effective in fiscal year 2023. Firms would have to increase leverage by the end of the 2022 fiscal year to fully benefit from tax shields – but they must consider the trade-off of higher risk. Conversely, according to the Pecking Order Theory, debt financing would primarily be needed to finance tax payments ex-post. Depending on the timing of these tax payments, the increase in leverage might occur in 2023 or later.

Given these theoretical insights, our hypothesis is that the announcement of the increase in the salmon tax in Norway, will lead to an increase in leverage among affected firms. This expectation is based on the belief that firms will respond to the

tax change by adjusting their capital structure to ease the impact of higher taxes on their after-tax income through tax shields.

Our regression model will be outlined as follows:

$$Leverage = \alpha + \beta 1 * \text{Treated} + \beta 2 * \text{Post} + \beta 3 * (\text{Treated} * \text{Post}) + \gamma * X + \varepsilon$$

Where *'Treated'* and *'Post'* are our core variables. '*Treated'* is a dummy variable which equals one if the company is affected by the salmon tax and zero otherwise. Also, '*Post'* is defined as a dummy variable, which equals one if the reporting period is after the announcement (year 2022 and forward) of the tax and zero if the reporting period is before (year 2021 and earlier). The coefficient of interest is $\beta 3$, on the interaction between '*Treated'* and '*Post'*. The variable *X* collectively represents our control independent variables (other factors that might affect leverage) which are all lagged by one year. We anticipate $\beta 3$ being positive, indicating an increase in leverage in response to the salmon tax announcement. Therefore, our hypothesis will be stated as follows:

Hypothesis: $\beta 3 > 0$

5.2 Methodology & regressions

In this section, we outline the methodology and regression techniques used to investigate the impact of the salmon tax announcement on the capital structure decisions of Norwegian salmon farming companies. Our analysis depends on comprehensive financial data sourced from the database *Datastream*, which provides coverage of financial metrics essential for our study.

5.2.1 Ordinary Least Square (OLS) & Diff-in-Diff Approach

The following data analysis is conducted using a Difference-in-Differences (Diff-in-Diff) technique through STATA. This statistical technique enables us to isolate the effect of the salmon tax announcement from other concurrent economic events, ensuring a clear understanding of its direct impact on the companies' financial strategies.

The Diff-in-Diff approach assesses an event's effect by comparing the outcomes between a group subject to the event (treated group) and a group that is not (control group), before and after the event occurs. For our analysis, the treated group includes the Norwegian fish farming companies directly affected by the salmon tax announcement. The control group, on the other hand, is the group that is not directly affected by the salmon tax. This method effectively adjusts for external factors that could affect the outcomes, by assuming these factors influence both groups equally over time. Employing Diff-in-Diff allows us to measure the specific impact of the salmon tax on the leverage of the affected companies, thereby shedding light on how such policy changes can alter corporate financing strategies.

We're employing Ordinary Least Squares (OLS) regressions in our analysis to estimate the relationship between the independent variables and the dependent variable, leverage. Reducing the prediction error between the actual and anticipated values is the goal of the ordinary least squares approach. The Gauss Markov theorem states that the best linear unbiased estimator (BLUE), is the OLS estimator of a linear regression model's variables (Hallin, 2006).

5.2.2 Variable description

We are utilizing the following core and control variables for our regression:

Leverage (L)

This represents the dependent variable, denoting the degree of financial leverage employed by the Norwegian salmon firms. It measures the extent to which these companies utilize debt in their capital structures. There are several benefits of using book leverage as the dependent variable in regression analysis. Compared to market leverage, it provides a stable measurement that is less affected by short-term market volatility and correctly represents a firm's financial structure based on its balance sheet (Myers 1977; Graham & Harvey, 2001). Myers (1997) also notes that managers prioritize book leverage since debt is more effectively backed by existing assets than by future growth prospects. Finally, the use of book value in a difference-in-difference regression is consistent with debt issue regressions that are typically scaled with book assets (Leary & Roberts 2005, JF; Axenrod

and Kisser, 2024 Working Paper). However, we will also include robustness checks using market leverage as well.

Treated

This variable is formed as a dummy variable, which means it will have the value "one" if the firm is "treated". '*Treated*' in this regression means that the firm is directly affected by the introduction of the tax policy in 2022. It is assigned a value of zero for all other firms not subjected to this tax change.

Post

Just like the variable '*Treated'*, this variable also represents a dummy variable. It will have a value of "one" if the financial information in the regression pertains to fiscal years ending in December 2022 or later, thereby including all fiscal years from December 2022 onwards. And the value is zero for all years before 2022, with other words, for year 2021 and earlier.

Profitability (prof)

Profitability signifies the profitability metric of the Norwegian salmon companies. It reflects the profitability levels or financial performance of these firms. Profitability will be measured in terms of EBITDA, consistent with prior literature (Titman and Wessels, 1988; Frank and Goyal, 2009; Danis et. al., 2014) - divided by total assets. This ratio indicates how efficiently a company is generating operating income (EBITDA) per unit of total assets. Thereafter, lagging profitability allows for a clearer understanding of how past financial performance impacts current financial decisions and leverage, accounting for the natural delays in how financial results influence strategic moves. The variable *'Prof'* will therefore be lagged with one year. However, the *'Prof'* variable in the triple interaction term '*TreatedPostProf*' in Column 7 and 8 in Table 5 and 7, is a dummy variable. Where *'Prof'* is equal to 1 when the firms' profitability > 0*,* and zero otherwise.

Company Size (size)

This variable denotes the size or scale of the Norwegian salmon companies. We have chosen to measure the size in total book assets, which is a key indicator of size and a straightforward measure. In the model we will use the logarithm of the

total book value of these assets. Using the logarithm of total assets as a size measure helps reduce the impact of extreme values, adjusting skewed data to roughly match normality (Feng et. al., 2014). This is consistent with Frank and Goyal's (2009) research, which discovered a positive correlation between size and leverage. Likewise consistent with Titman & Wessels (1988) and Faulkender & Petersen (2006) who also found a correlation between firm size and capital structure. We will lag the size variable to account for the time it takes for changes in the size of a company to influence and be reflected in its financial strategies and capital structure decisions.

Tobin's Q (Q)

Tobin's Q, often simply referred to as '*Q'*, is a ratio that measures a company's market value relative to its replacement cost of its assets. Tobin's Q is calculated as Total Market Value of Firm divided by Total Asset Value of Firm. The variable is often found to be negatively related to leverage. This negative relationship arises because firms with high Tobin's Q (>1) are generally perceived as having more growth opportunities and are thus less reliant on debt financing. These firms prefer to finance their growth through equity to avoid the risk and cost associated with high leverage (Lang et. al., 1996). Tobin's Q is lagged to prevent reverse causality issues, ensuring that the causal effect of market valuation on financial decisions is accurately captured, with market perceptions influencing subsequent financial strategies.

Tangibility (tan)

This variable represents tangibility or the asset structure of the Norwegian salmon firms. It measures the percentage of net tangible assets, such as property, plants, and equipment, relative to total assets. It makes sense that tangible assets provide substantial collateral value. This collateral potentially enhances a firm's ability to obtain loans, as these physical assets can be offered as security against debt, reducing the perceived risk for lenders. Tangibility is lagged to reflect the delay between acquiring or investing in tangible assets and the subsequent impact this has on the company's ability to secure financing or adjust its leverage due to the enhanced collateral value.

To get a clearer overview of the variables, they are presented in *Table 1* below.

Table 1: Variable Descriptions

Variable	*Formula*	*Description*
Leverage (book)	Total debt/Total assets	Measures the proportion of a company's assets that are financed through debt.
Treated	1 if affected by tax, 0 otherwise	Identifies firms affected by the salmon tax.
Post	1 for post period 2022-2023, 0 for earlier years	Indicates post-tax announcement period.
TreatedPost	Treated*Post	Interaction term for affected firms post-tax announcement.
TreatedPostProf	Treated*Post*Prof. Prof set as a dummy only for Column 7 & 8 with the value 1 if profitability > 0	Interaction term for affected firms, post-tax announcement with profitability higher than zero
Profitability	EBITDA/Total assets	Measure of a firm's profitability.
Size	Logarithm of Total assets	Measure of a firm's size.
Tobin's Q	MV of the firm/Total assets	Ratio of the market valuation to the book value of total assets, indicating market expectations.
Tangibility	PP&E (net)/Total assets	Reflects the proportion of the company's assets that are tangible and physically utilized in operations.

After analyzing the Diff-in-Diff regression based on our core variables, our next step involves controlling for additional factors that might influence the relationship between the salmon tax announcement and the leverage decisions of Norwegian salmon farming companies. By incorporating these control variables into our regression model, we can more accurately isolate the effects of the salmon tax announcement on leverage decisions, ensuring that any observed changes are not confounded by other extraneous factors.

Since our sample consists of *all* firms listed on Oslo Børs, the '*Treated'*-variable makes us able to compare the effects across different sectors and identify the unique impact of the tax change on the salmon farming industry.

5.2.3 Fixed Effects vs. Random Effects

We have conducted a Hausman test on two regressions to decide between fixed effects (FE) and random effects (RE) models. FE models control for unobserved heterogeneity by allowing individual-specific characteristics, while RE models assume these effects are random and uncorrelated with the regressors (Baltagi, 2014).

We conducted two Hausman tests based on the two regressions where we intended to use one of these effects. These two regressions are presented in *Table 5* in Column 2 and Column 4. The results of these tests can be found in the appendix under *A.2*. Although the first Hausman test suggested that the random effects model could be appropriate, the strong evidence from the second test leads us to favor the fixed effects model for our entire analysis. The fixed effects model ensures robustness and consistency, accounting for potential biases and providing more reliable estimates. Fixed effects are also frequently used in empirical capital structure studies (Lemmon et. al., 2008; DeAngelo & Roll, 2015).

The purpose of incorporating fixed effects is to control for time-invariant differences between the independent variables. This helps ensure that the coefficients won't be biased due to time-invariant elements (Kohler & Kreuter, 2009, p. 245). Moreover, it works well when researchers wish to interpret firm specific effects, such as we are doing with the salmon tax effect on the capital structure of a firm.

6.0 Data Collection

The empirical analysis in our study is underpinned by a comprehensive data collection process, primarily utilizing one significant source: the Datastream (LSEG) database with primary data.

6.1 Sampling details

The scope of our master thesis spans across the 297 firms listed on the Oslo stock exchange. Within this dataset, there are 16 Norwegian salmon farming companies which are directly affected by the newly implemented tax. To ensure accurate

identification of firms directly affected by the newly announced salmon tax, we utilized the Euronext (2023) website. This platform provided a detailed listing of 52 companies operating within the consumer discretionary and consumer staples sectors. Of these, 25 firms were specifically engaged in farming and fishing activities. However, further refinement and verification through Datastream, based on firm descriptions, confirmed that only 16 of these companies were directly impacted by the tax changes. This dual-source verification approach allowed us to precisely define our treated group for the regression analysis. Our primary focus remains centered on understanding the direct influence of the announcement of the newly implemented salmon tax on the leveraging strategies of the 16 affected Norwegian salmon firms.

We employ a panel dataset spanning from 2018 to 2023. Our regression will be based on the years 2019 to 2023, but since we're using variables that's lagged we have included year 2018 in our data sample. The critical event in our analysis, the announcement of the salmon tax, occurred in 2022. Thus, we define the post-announcement period as 2022 and 2023, where we observe the immediate and short-term effects of the tax on financial decisions. The year 2022 was coded as "one" for the *'Post'* dummy variable, despite the announcement of the salmon tax coming in September of that year. This is due to the financial reporting cut-off was on December 31, 2022, for all affected companies. By setting the dummy variable this way, we align our analysis with the timing of financial reporting, ensuring that our evaluation reflects the fiscal impact of the tax announcement within the appropriate financial year. An overview of the data sample and definitions can be found in *Table 2*.

The years prior to the announcement—2019, 2020, and 2021—represent the pre-announcement period. Consequently, the dataset contains annual observations, which effectively eliminates many issues related to seasonal variations that may exist within the variables. Given the short span of the post-announcement period, we have deliberately limited the number of years included in this phase to roughly balance the periods before and after the tax announcement. This decision ensures a more symmetric and controlled comparison across the two periods, enhancing the robustness of our Difference-in-Differences analysis and mitigating potential biases arising from uneven time spans. This division allows us to robustly

compare financial metrics before and after the policy implementation, facilitating a clear understanding of the tax's impact over time through our Difference-in-Differences analysis. All data collected for the analysis is in the Norwegian currency NOK.

Table 2: Overview of data sample

Data	*Number*
Total firms in sample	297
Total data sample	1 782
Firms affected of the tax	16
Definition	*Year*
Total sample period	2018 - 2023
Announcement of tax	2022
Pre period	2019-2021
Post period	≥ 2022

6.2 Correlation Matrix

A correlation matrix is a table that illustrates the correlation coefficients between different variables. The correlation between two variables is shown in each cell of the table. Ranging from -1 to 1, where 1 indicates a perfect positive correlation, meaning that as one variable increases, the other variable also increases. Conversely, a value of -1 implies a perfect negative correlation, which means that as one variable increases, the other declines. A coefficient of 0 indicates no correlation, meaning that changes in one variable do not affect the other variable (Taylor, 1990, p.36). The matrix helps identify relationships between variables, detect multicollinearity (high correlations between predictors), and helps when making decisions about which variables to include in the regression model. *Table 3* represents a correlation matrix for all our variables, including control variables but excluded the dummy variables.

Table 3: Correlation matrix

	Book Leverage	Market Leverage	Prof	Tan	Size	Q
Book Leverage	1,000					

Market Leverage	0.433 0,000	1,000				
Prof	0.078 0,009	0.233 0,000	1,000			
Tan	0.498 0,000	0.146 0,000	0,145 *0,000*	1,000		
Size	0.259 0,000	0.363 0,000	0,428 *0,000*	0,133 *0,000*	1,000	
Q	-0.284 0,000	-0.268 0,000	-0,435 *0,000*	-0,188 *0,000*	-0,488 *0,000*	1,000

Correlation Matrix for all variables, except dummy variables. The first number in each cell is the correlation coefficient, and the second number (below the correlation coefficient) is the p-value, which indicates the statistical significance of the correlation.

In the correlation matrix provided, the results for the dependent variables, book leverage and market leverage, offer insights into their relationships with the other independent variables. Both book leverage and market leverage show moderate positive relationships with firm size, suggesting that larger firms tend to have higher leverage. Tangible assets have a strong positive correlation with book leverage but only a weak positive correlation with market leverage. Both measures of leverage exhibit weak positive correlations with profitability.

Several variables have significant correlations with '*Size*' and '*Q'*, indicating their importance in the model. "*Size*" has significant positive correlations with '*Prof*" and '*Tan*'. This indicates that larger firms tend to have higher profitability, higher tangible assets, which could be important factors in understanding firm stability and investment. Moreover, '*Q*' shows a positive correlation with '*Post*'. This might suggest that the market perceives these firms more favorably or that they have better growth opportunities in the recent fiscal years compared to the years before 2022.

Overall, the correlations indicate significant relationships that should be considered in regression analysis. The significant correlations between key variables such as '*Size'* and '*Q*,' suggest that these factors are interrelated and will likely impact the regression outcomes. The presence of significant correlations and their directions provide a good foundation for regression analysis, although

we choose to check for multicollinearity to ensure that the independent variables do not excessively correlate with each other, which could distort the regression results.

6.3 Checking for multicollinearity

To confirm that there is no multicollinearity present between our independent variables, we have assessed a VIF-test (Variance Inflation Factor) for each and one of our regressions without fixed effects that has book leverage as dependent variable. Full results can be found in appendix under *A.1.* The mean VIF-values for the regressions represented (as columns) in *Table 5* is represented in *Table 4* below:

Table 4: Mean VIF-values

Column	*Mean VIF-value*
(1)	1,44
(3)	1,60
(5)	1,62
(7)	2,01

Column, Column represented in Table 5; Mean VIF-value, the mean VIF-value for each column.

The common thresholds for VIF interpretation are as follows: A VIF value of less than 1 indicates no multicollinearity. A VIF value between 1 and 5 indicates low to moderate multicollinearity. A VIF score of less than 1 implies no multicollinearity. A VIF rating between 1 and 5 implies low to moderate multicollinearity. A VIF score of 5 or above implies strong multicollinearity, which is often considered problematic and may require corrective measures (Shrestha, 2020). All the Mean VIF values in the table are below the threshold of 5, indicating that multicollinearity is low to moderate in these models and is not a significant problem. There is no need for corrective action based on these VIF values.

6.4 Data limitations

In our regression analysis, the number of observations, denoted as *n*, is subject to change depending on the specific variables incorporated into the model. As we

expand our set of explanatory variables to enrich the analysis, we may encounter instances of missing data for some of these variables across different companies. This missing data results from variations in reporting standards, data availability, or the financial disclosure practices of individual firms. Consequently, companies lacking complete data for all variables of interest will be excluded from the regression analysis to maintain the integrity and accuracy of our results. This approach ensures that our findings are based on robust and comprehensive data, but it also means that the size of our analytical sample may decrease as the variable set expands. The number of missing data per variable and descriptive statistics for all variables can be found in the appendix under *A.3*.

We decided to winsorize our variables in STATA at the 1st and 99th percentiles. This step was important because it helps manage outliers that could throw off the analysis. By trimming the most extreme values and capping them at these percentiles, we prevent these outliers from skewing our results. This method keeps the bulk of our data intact and makes sure our findings are more reflective of the true trends, giving us a clearer, more accurate picture.

6.5 Validity

There is also a potential for omitted variable bias in the regression. This can occur if one or more of the independent variables has been left out of the regression model. This suggests some variables are correlated with either the dependent or independent variables, which means endogeneity occurs in the model. This significantly affects our findings and weakens our capacity to establish causality. The risk is therefore that the model consistently overestimates or underestimates one or more relationship's strengths (Wilms, R. et al., 2021).

However, one way to control for (some of) the omitted variable bias is through adding Fixed Effects to the model. By adding FE, the regressions get controlled for omitted variable bias by accounting for unobserved, time-invariant characteristics specific to each entity, thereby isolating the effect of the variables of interest. However, since fixed effect models consider firm specific variations, it can constrain the possibility for external validity. While this approach effectively reduces the risk of omitted variable bias, it can limit external validity—the ability

to generalize the findings beyond the sample used in the study. This limitation arises because fixed effects models filter out between-firm variations, making the results highly specific to the firms in the sample. Consequently, the insights derived may not be applicable to other firms or broader contexts, as the unique characteristics of the sampled firms heavily influence the findings. This constraint can be particularly significant if the firm-specific traits or the industry context play a crucial role in the phenomena being studied.

7.0 Empirical Analysis

7.1 Book Leverage

In this section, we evaluate the impact of the salmon tax announcement using book leverage as the dependent variable. Book leverage is a key indicator of a firm's financial structure and risk profile. We compare our findings with previous research mentioned in section 4, such as Frank and Goyal (2009). The analysis is presented in *Table 5.*

Table 5: Regressions with Book Leverage as dependent variable

Dependent Variable: Book Leverage								
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Treated	0,001	0	-0,087**	0	-0,085**	0	-0,087**	0
	(0,035)	(omitted)	(0,042)	(omitted)	(0,042)	(omitted)	(0,042)	(omitted)
Post	-0,012	-0,014*	-0,006	-0,024**	-0,002	-0,016**	-0,006	-0,016**
	(0,014)	(0,007)	(0,013)	(0,009)	(0,013)	(0,008)	(0,013)	(0,007)
TreatedPost	0,044	0,036	0,040	0,036	-0,002	0,058	-0,075	0,054
	(0,056)	(0,029)	(0,056)	(0,043)	(0,061)	(0,051)	(0,076)	(0,081)
TreatedPostProf					0,657*	-0,239	0,173**	-0,027
					(0,388)	(0,339)	(0,076)	(0,088)
Prof			-0,098***	-0,046*	-0,100***	-0,026	-0,101***	-0,025
			(0,023)	(0,028)	(0,023)	(0,021)	(0,023)	(0,021)
Tan			0,376***	-0,045	0,377***	-0,014	0,383***	-0,009
			(0,022)	(0,067)	(0,022)	(0,052)	(0,022)	(0,052)
Size			0,016***	0,040**	0,015***	0,027***	0,015***	0,025**
			(0,003)	(0,013)	(0,003)	(0,010)	(0,003)	(0,010)
Q			-20,038***	3,584	-21,014***	0,509	-20,256***	0,406
			(3,650)	(4,209)	(3,727)	(3,325)	(3,643)	(3,247)
Cons	0,264***	0,265***	-0,022	0,306	-0,005	-0,117	-0,014	-0,093
	(0,009)	(0,004)	(0,052)	(0,187)	(0,052)	(0,148)	(0,052)	(0,144)
Fixed Effects	No	Yes	No	Yes	No	Yes	No	Yes
R^2	0,0012	0,0012	0,3325	0,0096	0,3295	0,0373	0,3363	0,0439
Adj. R^2	-0,0011	-	0,3272	-	0,3233	-	0,3303	-
N	1 299	1 299	896	896	885	885	896	896

The table displays regression results (coefficient estimates, and standard errors in parentheses) with book leverage as the dependent variable. Treated, dummy variable represent one if firm is affected by the salmon tax; Post, dummy variable represent one if the year is after the announcement of the salmon tax (2022

and forward); TreatedPost, interaction term; TreatedPostProf, triple interaction term where prof is set as a dummy variable for Column 7 and 8 (1 if Prof>0) otherwise prof is defined as in Table 1; The control variables are lagged by one period and include Prof, profitability; Tan, tangibility; Size, size of firm; Q, Tobin's Q; Cons, constant term; FE, Fixed Effects, Indicates whether fixed effects are included (Yes/No); R-squared, Proportion of the variance in the dependent variable that is predictable from the independent variables; Adjusted R-squared, Adjusted version of R-squared that accounts for the number of predictors; N, Number of observations.

*Significance levels: * p<0,10 / ** p<0,05 / *** p<0,01*

7.1.1 Main regressions

The main models explore the relationships between book leverage and various explanatory variables. In the first set of regressions (Columns 1 and 2) in *Table 5*, we observe some key trends and differences when fixed effects are included. The first column presents the basic regression without fixed effects, while Column 2 includes fixed effects.

In Column 1, the *'Treated'* variable shows a very small and statistically insignificant coefficient, stating that there is no significant difference between treated versus untreated firms regarding their unconditional leverage choice. However, in Column 2, this variable is omitted because the fixed effects model captures firm-specific characteristics that remain constant over time. Without fixed effects (Column 1), the *'Post'* variable has a negative but insignificant coefficient, but once fixed effects are included, the variable's coefficient becomes significant at the 5% level. This indicates a small but statistically significant negative effect during the post announcement period. Focusing on the coefficient of interest, we can see that the interaction term *'TreatedPost'* remains insignificant and positive in both models, indicating no significant combined effect of being treated and the post-announcement period. The R-squared values are very low in both models (0.0012), indicating poor overall fit. The negative adjusted R-squared value for Column 1 further suggests the model's inadequacy in explaining the variance.

In the second set of regressions, the model is extended by adding our control variables. Column 3 presents the regression without fixed effects, while Column 4 includes fixed effects. Notably, the fixed effects model also here results in the omission of the *'Treated'* variable due to its time-invariant nature, shifting the focus to how firms' leverage changes within the time frame rather than across different firms. The inclusion of fixed effects markedly impacts the regression outcomes of more than the variable '*Treated.'* Fixed effects models (Columns 2 and 4) tend to show a significant negative coefficient for the *'Post'* variable, highlighting the importance of accounting for firm-specific characteristics that do

not vary over time. The *'TreatedPost'* interaction term is once again not significant in either model and remains positive.

In accordance with previous research (Titman & Wessels, 1988; Frank & Goyal, 2009), higher profitability is associated with lower leverage among firms. This is shown by the negative and statistical significance of the variable *'Prof'* in both Column 3 and 4. The significance increases in Column 4, suggesting that more profitable firms tend to have higher leverage when firm-specific characteristics are not accounted for.

Tangibility (*'Tan'*) has a highly significant positive relationship with leverage in Column 3 but loses both its significance and positive coefficient when incorporating fixed effects. Once again showing the importance of firm-specific characteristics. Although, because of its' significance lost, it should be considered a less reliable indicator in this specific model. Firm size has in earlier studies (Frank & Goyal, 2009) shown that larger firms tend to have higher leverage. The variable *'Size'* in our research stays consistent with these findings, showing a positive and significant relationship with leverage in both columns. Tobin's Q (*'Q'*) shows a highly significant negative relationship with leverage in Column 3, suggesting that firms with higher market valuation relative to their assets tend to have lower leverage. This is in accordance with previous research findings (Lang et. al., 1996).

The constant term is only significant in Column 4, indicating some unexplained variance in leverage. The R-squared values are much higher in Column 3 with a value at 0.3325, indicating a better fit compared to the previous set. The adjusted R-squared value for Column 3 is also higher, suggesting that the regression explains more variance in leverage. The R-squared value for the fixed effect regression, Column 4, is significantly lower than for Column 3. The number of observations is slightly lower, with 896 in both models.

7.1.2 Findings separating The Trade-Off Theory and The Pecking Order Theory

In this section, we focus on analyzing the interaction terms presented in Columns 5 to 8 of *Table 5*. The '*TreatedPost*' interaction term shows the effect of the Salmon Tax announcement on leverage for firms affected by the tax after its introduction. The '*TreatedPostProf*' interaction term tells us the differential impact of the tax announcement on leverage for profitable firms affected by the tax, highlighting how profitability modifies the leverage response to the tax policy. These interaction terms are critical in understanding the leverage effects of the Salmon Tax announcement in Norway, particularly through the lenses of the Trade-off Theory and the Pecking Order Theory. As known, The Trade-off Theory states that firms balance the benefits of debt (such as tax shields) against the costs (like financial distress), thereby often taking on more debt when taxes increase. The research from Heider and Ljungqvist (2014) suggested that the leverage of firms should be increased after a tax increase. Looking back at our hypothesis, the '*TreatedPost*' interaction term should therefore have a positive (> 0) coefficient to align with this theory. The same goes for the triple interaction term, '*TreatedPostProf*'.

On the other hand, we have the Pecking-Order Theory, suggesting that firms prioritize internal funds over debt for financing, and only issues new equity as a last resort. This is especially interesting when we look at the triple interaction term, which has the profitability variable included. The more profitable a firm is, the more likely it is in a position to finance itself internally and, hence, the less debt it should take on according to this theory. This suggests that the coefficient for '*TreatedPostProf*' should be equal to zero and significant. Since we have programmed profitability in two different ways for this interaction term – we get to see if there is any difference in the outputs regarding *how* profitable a firm is (Column 5 & 6) versus only checking if it has a profitability rate over zero (Column 7 & 8). And since the interaction term of '*TreatedPost'* does not say anything about the firms' internal funds, it is hard to find evidence for or against the Pecking-Order Theory by only looking at this term. To summarize the arguments for the coefficients and the two theories, we have included an overview of this in *Table 6* below.

Table 6: Trade Off-Theory vs. The Pecking-Order Theory

	Value of coefficient	
	Trade-Off Theory	Pecking-Order Theory
TreatedPost	> 0	-
TreatedPostProf	> 0	0

Overview of coefficient values for the interaction terms supporting the Trade-Off Theory, respectively, the Pecking-Order Theory.

As mentioned, the definition of the '*Prof*'-variable separates Column 5 and 6 from Column 7 and 8. Profitability is defined as described in *Table 1* in the triple interaction term for the first two columns, and then shifts to a dummy variable for the last two. The dummy variable is constructed to be equal to "one" when the firm has a profitability higher than zero and takes on the value "zero" otherwise.

Starting off with the interaction term '*TreatedPost*' in Column 5 and 6 in *Table 5*, we can see a shift in the negative sign when including fixed effects. This suggests that unobserved, time-invariant factors previously led to a negative bias, and once controlled for, a positive relationship between the tax announcement and leverage is revealed. This partly supports the Trade-Off Theory, even if the value of the coefficient is close to zero. However, neither of coefficients show any statistical significance, meaning that the impact of the tax announcement on leverage is not robust and may be influenced by other factors not captured in the model.

Shifting focus to the triple interaction term, '*TreatedPostProf*,' we can see a statistically significant positive coefficient in Column 5 – suggesting that this finding argues for the Trade-Off Theory rather than the Pecking-Order Theory. When indulging fixed effect in Column 6, we can see the significance disappear and the coefficient shifting to a negative sign – meaning that we can't determine the impact.

As mentioned earlier, Column 7 and 8 takes on profitability as a dummy variable in the triple interaction term. Despite this, there is not much change in the outputs for the interaction terms compared to Column 5 and 6 – saying that there may not be a significant difference in terms of leverage regarding *how* profitable a firm is. But we can see, based on the coefficient, that profitable firms behave differently

than unprofitable firms in their leverage decisions. Even more so, the statistical significance increases to a 5% level for '*TreatedPostProf*'. However, the effect becomes again statistically insignificant when controlling for firm-fixed effects. And the control variables stay consistent with the outputs from the four first regressions, while size is showing itself significant for the first time when including fixed effects. The positive impact of profitability on leverage is in accordance with previous research by Frank and Goyal (2009).

In summary, while there is some evidence supporting the Trade-Off Theory, particularly regarding the interaction terms' coefficients - the lack of statistical significance in many cases highlights that the impact of the tax announcement on leverage may be influenced by other unobserved factors. However, *'TreatedPostProf'* is statistically significant when we do not include fixed effects, which gives us some support for the Trade-Off Theory.

7.2 Market Leverage

In this section, we present a robustness model where we use market leverage instead of book leverage as the dependent variable. Market leverage provides a different perspective on a firm's financial leverage, reflecting market perceptions and valuations. These regressions allow us to validate our findings by examining whether the determinants of leverage hold consistent when measured through market-based metrics. The regression outputs are presented in *Table 6*.

Table 7: Regressions with Marked Leverage as dependent variable

Dependent Variable: Market Leverage								
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Treated	0,024	0	0,017	0	0,020	0	0,017	0
	(0,054)	(omitted)	(0,051)	(omitted)	(0,050)	(omitted)	(0,051)	(omitted)
Post	-0,001	0,005	-0,023	-0,027***	-0,017	-0,026**	-0,022	-0,027**
	(0,017)	(0,012)	(0,016)	(0,013)	(0,015)	(0,123)	(0,015)	(0,013)
TreatedPost	0,011	0,056	0,012	0,019	-0,013	-0,023	-0,030	-0,004
	(0,075)	(0,053)	(0,067)	(0,057)	(0,071)	(0,085)	(0,091)	(0,139)
TreatedPostProf					0,347	0,364	0,063	0,028
					(0,456)	(0,572)	(0,092)	(0,151)
Prof			0,073***	-0,036	0,067**	0,034	0,072***	0,035
			(0,027)	(0,037)	(0,027)	(0,036)	(0,027)	(0,036)
Tan			0,071***	0,260***	0,066**	0,263**	0,074***	0,261***
			(0,027)	(0,088)	(0,026)	(0,087)	(0,027)	(0,088)
Size			0,024***	0,007	0,23***	0,006	0,024***	0,007
			(0,000)	(0,017)	(0,004)	(0,017)	(0,004)	(0,017)
Q			-9,818**	13,163***	-11,893**	12,904**	-9,900**	13,202**
			(4,374)	(5,564)	(4,387)	(5,603)	(4,376)	(5,572)
Cons	0,894***	0,891***	0,561***	0,744**	0,575***	0,763**	0,564***	0,744***
	(0,011)	(0,007)	(0,062)	(0,247)	(0,062)	(0,250)	(0,062)	(0,247)
Fixed Effects	No	Yes	No	Yes	No	Yes	No	Yes
R^2	0,0006	0,0003	0,1349	0,0228	0,1393	0,0184	0,1353	0,0231
Adj. R^2	-0,0022	-	0,1281	-	0,1314	-	0,1276	-
N	1 092	1 092	896	896	885	885	896	896

The table displays regression results (coefficient estimates, and standard errors in parentheses) with book leverage as the dependent variable. Treated, dummy variable represent one if firm is affected by the salmon tax; Post, dummy variable represent one if the year is after the announcement of the salmon tax (2022 and forward); TreatedPost, interaction term; TreatedPostProf, triple interaction term where prof is set as a dummy variable for Column 7 and 8 (1 if Prof>0) otherwise prof is defined as in Table 1; The control variables are lagged by one period and include Prof, profitability; Tan, tangibility; Size, size of firm; Q, Tobin's Q; Cons, constant term; Fixed Effects, Indicates whether fixed effects are included (Yes/No); R-squared, Proportion of the variance in the dependent variable that is predictable from the independent variables; Adjusted R-squared, Adjusted version of R-squared that accounts for the number of predictors; N, Number of observations.

*Significance levels: * p<0,10 / ** p<0,05 / *** p<0,01*

7.2.1 Main regressions

The main regressions are presented in Column 1 to Column 4 in *Table 6*. These are each designed to evaluate the impact of the salmon tax and various control variables on market leverage. Column 1 presents the regression without fixed effects, while Column 2 includes fixed effects.

The direction of the *'Treated'* variable differs between book and market leverage, with book leverage showing an overall negative and sometimes significant relationship, whereas market leverage shows a positive but insignificant relationship. This suggests that firms' responses to the tax announcement might differ depending on whether leverage is measured in book or market terms, potentially reflecting different strategies or market perceptions. The inclusion of fixed effects in Column 2 results in the omission of the *'Treated'* variable, just like we saw in *Table 5*. This indicates that firm-specific characteristics might better explain the observed effects.

The *'Post'* variable stays within its pattern of a negative coefficient. But interestingly, it turns significant on a 5% level in Column 4. This change implies that the period following the salmon tax announcement does significantly influence market leverage when fixed effects are considered. The *'TreatedPost'* interaction term stays positive but is not significant in both models, indicating no combined effect of treatment and the post-announcement period.

Both models have a highly significant positive constant term, pointing to some unexplained variance in market leverage. The R-squared values are very low (0.0006 for Column 1 and 0.0003 for Column 2), indicating that neither regression explains much of the variance in market leverage. The negative adjusted R-squared value in Column 1 further underscores the poor fit. With 1 092 observations in both models, the inclusion of fixed effects in Column 2 does not markedly improve the regression’s explanatory power.

Columns 3 and 4 incorporate additional variables to refine the analysis. Once again, we note that the *'Treated'* variable is omitted due to fixed effects, reinforcing the idea that firm-specific characteristics play a crucial role.

The *'Post'* variable is negative and insignificant in Column 3, but in Column 4, it becomes significant at the 5% level, reflecting a trend of the incorporate fixed effects in Column 2. The *'TreatedPost'* interaction term continues to be positive but not significant in both regressions, confirming no notable combined effect. Tangibility (*'Tan'*) is positively and highly significantly related to leverage in both models, indicating that companies often have a greater market leverage when they have more tangible assets.

A notable difference between book leverage and market leverage is observed in the *'Prof'* (profitability) variable. For book leverage, profitability consistently shows a significant negative relationship, suggesting that lower book leverage is typically seen in more profitable businesses. In contrast, for market leverage, the *'Prof'* variable overall shows a positive and significant relationship, suggesting that more profitable firms might have higher market leverage in some specifications. The positive impact of profitability goes against findings of previous studies on market leverage which show the opposite (Titman & Wessels, 1988; Danis et. al., 2014; Frank & Goyal, 2009). This divergence implies that profitability influences book and market leverage differently, possibly due to how profits are perceived in terms of accounting values versus market valuations. It should also be mentioned that profitability loses significance in Column 4, indicating that higher profitability is associated with higher leverage only when firm-specific characteristics are not controlled for.

According to earlier research (Danis et. al., 2014; Frank & Goyal, 2009), bigger firms tend to have higher leverage. The positive and significant variable *'Size'* in Column 3 confirms this as well. However, it loses its significance in Column 4, implying that the effect of the size of the firm is not robust on leverage with the inclusion of fixed effects. Tobin's Q (*'Q'*) shows a significant negative relationship with leverage in Column 3 but turns positive and significant in Column 4, highlighting potential omitted variable bias in the model without fixed effects.

Both regressions exhibit a highly significant positive constant term, indicating unexplained variance in market leverage. The R-squared values in Columns 3 and 4 are higher (0.1349 and 0.0228, respectively), indicating a better fit than the two

earlier models. The adjusted R-squared value is also higher, suggesting that these models explain more variance in market leverage. The number of observations remains at 896 in both models.

7.2.2 Comparing the leverage reaction of profitable and unprofitable firms

In this section, we analyze Columns 5 to 8 of *Table 7* which uses market leverage as the dependent variable. The Columns and variables are defined under section *7.1.2*, including the interaction terms.

The interaction term '*TreatedPost*' has a negative effect on leverage based on the coefficient sign over all four regressions. This is in accordance with the findings of Ivanov, et al. (2022), which suggest that a tax increase has a negative impact on leverage. However, the coefficient values, although negative, are all close to zero and miss statistical significance. The value itself argues against the Trade-Off Theory that states that the sign should be positive, but the insignificance states that the effect of the tax announcement on leverage might be negligible or highly influenced by other factors not accounted for in the model, thereby failing to provide robust evidence against or in favor of the Trade-Off Theory. The insignificance of this interaction term is like the output for book leverage in Table 5, the main difference between them is the shift in sign when including fixed effects.

The statistical insignificance among the coefficients for '*TreatedPost*' is also noticeable for the triple interaction term when compared to book leverage (Table 5), where they showed significance when excluding fixed effects. Looking away from the insignificance among these coefficients (Column 5 to 8), we find positive, but small values close to zero. All in all, market leverage regression fails to provide evidence in favor of the Trade-Off theory.

When comparing the results of Column 5 to 8 between Table 5 and 7, a few differences and similarities stand out in terms of the control variables.
The '*Post'* variable consistently shows a negative impact across both tables,

indicating a general reduction in leverage post-announcement when including fixed effects. Profitability is shown to negatively affect book leverage in accordance with previous research (Titman & Wessels, 1988; Frank & Goyal, 2009), while overall positively impacts market leverage. The '*Size'* variable remains positively associated with leverage in both cases, reinforcing the idea from Frank & Goyal (2009) that larger firms are more likely to take on additional debt. This becomes especially clear in terms of book leverage. Although noteworthy, size loses its significance when including fixed effects for market leverage. '*Q*' shows a pattern of statistical significance for both market leverage and book leverage – and shows a positive impact on leverage when including fixed effects in the regressions, and negative otherwise.

8.0 Conclusion

In this concluding section of our master thesis, we will summarize the main findings of our empirical analysis, providing a comprehensive overview of the key findings and outcomes of our research. Also, we will identify the limitations encountered during the study and offer suggestions for future research, highlighting potential areas for further investigation to build upon our work and address them.

8.1 Summary of key findings

We choose our independent variables based on previous studies that had shown impact on leverage. We found that the factors of profitability, tangibility, firm size, and Tobin's Q all had an overall significant effect on both book and market leverage. Which may suggest that tangible assets provide collateral which encourages borrowing, larger firms have better access to credit markets, and firms with higher market valuations prefer equity financing to avoid financial distress. Profitability showed an overall decreasing trend for book leverage, while maintaining the opposite for market leverage. This suggests that profitability influences book and market leverage differently, possibly due to how profits are perceived in terms of accounting values versus market valuations.

The purpose of this master thesis was to get a clearer picture on whether the salmon tax announcement in Norway had an increasing effect on leverage for the affected companies: "*Does the announcement of the salmon tax affect capital structure decisions of Norwegian salmon farming companies?*". And with a hypothesis that would be consistent with the Trade-Off Theory, stating that the coefficient for the interaction term '*TreatedPost'* should be greater than zero. Analyzing book leverage first, the interaction term '*TreatedPost'* shows overall positive coefficients. While at first sight the overall positive coefficient outputs support the Trade-Off Theory, they are close to zero and most importantly, statistically insignificant, suggesting that the impact of the tax announcement on leverage is negligible. For market leverage on the other hand, the interaction term '*TreatedPost'* displays both positive and negative. However, there is also a consistently statistically insignificance here, suggesting other factors may influence leverage.

The triple interaction term '*TreatedPostProf'* shows a statistically significant, positive coefficient for book leverage without fixed effects, supporting the Trade-Off Theory, but loses significance as soon as fixed effects are included. For market leverage, *'TreatedPostProf'* has positive but insignificant coefficients, providing no robust evidence due to the insignificance.

8.2 Suggestions for future research and limitations of our study

Our study has some limitations that should be acknowledged. Firstly, the analysis is based on a relatively short time period and a small sample of firms, which may not fully capture the long-term effects of the tax. Secondly, our study focuses primarily on the announcement effects rather than the actual implementation of the tax due to the short time-period. This might limit the accuracy of predicting the real impacts on financial structures. Future research could therefore focus on examining the actual application of the salmon tax, not only its announcement. This approach would allow for a better understanding of the long-term effects on the financial structures of salmon farming companies by analyzing data from subsequent years. Additionally, as mentioned extending the timespan of the study to include longer periods before and after the tax implementation could provide more robust insights into its impacts.

It could also be beneficial to explore the broader economic impacts of the tax on the Norwegian aquaculture sector, including investment patterns, employment rates, and overall profitability. Additionally, the scope of our data is limited to Norwegian salmon farming companies, which may reduce the generalizability of our findings to other sectors or regions. A comparative analysis with other sectors or countries that have implemented similar taxes could provide valuable insights. Further studies could also investigate firm-specific characteristics, such as ownership structure and management practices, to understand why some companies are more resilient to tax changes. Incorporating qualitative methods, like interviews with industry stakeholders, could offer deeper insights into strategic decision-making processes.

A.0 Appendix

A.1 VIF test results

We conducted VIF-tests in STATA to check for multicollinearity among our independent variables. We conducted one VIF-test for each regression without fixed effects, represented in columns in *Table 5*.

Test results for the regression represented in Column 1 in *Table 5* are represented in *Table 7* below.

Table 8: VIF test results for Column 1

Variable	*VIF*	*1/VIF*
Treated	1,67	0,600
Post	1,61	0,622
TreatedPost	1,06	0,941
Mean VIF	1,44	

VIF, VIF-value for each variable; Mean VIF, mean VIF-value for the whole regression.

These values indicate low to moderate multicollinearity among the independent variables. Since all VIF values are well below the threshold of 5, there is no significant concern about multicollinearity affecting the stability or reliability of the regression coefficients in this model.

Table 9: VIF test results for Column 3

Variable	*VIF*	*1/VIF*
Treated	2,33	0,429
Post	1,11	0,897
TreatedPost	2,38	0,420
Prof	1,31	0,761
Tan	1,08	0,929
Size	1,38	0,723
Q	1,58	0,634
Mean VIF	1,60	

VIF, VIF-value for each variable; Mean VIF, mean VIF-value for the whole regression.

The results stay within the same thresholds as for the results in *Table 7*. This means there is no significant concern about multicollinearity for the regression represented by Column 3 too.

Table 10: VIF test results for Column 5

Variable	*VIF*	*1/VIF*
Treated	2,33	0,430
Post	1,11	0,897
TreatedPost	2,76	0,362
TreatedPostProf	1,38	0,724
Prof	1,33	0,754
Tan	1,09	0,919
Size	1,40	0,715
Q	1,59	0,629
Mean VIF	1,62	

VIF, VIF-value for each variable; Mean VIF, mean VIF-value for the whole regression.

The majority of the VIF values for the regression in Column 5 in *Table 5* are below 5, indicating low to moderate multicollinearity. Although, the VIF values for *Treated (2,33)* and *TreatedPost* (2,76) are relatively high but still below the critical threshold of 5. Despite the high VIF values we have chosen to still include them in our regression. As illustrated above, the VIFs remain below the 10-point threshold, indicating that although multicollinearity is somewhat present, it is not severe enough to require the removal of these variables.

The mean VIF for the regression is 1,62, suggesting that overall, the model has low to moderate multicollinearity.

Table 11: VIF test results for Column 7

Variable	*VIF*	*1/VIF*
Treated	2,33	0,430
Post	1,11	0,897
TreatedPost	4,32	0,231
TreatedPostProf	2,91	0,343
Prof	1,32	0,760
Tan	1,09	0,915
Size	1,39	0,717
Q	1,58	0,633
Mean VIF	2,01	

VIF, VIF-value for each variable; Mean VIF, mean VIF-value for the whole regression.

All the VIF values in the table are well below the threshold of 5, indicating that multicollinearity is not a significant concern in this model. The mean VIF of 2,01 further supports this conclusion, showing that the overall multicollinearity in the regression model is low to moderate.

A.2 Hausman test results

We conducted a Hausman test in Stata to compare fixed effects (FE) and random effects (RE) models for two regressions where we planned to use one of the effects in the regressions.

Regression 1:

$$Book\ Leverage = \beta_0 + \beta_1(Treated) + \beta_2(Post) + \beta_3(TreatedPost) + \varepsilon$$

Regression 2:

$$Book\ Leverage = \beta_0 + \beta_1(Treated) + \beta_2(Post) + \beta_3(TreatedPost) + \beta_4(Prof) + \beta_5(Tan) + \beta_6(Size) + \beta_7(Q) + \varepsilon$$

Table 12: Hausman test results

Model Comparison	*Chi-Squared*	*Degrees of Freedom*	*p-value*	*Preferred Model*
Regression 1	1,06	2	0,5881	Random Effects
Regression 2	54,93	6	0,000	Fixed Effects

In Regression 1, the Hausman test yielded a chi-squared value of 1.06 with 2 degrees of freedom (p=0.5881), suggesting that the RE model is appropriate due to no significant difference between the models. For Regression 2, the test produced a chi-squared value of 54.93 with 6 degrees of freedom (p=0.0000), indicating a significant difference and thus favoring the FE model. The FE model is preferred here because it accounts for unobserved heterogeneity that is correlated with the regressors, ensuring more reliable estimates.

A.3 Descriptive variable statistics and variable information

Table 13: Data limitations, missing values

Core and Control Variables	*Missing values*
Leverage	186
Prof	285
Tan	221
Size	177
Q	384

Missing values per variable in the data set before winzorizing and lagging the variables.

Table 14: Descriptive statistics for all variables

					Percentiles			
Variable	*Obs.*	*Mean*	*Std. Dev*	*Median*	*25th*	*75th*	*Min*	*Max*
Leverage	1 299	0,260	0,232	0,220	0,056	0,400	0	3,997
Prof	1 200	-0,021	0,325	0,030	-0,046	0,115	-5,985	1,991
Tan	1 264	0, ,249	0,285	0,130	0,010	0,420	0	0,988
Size	1 308	14,623	2,385	14,650	12,962	16,272	0,693	21,959
Q	1 101	0,001	0,002	0,000	0,000	0,001	4,83e-06	0,018

Descriptive statistics per variable in the data set before winzorizing and lagging the variables. Obs. number of observations; Mean, average value of the data set; Std.Dev, Standard Deviation; 25th & 75th, percentile values; Min, minimum value of the data set; Max, maximum value of the data set.

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